

57. Vitamin A. *Natural Medicines Comprehensive Database*. <<http://naturaldatabase.therapeuticresearch.com>>; Accessed 5.12.10.
58. Enshaieh S, Jooya A, Siadat AH, et al. The efficacy of 5% topical tea tree oil in mild to moderate acne vulgaris: a randomized, double-blind placebo-controlled study. *Indian J Dermatol Venereol Leprol*. 2007;73:22–25.
59. Bassett IB, Pannowitz DL, Barnetson RS. A comparative study of tea-tree oil versus benzoyl peroxide in the treatment of acne. *Med J Aust*. 1990;153:455–458.
60. Carson CF, Hammer KA, Riley TV. *Melaleuca alternifolia* (tea tree) oil: a review of antimicrobial and other medicinal properties. *Clin Microbiol Rev*. 2006;19:50–62.
61. Nguyen QH, Bui TP. Azelaic acid: pharmacokinetic and pharmacodynamic properties and its therapeutic role in hyperpigmentary disorders and acne. *Int J Dermatol*. 1995;34:75–84.
62. Gollnick HP, Graupe K, Zaumseil RP. Azelaic acid 15% gel in the treatment of acne vulgaris. Combined results of two double-blind clinical comparative studies. *J Dtsch Dermatol Ges*. 2004;2:841–847.
63. Lowe NJ, Rizk D, Grimes P, et al. Azelaic acid 20% cream in the treatment of facial hyperpigmentation in darker-skinned patients. *Clin Ther*. 1998;20:945–959.
64. Liu RH, Smith MD, Basta SA, et al. Azelaic acid in the treatment of papulopustular rosacea: a systematic review of randomized controlled trials. *Arch Dermatol*. 2006;142:1047–1052.
65. Duteil L, Ortonne JP. Colorimetric assessment of the effects of azelaic acid on light-induced skin pigmentation. *Photodermatol Photoimmunol Photomed*. 1992;9:67–71.
66. Shalita AR. Treatment of mild and moderate acne vulgaris with salicylic acid in an alcohol-detergent vehicle. *Cutis*. 1981;28:556–561.
67. Zander E, Weisman S. Treatment of acne vulgaris with salicylic acid pads. *Clin Ther*. 1992;14:247–253.
68. Shalita AR. Comparison of a salicylic acid cleanser and a benzoyl peroxide wash in the treatment of acne vulgaris. *Clin Ther*. 1989;11:264–267.
69. Rougier A, Dupuis D, Lotte C, et al. The measurement of the stratum corneum reservoir. A predictive method for in vivo percutaneous absorption studies: influence of application time. *J Invest Dermatol*. 1985;4:66–68.
70. Gollnick H, Schramm M. Topical drug treatment in acne. *Dermatology*. 1998;196:119–125.
71. Tenuad I, Khammari A, Dreno B. In vitro modulation of TLR-2, CD1d and IL-10 by adapalene on normal human skin and acne inflammatory lesions. *Exp Dermatol*. 2007;16:500–506.
72. Kang S, Voorhees JJ. Topical retinoids. In: Wolff K, Goldsmith LA, Katz SI, et al, eds. *Fitzpatrick's Dermatology in General Medicine*. 7th ed. New York: McGraw Hill; 2008.
73. Ertl GA, Levine N, Kligman AM. A comparison of the efficacy of topical tretinoin and low-dose oral isotretinoin in rosacea. *Arch Dermatol*. 1994;130:319–324.
74. Griffiths CE, Kang S, Ellis CN, et al. Two concentrations of topical tretinoin (retinoic acid) cause similar improvement of photoaging but different degrees of irritation. A double-blind vehicle-controlled comparison of 0.1% and 0.025% tretinoin creams. *Arch Dermatol*. 1995;131:1037–1044.
75. Pelle MT, Crawford GH, James WD. Rosacea: II. Therapy. *J Am Acad Dermatol*. 2004;51:499–512.
76. Cunliffe WJ, Holland KT, Bojar R, et al. A randomized, double-blind comparison of clindamycin phosphate/benzoyl peroxide gel formulation and a matching clindamycin gel with respect to microbiologic activity and clinical efficacy in the topical treatment of acne vulgaris. *Clin Ther*. 2002;24:1117–1133.
77. Eady EA, Farmery MR, Ross JI, et al. Effects of benzoyl peroxide and erythromycin alone and in combination against antibiotic-sensitive and -resistant skin bacteria from acne patients. *Br J Dermatol*. 1994;131:331–336.
78. Eady EA, Bojar RA, Jones CE, et al. The effects of acne treatment with a combination of benzoyl peroxide and erythromycin on skin carriage of erythromycin-resistant propionibacteria. *Br J Dermatol*. 1996;134:107–113.
79. Leyden J, Kaidbey K, Levy SF. The combination formulation of clindamycin 1% plus benzoyl peroxide 5% versus 3 different formulations of topical clindamycin alone in the reduction of *Propionibacterium acnes*. An in vivo comparative study. *Am J Clin Dermatol*. 2001;2:263–266.
80. Leyden JJ, Del Rosso JQ, Webster GE. Clinical considerations in the treatment of acne vulgaris and other inflammatory skin disorders: a status report. *Dermatol Clin*. 2009;27:1–15.
81. Thiboutot D, Gollnick H, Bettoli V, et al. New insights into the management of acne: an update from the Global Alliance to Improve Outcomes in Acne Group. *J Am Acad Dermatol*. 2009;60:S1–S50.
82. Del Rosso JQ, Kim G. Optimizing use of oral antibiotics in acne vulgaris. *Dermatol Clin*. 2009;27:33–42.
83. Quarterman MJ, Johnson DW, Abele DC, et al. Ocular rosacea. Signs, symptoms, and tear studies before and after treatment with doxycycline. *Arch Dermatol*. 1997;133:49–54.
84. Oprica C, Nord CE. European surveillance study on the antibiotic susceptibility of *Propionibacterium acnes*. *Clin Microbiol Infect*. 2005;11:204–213.
85. Desai A, Kartono F, Del Rosso JQ. Systemic retinoid therapy: a status report on optimal use and safety of long-term therapy. *Dermatol Clin*. 2007;25:185–193.
86. iPLEDGE: Committed to Pregnancy Prevention. <[www.ipledgeprogram.com](http://www.ipledgeprogram.com)>; Accessed 9.12.10.
87. Marqueling AL, Zane LT. Depression and suicidal behavior in acne patients treated with isotretinoin: a systematic review. *Semin Cutan Med Surg*. 2007;26:210–220.
88. van Vloten WA, Sigurdsson V. Selecting an oral contraceptive agent for the treatment of acne in women. *Am J Clin Dermatol*. 2004;5:435–441.
89. Lucky AW, Koltun W, Thiboutot D, et al. A combined oral contraceptive containing 3-mg drospirenone/20- $\mu$ g ethinyl estradiol in the treatment of acne vulgaris: a randomized, double-blind, placebo-controlled study evaluating lesion counts and participant self-assessment. *Cutis*. 2008;82:143–150.
90. Rapkin AJ, Winer SA. Drospirenone: a novel progestin. *Expert Opin Pharmacother*. 2007;8:989–999.
91. Thielitz A, Gollnick H. Overview of new therapeutic developments for acne. *Expert Rev Dermatol*. 2009;4:55–65.
92. Hamilton FL, Car J, Lyons C. Laser and other light therapies for the treatment of acne vulgaris: systematic review. *Br J Dermatol*. 2009;160:1273–1285.
93. Orringer JS, Sachs DL, Bailey E, et al. Photodynamic therapy for acne vulgaris: a randomized, controlled, split-face clinical trial of topical aminolevulinic acid and pulsed dye laser therapy. *J Cosmet Dermatol*. 2010;9:28–34.
94. Lonne-Rahm S, Nordlind K, Edström DW, et al. Laser treatment of rosacea: a pathoetiological study. *Arch Dermatol*. 2004;140:1345–1349.
95. Bernstein EF, Kligman A. Rosacea treatment using the new-generation, high-energy, 595 nm, long pulse-duration pulsed-dye laser. *Lasers Surg Med*. 2008;40:233–239.
96. Dreno B, Nocera T, Verriere F, et al. Topical retinaldehyde with glycolic acid: study of tolerance and acceptability in association with anti-acne treatments in 1,709 patients. *Dermatology*. 2005;210(suppl 1):22–29.
97. Poli F, Ribet V, Lauze C, et al. Efficacy and safety of 0.1% retinaldehyde/6% glycolic acid (diacneal) for mild to moderate acne vulgaris. A multicentre, double-blind, randomized, vehicle-controlled trial. *Dermatology*. 2005;210(suppl 1):14–21.
98. Katsambas AD. RALGA (Diacneal), a retinaldehyde and glycolic acid association and postinflammatory hyperpigmentation in acne—a review. *Dermatology*. 2005;210(suppl 1):39–45.
99. Elsaie ML, Abdelhamid MF, Elsaiee LT, et al. The efficacy of topical 2% green tea lotion in mild-to-moderate acne vulgaris. *J Drugs Dermatol*. 2009;8:358–364.
100. Paranjpe P, Kulkarni PH. Comparative efficacy of four Ayurvedic formulations in the treatment of acne vulgaris: a double-blind randomized placebo-controlled clinical evaluation. *J Ethnopharmacol*. 1995;49:127–132.
101. Lalla JK, Nandedkar SY, Paranjape MH, et al. Clinical trials of ayurvedic formulations in the treatment of acne vulgaris. *J Ethnopharmacol*. 2001;78:99–102.
102. Slobodníková L, Kost'álová D, Labudová D, et al. Antimicrobial activity of Mahonia aquifolium crude extract and its major isolated alkaloids. *Phytother Res*. 2004;18:674–676.
103. Seki T, Morohashi M. Effect of some alkaloids, flavonoids and triterpenoids, contents of Japanese-Chinese traditional herbal medicines, on the lipogenesis of sebaceous glands. *Skin Pharmacol*. 1993;6:56–60.
104. Akamatsu H, Asada Y, Horio T. Effect of keigai-rengyo-to, a Japanese kampo medicine, on neutrophil functions: a possible mechanism of action of keigai-rengyo-to in acne. *J Int Med Res*. 1997;25:255–265.

105. Higaki S, Morimatsu S, Morohashi M, et al. Susceptibility of *Propionibacterium acnes*, *Staphylococcus aureus* and *Staphylococcus epidermidis* to 10 Kambo formulations. *J Int Med Res*. 1997;25:318–324.
106. Brown J, Farquhar C, Lee O, et al. Spironolactone versus placebo or in combination with steroids for hirsutism and/or acne. *Cochrane Database Syst Rev*. 2009;(2): CD000194.
107. Koçak M, Yağlı S, Vahapoglu G, et al. Permethrin 5% cream versus metronidazole 0.75% gel for the treatment of papulopustular rosacea: a randomized double-blind placebo-controlled study. *Dermatology*. 2002;205:265–270.
108. Rigopoulos D, Kalogeromitros D, Gregoriou S, et al. Randomized placebo-controlled trial of a flavonoid-rich plant extract-based cream in the treatment of rosacea. *J Eur Acad Dermatol Venereol*. 2005;19:564–568.
109. Berardesca E, Cameli N, Cavallotti C, et al. Combined effects of silymarin and methylsulfonylmethane in the management of rosacea: clinical and instrumental evaluation. *J Cosmet Dermatol*. 2008;7:8–14.
110. Shalita AR, Smith JG, Parish LC, et al. Topical nicotinamide compared with clindamycin gel in the treatment of inflammatory acne vulgaris. *Int J Dermatol*. 1995;34:434–437.



# Human Papillomavirus and Warts

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## Pathophysiology

Warts are benign growths found on the epithelium of the skin and mucous membranes that appear as thick, hyperkeratotic lesions. They are caused by infections from a family of double-stranded DNA viruses known as human papillomavirus (HPV).<sup>1</sup> More than 100 types of HPV have been identified within this family.<sup>2</sup> Infections by HPV (Figs. 74-1 to 74-3) are manifested mostly as cutaneous, nongenital disease (common warts, flat warts, plantar warts) and genital disease (genital warts, cervical dysplasia, cervical cancer). HPV infection is also uncommonly found in the oral and respiratory mucosa (Table 74-1). The clinical manifestation of the infection depends on the HPV type, the size of the inoculum, the immune status of the host, and the anatomic site. Individuals with impaired cell-mediated immunity are particularly more susceptible to HPV infection.<sup>3</sup>

The virus is transmitted by direct and indirect contact, and predisposing factors include disruptions to the normal epithelial barrier. The risk factors for cutaneous warts are community showers, occupational handling of meat, and immunosuppression<sup>4</sup>; the risk factors for genital HPV infection are sexual activity and lifetime number of sexual partners.<sup>5,6</sup>

Cutaneous warts and genital warts are usually asymptomatic. Most do not have malignant potential. However, some types in the genital region, such as HPV types 16 and 18, have been associated with cervical dysplasia and cervical cancer in women and squamous intraepithelial neoplasia in men.<sup>7,8</sup>

Cutaneous warts affect around 3.5% of the general population and occur in 10% of children and adolescents.<sup>9,10</sup> Warts resolve spontaneously in 40% of children, and two thirds of the warts resolve spontaneously within 2 years.<sup>11</sup>

Genital warts affect around 1% of sexually active adults in the general population.<sup>12</sup> Approximately 500,000 cases of genital warts occur each year in the United States<sup>13</sup>;

associated annual medical costs are estimated at \$200 million.<sup>14</sup> HPV is associated with more than 99% of cervical cancers and 84% of anal cancers, primarily due to HPV types 16 and 18.<sup>8,15</sup> Each year, more than 10,000 cases of cervical cancer are diagnosed, and 3700 women die of the disease<sup>16</sup> (see Fig. 74-1).

## Integrative Therapies

The primary goals of treatment are to remove symptomatic warts, to decrease social stigma, and to decrease infectivity from one person to another. Otherwise, observation is a reasonable first approach.

Observation is a reasonable first approach.

HPV infection and wart development are closely linked to the immunologic state of the individual. Warts occur more frequently, last longer, and appear in greater numbers in patients with acquired immunodeficiency syndrome (AIDS) or lymphomas and in those taking immunosuppressive drugs.<sup>1,3</sup> Therefore, therapies that promote a healthy immune system are crucial for treatment of warts.

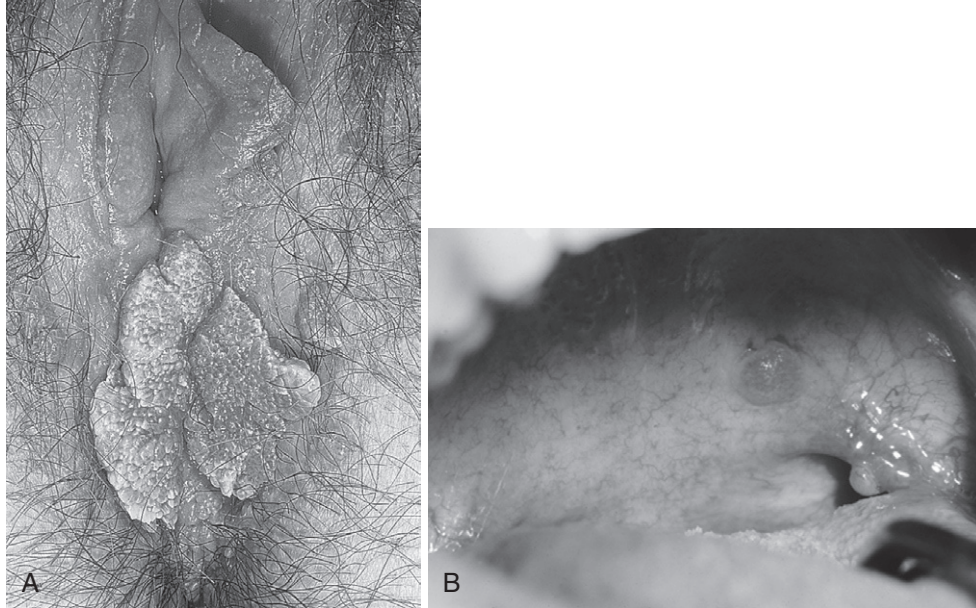
## Nutrition and Lifestyle

### Diet

A healthy combination of whole food with fruits and vegetables, particularly dark green and yellow ones such as papaya, pumpkin, oranges, broccoli, and spinach, has been reported to protect against the effects of HPV and to support a healthy immune system.<sup>17-20</sup> These foods are usually rich in antioxidants like vitamin C, carotenoids, tocopherols, and folic acids. Avoidance of high intake of sugar may also improve the immune system.<sup>21</sup>

**FIGURE 74-1**

Human papillomavirus (HPV) infections. **A**, Large, cauliflower-like wart of the vagina. **B**, Dome-shaped HPV-induced lesions of the soft palate and retromolar trigone. (A from Habif TP, Campbell JI Jr, Chapman MS, et al. *Skin Disease: Diagnosis and Treatment*. 2nd ed. St. Louis: Mosby; 2005; B from Little JW, Falace DA, Miller CS, Rhodus NL. *Dental Management of the Medically Compromised Patient*. 7th ed. St. Louis: Mosby; 2008.)

**FIGURE 74-2**

Plantar wart. A hyperkeratotic, verrucous papule or plaque beneath a pressure point on the sole of the foot is characteristic. HPV types 1 (myrmecia), 2 (mosaic), and 4 are most common. Because plantar warts are driven into the skin by the pressure of walking or standing, they are usually the most treatment resistant. (From Douglas JM. Papillomavirus. In: Goldman L, Ausiello D, eds. *Cecil Medicine*. 23rd ed. Philadelphia: Saunders; 2008.)

**FIGURE 74-3**

Verrucae planae or flat warts. The warts, skin colored to pink, are smooth-surfaced, flat papules (HPV 10 was detected). (From Bologna JL, Jorizzo JL, Rapini RP. *Dermatology*. 2nd ed. St. Louis: Mosby; 2008.)



**TABLE 74-1.** Warts and Some of Their Frequently Associated Locations and HPV Types

CLINICAL MANIFESTATIONS	LOCATIONS	SOME ASSOCIATED HPV TYPES
<b>Cutaneous warts</b>		
Common warts ( <i>verruca vulgaris</i> )	Hands, knees, fingers, toes, nails	2, 4
Common warts: butcher's warts, found on meat, fish, and poultry handlers	Hands, fingers	7, 2
Plantar warts ( <i>verruca plantaris</i> )	Foot	1
Flat warts ( <i>verruca plana</i> )	Face	3, 10, 28
Epidermodysplasia verruciformis	Face, neck, trunk, extremities	5
<b>Anogenital warts</b>		
Genital warts ( <i>condylomata acuminata</i> )	Anogenital area	6, 11
Anogenital malignant neoplasms	Anogenital area	16, 18
<b>Other manifestations</b>		
Recurrent respiratory papillomatosis	Larynx, trachea, lungs	6, 11
HPV, human papillomavirus		

A healthy combination of whole food with fruits and vegetables, particularly dark green and yellow ones such as papaya, pumpkin, oranges, broccoli, and spinach, has been reported to protect against the effects of HPV and to support a healthy immune system.

### Sexual Contact

Genital contact is a major risk factor for genital HPV infections. Behaviors such as limiting the number of sex partners, delaying age at first intercourse, and consistently using condoms may reduce infection risk.<sup>22</sup>

### Alcohol

Connections have been made between alcohol consumption and HPV infections in epidemiologic studies, but confounding factors, such as risky sexual behaviors and poor hygiene, pose a challenge to clarification of these relationships. However, animal and in vitro studies support the effect of alcohol on cellular immunity and lymphocytic activities.<sup>23</sup>

### Smoking

Tobacco cessation is recommended because tobacco use is associated with increased risk of persistent HPV infections and with the development of warts and HPV-related malignant neoplasms.<sup>24,25</sup>

Tobacco use is associated with increased risk of persistent HPV infections as well as with the development of warts and HPV-related malignant neoplasms.

## Supplements

Most of the epidemiologic studies that have evaluated nutritional factors and their relationship with the treatment of warts have been based on targeted nutrient intakes or serum levels of specific nutrients rather than on specific supplement use. These studies support healthy food choices without identification of a specific dietary supplement to be more protective against warts.<sup>26</sup> So far, studies on the use of carotenoids, vitamin C, vitamin E, and folic acid have been inconclusive regarding the prevention and treatment of HPV infections in women.<sup>26-30</sup> These nutrients, however, have many immunostimulatory and protective functions. The supplements described here are chosen on the basis of their positive effects on the immune system and the inverse relationships with the risk for HPV infection or disease.<sup>26-28,31</sup>

### Carotenoids

Carotenoids, mostly found in plant sources, have been shown to have antioxidant effects and to enhance lymphocytic responses. Studies have not shown vitamin A, a fat-soluble vitamin obtained from animal sources, to be related to cervical cancer risk or progression. In contrast, studies have shown that low intake of carotenoids in food and low serum levels are linked to increased risk for cervical cancer or persistent HPV infection.<sup>26,31</sup> However, because of the potential toxicity of high-dose vitamin A supplementation and lack of consistent evidence, a diet high in carotenoids is recommended over supplementation.<sup>26</sup>

A diet high in carotenoids is recommended over supplementation.

### Vitamin C

Vitamin C has been well studied for its antioxidant effects that protect DNA against oxygen species and has been suggested to inhibit oncogenic transformation and to reduce virus production. It also increases immune system modulators and improves folate uptake and function.<sup>26,27,32</sup> In most epidemiologic studies, vitamin C has been found to be inversely related to the risk of cervical cancer.

#### ■ Dosage

The recommended dosage of vitamin C is 1000 mg twice daily.

#### ■ Precautions

High doses often cause diarrhea.

### Vitamin E

Vitamin E has been shown to enhance cell-mediated immune response and phagocyte-derived functions. A study has shown that women with persistent HPV infection had a lower concentration of serum tocopherols than did those with transient or no HPV infection.<sup>26,31</sup>

#### ■ Dosage

The recommended dosage of vitamin E is 400 units/day of mixed tocopherols and tocotrienols.

#### ■ Precautions

Prolonged use of high doses (400 units or more) has been associated with an increase in cardiovascular risk.

### Folic Acid

Folic acid is essential for DNA synthesis, protein synthesis, and gene expression.<sup>26,27</sup> Low levels have been suggested to increase incorporation of HPV DNA in cervical tissue at early infection stages.<sup>27,33</sup>

#### ■ Dosage

The recommended dosage of folic acid is 400 mcg/day.

## Mind-Body Therapies

### Hypnotherapy

Hypnotherapy is the induction of a trance state for the purpose of treatment and healing. During hypnosis, a person is induced into a hypnotic state consisting of narrowed awareness, restricted attentiveness, selective wakefulness, and heightened suggestibility through specific techniques.<sup>34</sup> Suggestions for imaginative experiences will then be presented to the patient by the hypnotherapist for alterations in perception, sensation, emotion, thought, or behavior.<sup>35</sup> Many case reports and studies have data supporting the use of hypnotherapy in the treatment of warts.<sup>36–39</sup> In a study that compared hypnosis, topical salicylic acid, and placebo, hypnosis produced significantly more wart regression than the salicylic acid or placebo treatment did at a 6-week follow-up.<sup>37</sup> Hypnosis is generally safe and does not have side effects. Self-hypnosis is also easy to learn, even for children (see Chapter 92, Self-Hypnosis Techniques).

In a study that compared hypnosis, topical salicylic acid, and placebo, hypnosis produced significantly more wart regression than the salicylic acid or placebo treatment did at a 6-week follow-up.

## Botanicals

Since ancient times, there have been many traditional cures for warts. This section discusses some herbal treatments for which there are at least some prospective randomized controlled trials (RCTs) that support the potential efficacy of wart treatments.

### Green Tea Extract

Green tea polyphenols or catechins (major components of green tea leaves) have immunostimulatory, antiproliferative, and antioxidant activities. The ointment Veregen (sinecatechins), which contains polyphenols, has shown positive effects against genital warts. In a few double-blinded RCTs, the clearance rate for genital warts is statistically significant compared with placebo.<sup>40–42</sup> Veregen was approved by the Food and Drug Administration (FDA) in 2006.

#### ■ Dosage

Veregen ointment, 15%, is applied three times daily.

#### ■ Precautions

The ointment can cause local pain, itching, burning, and inflammation. It is expensive.

### Fig Tree Latex

Fig tree (*Ficus carica*) latex, or ficin, a milky excretion of leaves and fruits of the common fig tree, has been documented for treatment of warts since ancient Persia. A small prospective study showed similar outcomes compared with cryotherapy.<sup>43</sup>

#### ■ Dosage

One drop per wart is applied three times daily for a minimum of 4 days.

### Propolis

Propolis is a natural flavonoid-rich resin created by bees, used in the construction of hives. It is a mixture of the buds of conifer and poplar trees and bee secretions. It has antiviral and antibacterial properties that increase natural host resistance to infections. In a randomized study, 73% and 75% of patients with common warts and flat warts were cured compared with echinacea and placebo.<sup>44</sup>

#### ■ Dosage

Propolis is administered orally, 500 mg/day, for 3 months.

### Populus euphratica

The *Populus euphratica* tree is found in the Middle East, central and southern Asia, and northern Africa. It is part of the Salicaceae family that contains salicin, a precursor of salicylic acid, a common treatment of warts. In a randomized study, the smoke of the tree's burnt leaves was found to be as effective as cryotherapy when the affected area was exposed for 10 minutes for up to 10 weeks.<sup>45</sup>

## Other Therapies

### *Duct Tape (silver type)*

In a prospective RCT comparing duct tape use with cryotherapy in children, the clearance rate was 85% compared with 60%, respectively. Duct tape was placed on the patient's warts for 6 days and removed on the seventh day; the area was then soaked and débrided. This cycle was repeated for up to 2 months.<sup>46</sup> Other studies did not show significant results, but those used a different transparent tape.<sup>47,48</sup>

## Pharmaceutical Therapies

Therapies usually include local destruction of wart tissue directly by chemical agents, ablative therapies, and immunomodulating therapies that enhance the patient's immune response against HPV.<sup>1,49,50</sup> For cutaneous warts, the first-line treatments are typically salicylic acid and cryotherapy; for genital warts, they are cryotherapy, trichloroacetic acid, and podophyllin. Other treatments are reserved for extensive or recalcitrant disease.

Therapies usually include local destruction of wart tissue directly by chemical agents, ablative therapies, and immunomodulating therapies that enhance the patient's immune response against HPV.

## Chemical Agents (for cutaneous warts)

### *Salicylic Acid*

Salicylic acid is a safe and effective first-line treatment of cutaneous warts.<sup>51-53</sup> It is a keratolytic agent that chemically débrides the surface of the wart, resulting in a host immune response that may help clear the infection.<sup>51,54</sup> The wart surface should first be pared away with pumice stone, emery board, or surgical blade and then soaked in warm water for softening. Salicylic acid is then applied to the softened keratin on the wart and allowed to dry. This cycle should be repeated daily for up to 12 weeks.<sup>51</sup> The pooled data from six RCTs demonstrated a clearance rate of 75% in the salicylic acid treatment group compared with 48% in the control group.<sup>53</sup>

#### ■ Dosage

Salicylic acid, 15% to 20% preparation, is applied daily at home.

### *Bleomycin (Blenoxane)*

Bleomycin (Blenoxane) is a cytotoxic agent that directly interferes with DNA synthesis. The solution may be injected into a wart or applied to the wart and then pricked through with a lancet, allowing the solution to enter the tissue.<sup>51,52,54</sup> Data for efficacy are inconsistent, and use is supported only for recalcitrant warts.<sup>53,54</sup>

#### ■ Dosage

Bleomycin 0.3 mL (0.15 unit) is administered in each treatment; the injection may be repeated every 3 to 4 weeks.

#### ■ Precautions

Common adverse effects include pain, swelling, scarring, pigment change, and nail damage.<sup>51</sup>

## Chemical Agents (for genital warts)

### *Trichloroacetic Acid*

Trichloroacetic acid destroys the wart tissue by causing chemical coagulation of tissue proteins. It is inexpensive and has an efficacy of 80%. It can be used on the cervix and vagina, and it is safe during pregnancy.

#### ■ Dosage

Trichloroacetic acid (Tri-Chlor), 80% to 90% solution, is administered weekly for 4 to 6 weeks by the physician.<sup>55, 56</sup>

#### ■ Precautions

A common side effect is irritation.<sup>49</sup>

### *Podophyllin*

Podophyllin from the mayapple plant, *Podophyllum peltatum*, acts as an antimetabolic and cytotoxic agent that disrupts viral activities and the microcirculation of the wart.<sup>6,9</sup> The preparations are not standardized; therefore, efficacy may be variable.

#### ■ Dosage

Podophyllin, 25% solution for small warts and 10% solution for areas near the mucosal surfaces or larger warts, is washed off within 6 hours after application. It is applied by the physician one or two times per week.

#### ■ Precautions

Because podophyllin is highly absorbable, treatment of large areas may increase the potential for systemic effects, such as bone marrow suppression and neurotoxicity. Side effects include burning, redness, and swelling.

### *Podophyllotoxin (Podofilox)*

Podophyllotoxin (podofilox) is a standardized formulation of the active compound from podophyllin, a preparation safe for self-administration. Studies show that podophyllotoxin is more effective than podophyllin. It has an estimated efficacy of 60%.<sup>55</sup>

#### ■ Dosage

Podofilox, 0.5% gel or solution, is applied twice daily for 3 days, followed by 4 days of no treatment, repeated for up to four cycles. The treatment surface area should not exceed 10 cm<sup>2</sup>, and the volume of medication should not exceed 0.5 mL per use.<sup>6,57,58</sup> It is applied by the patient.

#### ■ Precautions

Do not apply podophyllin to the cervix or vagina because of the risk of chemical burns. Do not use in pregnancy.

### *5-Fluorouracil*

5-Fluorouracil (5-FU) inhibits cell growth by interfering with DNA and RNA synthesis. It is used intralesionally and is awaiting FDA approval.<sup>49</sup> It is highly teratogenic.

## Immunomodulating Agents (for cutaneous warts and genital warts)

### *Imiquimod*

Imiquimod (Aldara) induces local production of cytokines and enhances T-cell-mediated cytolytic activity against viral targets. Although RCT data are lacking, a study showed a clearance rate of 56% for cutaneous warts.<sup>59</sup> Use for recalcitrant warts.

#### ■ Dosage

Imiquimod, 5% cream, is applied three times a week at bedtime for up to 16 weeks.<sup>56</sup>

#### ■ Precautions

Adverse reactions included erythema, burning, itching, and erosion.

## Immunomodulating Agents (for cutaneous warts)

### *Candida Antigen and Mumps Antigen*

Most people have been exposed to the yeast *Candida albicans* or to the mumps virus and will mount a delayed hypersensitivity response when they are injected with one of these antigens. As a result, immunity against HPV is enhanced.<sup>60</sup>

## Immunomodulating Agents (for genital warts)

### *Interferons*

Interferons are immunologic proteins that inhibit viral replication. Topical interferon may be effective against recalcitrant and recurrent warts.<sup>61</sup>

#### ■ Dosage

Interferon alfa, 1 million international units, is injected two or three times per week for up to 8 weeks. Limit to five warts per session.<sup>49,54</sup>

## Vaccinations

### *Human Papillomavirus Vaccine*

Two vaccines (Gardasil and Cervarix) are available to protect females against HPV infections that cause most cervical cancers. The quadrivalent HPV vaccine (Gardasil) targeting HPV types 6, 11, 16, and 18 is effective for primary prevention against genital warts in males and females. It is licensed for use between the ages of 9 and 26 years. It is most beneficial to complete three doses during a 6-month period before beginning of sexual activity.<sup>62</sup>

The quadrivalent HPV vaccine (Gardasil) is effective for primary prevention against genital warts in males and females.

## Ablative Methods (for cutaneous and genital warts)

### *Cryotherapy*

Liquid nitrogen is the most commonly used cryogen. It causes irreversible cytolysis by thermal damage, and local inflammation produces a cell-mediated immunologic response.<sup>9,51,54</sup> First, débride the wart with a surgical blade, then use a cotton-tipped applicator or cryospray to treat the wart until a halo of frozen tissue appears around the wart and time for 5 to 30 seconds. Alternate the freezing with an intervening period that allows the wart to thaw. This freeze-thaw-freeze technique may increase the chance for complete eradication of the wart.<sup>9</sup> Repeat treatment at 1- to 3-week intervals. Side effects may include pain and blistering. Efficacy studies have shown variable results. Pooled data showed that aggressive cryotherapy has a clearance rate of 52%.<sup>53</sup>

### *Pulsed Dye Laser*

Pulsed dye laser is a vascular lesion laser that selectively heats hemoglobin contained in the wart blood vessels. This cauterization of the blood vessels leads to necrosis.<sup>58</sup> Its efficacy is between 48% and 93% for different warts and highest against periungual warts.<sup>52</sup> Use when other therapies have failed.

### *Carbon Dioxide Laser*

The carbon dioxide laser uses focused infrared light energy to vaporize the wart. It is indicated for extensive vaginal and intraurethral warts. Physicians are advised to wear masks during treatment to prevent inhalation of the smoke plume, which contains HPV viral particles.<sup>49,56</sup>

### *Surgical Excision*

Surgical treatment of warts involves removal at the dermal-epidermal junction. Surgical methods include scissor excision, shave excision, curettage, electrocautery, loop electrosurgical excision procedure (LEEP), and large loop excision of the transformation zone (LLETZ). The efficacy is 35% to 70%.<sup>56</sup> Side effects include pain, scarring, and bleeding. Local, regional, or general anesthesia is required, depending on the location and size of the lesion. LEEP and LLETZ are effective ways for removal of cervical condylomas.<sup>9,49,50,63</sup>

## Therapies to Consider

Garlic has been used for warts in China, and a few studies have demonstrated that garlic is effective when it is used as an extract or cut off and rubbed onto the lesion.<sup>64,65</sup> Acupuncture points have also been suggested for wart treatments.<sup>66</sup>

A limited number of studies have been done in distant healing,<sup>67</sup> Reiki,<sup>68</sup> and homeopathy,<sup>69</sup> but no strong supporting data have been found.



## PREVENTION PRESCRIPTION

- Maintain a healthy diet that consists of dark green and yellow vegetables and fruits.
- Avoid moderate to high consumption of alcohol and cigarette smoking.
- Workers handling meat, fish, and poultry should wear appropriate protective gear.
- Wear shoes when using communal showers or locker rooms.
- If either partner has genital warts, use condoms consistently during sexual intercourse.
- Maintain regular screening for cervical HPV infection with Papanicolaou smear.
- Vaccinate against HPV types that lead to cervical cancer and genital warts (quadrivalent HPV vaccine [Gardasil], 0.5 mL intramuscularly three times at 0, 2, and 6 months).



### THERAPEUTIC REVIEW

#### ■ Diet and Lifestyle

- Balanced, whole-food diet that consists of vitamin C, vitamin E, carotenoids, and folic acid. Also include lots of dark green and yellow vegetables and fruits.



#### ■ Integrative Therapies

- Hypnotherapy
- Duct tape
- Topical green tea extract ointment (Veregen)



#### ■ Supplements

- Vitamin C: 1000 mg two times daily



- Vitamin E: 400 units/day



- Folic acid: 400 mcg/day



#### ■ Pharmaceutical Therapies

- Topical salicylic acid: 15% to 20% preparations, applied daily for 12 weeks
- Topical podophyllotoxin (podofilox): 0.5% gel or solution, applied twice daily for 3 days, followed by 4 days of no treatment, then repeated up to four cycles
- Topical trichloroacetic acid: 80% to 90% preparations, applied weekly by physician for 4 to 6 weeks



#### ■ Surgical Therapies

- Cryotherapy
- LEEP/LLETZ



#### KEY WEB RESOURCES

<http://www.cdc.gov/hpv>

An extensive Web site with information on HPV for health professionals, educators, and patients, from the latest recommendations and statistics to fact sheets in English and Spanish

<http://www.nlm.nih.gov/medlineplus/warts.html>

A compilation of Web sites that directs you to the latest clinical trials, published articles, pictures of warts, and patient education materials

<http://www.aafp.org/online/en/home/publications/journals/afp.html>

An easy-to-navigate online journal that provides journal reviews, clinical guidelines, and patient handouts for warts

### References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Habif TP. Warts, herpes simplex, and other viral infections. In: *Clinical Dermatology*. 5th ed. St. Louis: Mosby; 2004:454–464.
- Brentjens MH, Yeung-Yue KA, Lee PC, et al. Human papillomavirus: a review. *Dermatol Clin*. 2002;20:315–331.
- Morelli JG. Cutaneous viral infections. In: Kliegman RM, ed. *Nelson Textbook of Pediatrics*. 18th ed. Philadelphia: Saunders; 2007:2751–2753.
- Loo KS, Tang YW. Warts (non-genital). *Am Fam Physician*. 2010;81:1008–1009.
- Ho GY, Bierman R, Beardsley L, et al. Natural history of cervicovaginal papillomavirus infection in young women. *N Engl J Med*. 1998;338:423–428.
- Scheinfeld N. An evidence-based review of medical and surgical treatments of genital warts. *Dermatol Online J*. 2006;12:3–5.
- Adam E, Berkova Z, Daxnerova Z. Papillomavirus detection: demographic and behavioral characteristics influencing the identification of cervical disease. *Am J Obstet Gynecol*. 2000;182:257–264.
- Kulasingam SL, Hughes JP, Kiviat NB, et al. Evaluation of human papillomavirus testing in primary screening for cervical abnormalities: comparison of sensitivity, specificity, and frequency of referral. *JAMA*. 2002;288:1749–1757.
- Plasencia JM. Cutaneous warts: diagnosis and treatment. *Prim Care*. 2000;27:423–434.
- Allen AL, Siegfried EC. What's new in human papillomavirus infection. *Curr Opin Pediatr*. 2000;12:365–369.
- Massing AM, Epstein WL. Natural history of warts: a two year study. *Arch Dermatol*. 1963;87:306–310.
- Koutsky L. Epidemiology of genital human papillomavirus infection. *Am J Med*. 1997;102:3–8.
- Workowski KA, Levine WC. Sexually transmitted disease guidelines 2002. *MMWR Recomm Rep*. 2002;1:1–80. <<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5106a1.htm>>; Accessed 9.12.10.
- Insinga RP, Dasbach EJ, Elbasha EH. Assessing the annual economic burden of preventing and treating anogenital human papillomavirus-related disease in the US: analytic framework and review of the literature. *Pharmacoeconomics*. 2005;23:1107–1122.
- Frisch M, Glimmerius B, van den Brule AJ, et al. Sexually transmitted infection as a cause of anal cancer. *N Engl J Med*. 1997;337:1350–1358.
- Affinito JH, Ault K, Ettari MP, et al. Cervical cancer and other human papillomavirus-related diseases: screening and prevention strategies for primary care clinicians. In: *Family Practice Education Network Consensus Recommendation*. Vol. 6(2). Lisle, IL: Illinois Academy of Family Physicians/ Family Practice Network; 2005.
- Tomita LY, Filho AL, Costa MC, et al. Diet and serum micronutrients in relation to cervical neoplasia and cancer among low-income Brazilian women. *Int J Cancer*. 2010;126:703–714.
- Siegel EM, Salemi JL, Villa LL, et al. Dietary consumption of antioxidant nutrients and risk of incident cervical intraepithelial neoplasia. *Gynecol Oncol*. 2010;118:289–294.
- Garcia-Closas R, Castellsague X, Bosch X, et al. The role of diet and nutrition in cervical carcinogenesis: a review of recent evidence. *Int J Cancer*. 2005;117:629–637.
- Hernandez BY, McDuffie K, Wilkens LR, et al. Diet and premalignant lesions of the cervix: evidence of a protective role for folate, riboflavin, thiamin, and vitamin B<sub>12</sub>. *Cancer Causes Control*. 2003;14:859–870.
- Hostetter MK. Handicaps to host defense: effects of hyperglycemia on C3 and *Candida albicans*. *Diabetes*. 1990;39:271–275.
- Juckett G, Hartman-Adams H. Human papillomavirus: clinical manifestations and prevention. *Am Fam Physician*. 2010;82:1209–1213.
- Bairati I, Sherman KJ, McKnight B, et al. Diet and genital warts: a case-control study. *Sex Transm Dis*. 1994;21:149–154.
- Khan AM, Freeman-Wang T, Pital N, et al. Smoking and multicentric vulval intraepithelial neoplasia. *J Obstet Gynaecol*. 2009;29:123–125.
- Maucort-Boulch D, Plummer M, Castle PE, et al. Predictors of human papillomavirus persistence among women with equivocal or mildly abnormal cytology. *Int J Cancer*. 2010;126:684–691.
- Rock CL, Michael CW, Reynolds RK, et al. Prevention of cervix cancer. *Crit Rev Oncol Hematol*. 2000;33:169–185.
- Potischman N, Brinton LA. Nutrition and cervical neoplasia. *Cancer Causes Control*. 1996;113–126.
- Schneider A, Shah L. The role of vitamins in the etiology of cervical neoplasia: an epidemiological review. *Arch Gynecol Obstet*. 1989;246:1–13.
- Goodman MT. Case-control study of plasma folate, homocysteine, vitamin B<sub>12</sub>, and cysteine as markers of cervical dysplasia. *Cancer*. 2000;89:376–382.
- Mackerras D, Irwig L, Simpson JM, et al. Randomized double-blind trial of beta-carotene and vitamin C in women with minor cervical abnormalities. *Br J Cancer*. 1999;79:1448–1453.
- Guiliano AR, Papenfuss M, Nour M, et al. Antioxidant nutrients: associations with persistent human papillomavirus infection. *Cancer Epidemiol Biomarkers Prev*. 1997;11:917–923.
- Henson DE, Block G, Levine M. Ascorbic acid: biologic functions and relation to cancer. *J Natl Cancer Inst*. 1991;83:547–550.
- Butterworth C, Hatch KD, Macaluso M, et al. Folate deficiency and cervical dysplasia. *JAMA*. 1992;267:528–533.
- Shenefelt PD. Biofeedback, cognitive-behavioral methods, and hypnosis in dermatology: is it all in your mind? *Dermatol Ther*. 2003;16:114–122.
- The Official Division 30 Definition and Description of Hypnosis*. <<http://psychologicalhypnosis.com/info/the-official-division-30-definition-and-description-of-hypnosis/>>; Accessed 11.12.10.
- Surman OS, Gottlieb SK, Hackett TP, et al. Hypnosis in the treatment of warts. *Arch Gen Psychiatry*. 1973;28:439–441.
- Spanos NP, Stenstrom RJ, Johnston JC. Hypnosis, placebo, and suggestion in the treatment of warts. *Psychosom Med*. 1988;50:245–260.
- Shenefelt PD. Hypnosis in dermatology. *Arch Dermatol*. 2000;136:393–399.
- Barabasz A, Higley L, Christensen C, et al. Efficacy of hypnosis in the treatment of human papillomavirus (HPV) in women: rural and urban samples. *Int J Clin Exp Hypn*. 2010;58:102–121.
- Stockfleth E, Beti H, Orasan R, et al. Topical Polyphenon E in the treatment of external genital and perianal warts: a randomized controlled trial. *Br J Dermatol*. 2008;158:1329–1338.
- Gross G, Meyer KG, Pres H, et al. A randomized, double-blind, four-arm parallel-group, placebo-controlled Phase II/III study to investigate the clinical efficacy of two galenic formulations of Polyphenon E in the treatment of external genital warts. *J Eur Acad Dermatol Venereol*. 2007;21:1404–1412.
- Tatti S, Stockfleth E, Beutner KR, et al. Polyphenon E: a new treatment for external anogenital warts. *Br J Dermatol*. 2010;162:176–184.
- Bohlooli S, Mohebipoor A, Mohammadi S, et al. Comparative study of fig tree efficacy in the treatment of common warts (*Verruca vulgaris*) vs. cryotherapy. *Int J Dermatol*. 2007;46:524–526.
- Zedan H, Hofny ER, Ismail SA. Propolis as an alternative treatment for cutaneous warts. *Int J Dermatol*. 2009;48:1246–1249.
- Rahimi AR, Emad M, Rezaian GR. Smoke from leaves of *Populus euphratica* Olivier vs. conventional cryotherapy for the treatment of cutaneous warts: a pilot, randomized, single-blind, prospective study. *Int J Dermatol*. 2008;47:393–397.
- Focht DR III, Spicer C, Fairchok MP. Efficacy of duct tape vs cryotherapy in the treatment of verruca vulgaris (the common wart). *Arch Pediatr Adolesc Med*. 2002;156:971–974.
- Wenner R, Askari SK, Cham PM, et al. Duct tape for the treatment of common warts in adults: a double-blind randomized controlled trial. *Arch Dermatol*. 2007;143:309–313.
- de Haen M, Spigt MG, van Uden CJ, et al. Efficacy of duct tape vs placebo in the treatment of verruca vulgaris (warts) in primary school children. *Arch Pediatr Adolesc Med*. 2006;160:1121–1125.
- Rivera A, Tying SK. Therapy of cutaneous human papillomavirus infections. *Dermatol Ther*. 2004;17:441–448.
- Stulberg DL, Hutchison AG. Molluscum contagiosum and warts. *Am Fam Physician*. 2003;67:1233–1240.
- Micali G, Dall'Oglio F, Nasca MR, Tedeschi A. Management of cutaneous warts: an evidence-based approach. *Am J Clin Dermatol*. 2004;5:311–317.
- Bacelieri R, Johnson S. Cutaneous warts: an evidence-based approach to therapy. *Am Fam Physician*. 2005;72:647–652.
- Gibbs S, Harvey L. Topical treatments for cutaneous warts. *Cochrane Database Syst Rev*. 2006;(3): CD01781.
- Sterling JC, Handfield-Jones S, Hudson PM. Guidelines for the management of cutaneous warts. *Br J Dermatol*. 2001;144:4–11.
- Beutner KR, Ferenczy A. Therapeutic approaches to genital warts. *Am J Med*. 1997;102:28–37.
- Auborn KJ, Carter TH. Treatment of human papillomavirus gynecologic infections. *Clin Lab Med*. 2000;20:407–422.
- Sedlacek TV. Advances in the diagnosis and treatment of human papillomavirus infections. *Clin Obstet Gynecol*. 1999;42:206–220.

58. Hruza GJ. Laser treatment of epidermal and dermal lesions. *Dermatol Clin*. 2002;20:147–164.
59. Hengge UR, Esser S, Schultewolter T, et al. Self-administered topical 5% imiquimod for the treatment of common warts and molluscum contagiosum. *Br J Dermatol*. 2000;143:1026–1031.
60. Johnson SM, Roberson PK, Horn TD. Intralesional injection of mumps or *Candida* skin test antigens: a novel immunotherapy for warts. *Arch Dermatol*. 2001;137:451–455.
61. Yang J, Pu YG, Zeng ZM, et al. Interferon for the treatment of genital warts: a systemic review. *BMC Infect Dis*. 2009;9:156.
62. Markowitz LE, Dunne EF, Saraiya M. Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee for Immunization Practices (ACIP). *MMWR Recomm Rep*. 2007;56:1–24. <<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5602a1.htm>>; Accessed 9.12.10.
63. Kodner CM, Nasraty S. Management of genital warts. *Am Fam Physician*. 2004;70:2335–2342.
64. Dehghani F, Merat A, Panjehshahin MR, et al. Healing effect of garlic extract on warts and corns. *Int J Dermatol*. 2005;44:612–615.
65. Silverberg NB. Garlic cloves for verruca vulgaris. *Pediatr Dermatol*. 2002;19:183.
66. Filshie J, White A, eds. *Medical Acupuncture: A Western Scientific Approach*. Edinburgh: Churchill Livingstone; 1998.
67. Harkness EF, Abbot NC, Ernst E. A randomized trial of distant healing for skin warts. *Am J Med*. 2000;108:448–452.
68. Goldmeier D, Madden P, Lacey C, et al. Complementary therapy and genital warts. *Sex Transm Infect*. 2005;81:360.
69. Kainz JT, Kozel G, Haidvogel M, et al. Homoeopathic versus placebo therapy of children with warts on the hands: a randomized, double-blind clinical trial. *Dermatology*. 1996;193:318–320.



# Breast Cancer

Lucille R. Marchand, MD, BSN

Cancer encompasses a wide variety of diseases that have uncontrolled growth of abnormal cells in common. Each cancer has a unique set of genetic and environmental factors that encourage this abnormal response in the body. Genetic vulnerability is coupled with environmental factors (epigenetics) that give rise to conditions favorable to cancer growth. Breast cancer involves this interplay of genes with environmental factors (such as food choices, exercise, lifestyle, and estrogen exposures) and environmental toxins (such as radiation and pesticides). Integrative medicine emphasizes personal empowerment to make lifestyle choices that can help prevent cancer from occurring and slow its growth once it has occurred or prevent recurrence. Many factors may not be in our control, but many lifestyle choices are. These same healthy choices also limit the development of other chronic illnesses, such as heart disease, diabetes, obesity, and hyperlipidemia.<sup>1</sup>

Breast cancer is currently the most common cancer in women in the United States (incidence of 28% of all new cancers in women), with a lifetime risk of one in eight women. It is the second most common cancer in women causing cancer-related mortality—15% of all cancers (highest mortality rates in women are from lung cancer—26%).<sup>2</sup> Five-year survival rates are high in women with early-stage cancers: stage 0, 100%; stages 1 and 2, 98% for local invasion, 83.6% for regional invasion; stage 3, 57%; and in women with metastatic breast cancer, 23.4%.<sup>3</sup> One percent of breast cancers occur in men.<sup>4</sup>

## Pathophysiology

Breast cancer is generally a hormone-driven cancer; higher lifetime risk is associated with higher estrogen exposure. Seventy percent of breast cancers express hormone receptors for progesterone or estrogen.<sup>5</sup> Exogenous estrogens, such as hormone replacement therapy (HRT), pesticides that have an estrogenic effect in our bodies, and hormones from animal and dairy sources, are most concerning, although obesity is an intrinsic factor that increases risk as well. Soy foods (rather than supplements), which are weak plant estrogens, may have

a protective effect. Some genetic mutations have a higher likelihood of cancer development, such as *BRCA1* and *BRCA2* mutations, which are associated with a 60% to 80% lifetime risk for breast cancer. These genetic markers are related to mutations that inactivate cancer suppressor genes.<sup>6,7</sup>



Table 75-1e, which lists risk factors for breast cancer, can be found online at [expertconsult.com](http://expertconsult.com).

## Risk Factors

Factors that increase the risk of breast cancer include alcohol consumption of more than one serving per day, taking estrogen-containing products such as HRT and birth control pills, increased estrogen lifetime exposure including early menarche and late menopause, low intake of fruits and vegetables, obesity, exposure to radiation, and sedentary lifestyle (Table 75-1e, available online at [expertconsult.com](http://expertconsult.com)). Aging is a risk factor in that 80% of women with a breast cancer diagnosis are older than 50 years. Family history of breast cancer and certain mutations, such as *BRCA1*, *BRCA2*, and *p53*, increase the risk for breast cancer. These gene mutations increase lifetime risk for development of breast cancer by 40% to 85%. Women with a mother, sister, or daughter with breast cancer are twice as likely to develop cancer as is a woman with no family history of breast cancer in female relatives. Both paternal and maternal relatives are important in determining breast cancer risk.<sup>1</sup>



More information on this topic can be found online at [expertconsult.com](http://expertconsult.com).

A study in Sri Lanka identified prolonged breast-feeding (24 months in a lifetime) in significantly reducing risk of breast cancer. The mechanism may be reduction in lifetime estrogen exposure.<sup>10</sup> Another study in Tunisia showed similar protective effect of prolonged breast-feeding.<sup>11</sup>

**TABLE 75-1e. Breast Cancer Risk Factors**

FACTOR	MAGNITUDE OF RISK
<b>Well-Confirmed Factors That Increase Breast Cancer Risk</b>	
Increasing age	++
Geographic region (Western world)	++
Family history of breast cancer	++
Mutations in <i>BRCA1</i> and <i>BRCA2</i> genes	++
Ionizing radiation exposure in childhood	++
History of benign breast disease	++
Late menopause (>54 years)	++
Early age at menarche (<12 years)	++
Nulliparity or older age at first birth	++
High mammographic breast density	++
Hormone replacement therapy	+
Recent oral contraceptive use	+
Obesity in postmenopausal women	+
Tall stature	+
Alcohol consumption (more than one drink/day)	+
High insulin-like growth factor 1 (IGF-1) levels	++
<b>Probable Factors That Increase Breast Cancer Risk</b>	
High-saturated fat diet	+
High socioeconomic status	+
<b>Well-Confirmed Factors That Decrease Breast Cancer Risk</b>	
Geographic location (Asia and Africa)	--
Early age of first full-term pregnancy	--
Higher parity	--
Breast-feeding (longer duration)	--
Obesity in premenopausal women	-
Fruits and vegetables consumption	-
Physical activity	-
Pharmaceutical chemopreventive agents	-
Nonsteroidal antiinflammatory drugs	-
++ Moderate to high increase in risk; +, low to moderate increase in risk; -, low to moderate decrease in risk; --, moderate to high decrease in risk. Modified from Dumitrescu RG, Cotarla I. Understanding breast cancer risk—where do we stand in 2005? <i>J Cell Mol Med</i> . 2005;9:208–221. Risk factors are also reviewed in Costanza ME, Chen WY. Epidemiology and risk factors for breast cancer. UpToDate. < <a href="http://www.uptodate.com">www.uptodate.com</a> >; Updated 5.10.10.	

Risk-reducing surgery in patients with *BRCA1* and *BRCA2* mutations can attenuate risk of breast and ovarian cancer. Risk-reducing mastectomy reduced the risk for development of breast cancer in *BRCA1* with surgery compared with control group *BRCA1* with no surgery (14% vs. 20%) and *BRCA2* with surgery compared with *BRCA2* without surgery (7% vs. 23%). Salpingo-oophorectomy reduced the incidence of breast cancer, ovarian cancer, all-cause

mortality, and breast and ovarian cancer-specific mortality.<sup>8</sup> In one study assessing 725 *BRCA1* and *BRCA2* carriers, 218 had been diagnosed with breast cancer within a 10-year period. This study assessed level of exercise with development of cancer and found an inverse relationship of greater intensity of exercise with decreased risk for development of cancer in these carriers, but the significance was at the  $P = .053$  level.<sup>9</sup>

Short telomere length is associated with increased risk of cancer occurrence and cancer mortality. Telomeres are nucleoproteins that serve to protect chromosomal integrity. In a population-based study, telomere length was not shown to have the same association in breast or colorectal cancer.<sup>12</sup>

Obesity is a significant risk factor for breast cancer occurrence, recurrence, and mortality. Limiting the intake of high-density foods, such as fat and sugars, and increasing plant-based lower density foods, such as fruits, vegetables, and whole grains, can help maintain healthy weight in combination with regular exercise for energy expenditure and glycemic control.<sup>13,14</sup> Limiting of portion size is an important weight control strategy.<sup>13</sup>

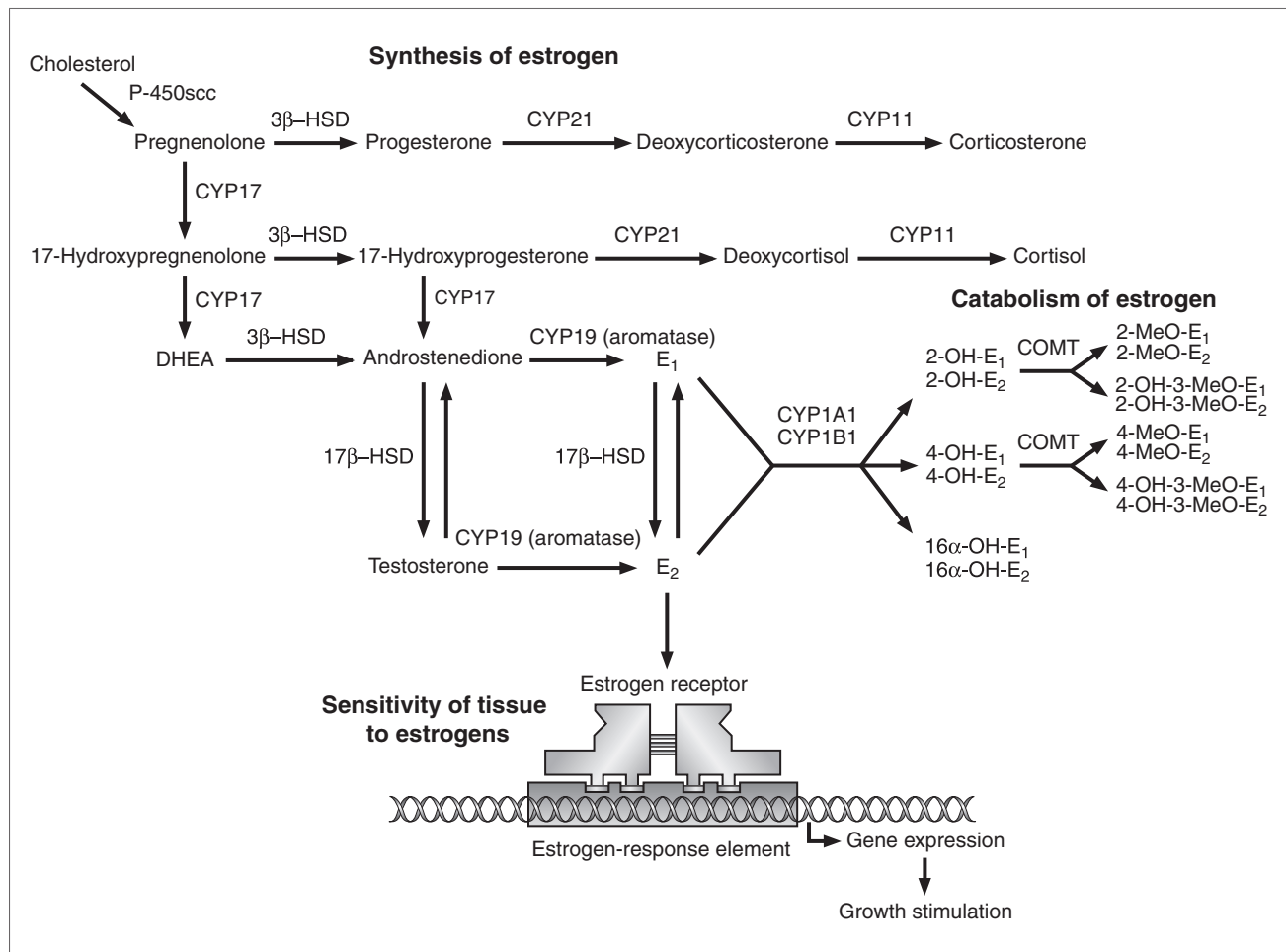
Night shift work and subsequent disruption of the natural circadian rhythm can put women at risk for increased breast cancer. Melatonin levels are suppressed with these disruptions, and low melatonin levels raise estradiol levels and increase risk of breast cancer.<sup>15-17</sup>

## 2-Hydroxyestrone/16-Hydroxyestrone Ratio

In estrogen receptor-positive (ER<sup>+</sup>) tumors, estrogen metabolism can contribute to risk. Both strong and weak estrogen metabolites are produced from oxidative processes in the body. 2-Hydroxyestrone are weakly estrogenic and may be protective (similar perhaps in action to weak plant estrogens such as soy foods), and 16-hydroxyestrone are more strongly estrogenic. The 16-hydroxyestrone can stimulate estrogen receptors in vulnerable tissue, leading to ER<sup>+</sup> tumors, and can disrupt DNA, which produces oncogenes and tumor suppressor genes (Fig. 75-1). The ratio of these urinary estrogen metabolites can be measured by specialized testing to monitor and guide interventions and to assess risk.<sup>18-20</sup> Dietary measures (decreased alcohol intake, increased oleic acid such as in olive oil), physical activity, phytoestrogens such as flaxseed meal, and cruciferous vegetables can help favor weaker estrogen metabolites.<sup>19,21,22</sup>

**FIGURE 75-1**

Pathways of estrogen synthesis and catabolism. 2-MeO-E<sub>1</sub>, 2-methoxyestrone; 2-MeO-E<sub>2</sub>, 2-methoxyestradiol; 2-OH-3-MeO-E<sub>1</sub>, 2-hydroxyestrone-3-methylether; 2-OH-3-MeO-E<sub>2</sub>, 2-hydroxyestradiol-3-methylether; 2-OH-E<sub>1</sub>, 2-hydroxyestrone; 2-OH-E<sub>2</sub>, 2-hydroxyestradiol; 3β-HSD, 3β-hydroxysteroid dehydrogenase; 4-OH-3-MEO-E<sub>1</sub>, 4-hydroxyestrone 3-methyl ether; 4-OH-3-MEO-E<sub>2</sub>, 4-hydroxyestradiol 3-methyl ether; 4-OH-E<sub>1</sub>, 4-hydroxyestrone; 4-OH-E<sub>2</sub>, 4-hydroxyestradiol; 16α-OH-E<sub>1</sub>, 16α-hydroxyestrone; 16α-OH-E<sub>2</sub>, 16α-hydroxyestradiol; 17β-HSD, 17β-hydroxysteroid dehydrogenase; COMT, catechol O-methyltransferase; CYP11, 11β-hydroxylase; CYP1A1, cytochrome P-450 1A1; CYP1B1, cytochrome P-450 1B1; CYP17, 17β-dehydroxylase; CYP19, P-450 aromatase; CYP21, 21-hydroxylase; DHEA, dehydroepiandrosterone; E<sub>1</sub>, estrone; E<sub>2</sub>, estradiol; P-450, cytochrome P-450; scc, side-chain cleavage enzyme. (From Clemons M, Goss P. Estrogen and the risk of breast cancer. *N Engl J Med*. 2001;344:276-285.)



Exercise, weight loss, cruciferous vegetables, and lignan-rich flaxseed can improve the 2-hydroxyestrone/16-hydroxyestrone ratio, reducing the stimulatory effect on breast tissue.

In women receiving postmenopausal HRT, breast cancer risk for hormone receptor-positive cancers and HER2/neu-positive tumors increases. In women taking estrogen and progesterin replacement for more than 15 years, the risk of breast cancer increased by 83% compared with estrogen-only HRT, which increased risk by 19%. Risks associated with HRT were found only in women with body mass index (BMI) below 29.9 kg/m<sup>2</sup> but not in women with a BMI above 30.<sup>23</sup>

## Screening



Information on this topic can be found online at [expertconsult.com](http://expertconsult.com).

## Integrative Therapies

### Lifestyle

The European Prospective Investigation into Cancer and Nutrition found that four lifestyle measures were critical in reducing risk of cancer as well as chronic illnesses such as heart disease and diabetes. These measures included not smoking; BMI below 30; 3.5 hours a week of exercise or more; and eating a healthy diet of fruit, vegetables, and whole grains, with little meat consumption. Having all four lifestyle factors reduced the risk of cancer by 36%.<sup>30</sup> Block et al<sup>31</sup> found that at their integrative cancer center with attention to nutrition, nutraceuticals, exercise, and psychological interventions, metastatic breast cancer patients had a survival rate twice that of comparison groups in the literature. Median survival in their center was 38 months, compared with 12 to 24 months reported in similar populations. For patients to make informed decisions about nutritional changes, consultation with a person trained in integrative nutrition must be made available.<sup>32</sup>

### Exercise

Exercise has a role in cancer prevention through weight control, muscle strength, and improved immunity and mood control. During and after cancer treatment, exercise can benefit mood, strength, weight control, energy levels, immunity, overall health and well-being, survival, prevention of recurrence, and quality of life. It allows patients to go through their cancer treatments with increased strength, less fatigue and muscle weakness, better balance, and fewer falls.<sup>33</sup> It also has a beneficial effect on the vasomotor instability of menopause. Yoga and higher intensity, frequent exercise have significant beneficial effects on depression with less marked positive effects on anxiety.<sup>34</sup> One study that looked at breast cancer survivors versus controls showed that breast cancer survivors are less likely than non-breast cancer controls to adhere to physical activity recommendations.<sup>35</sup> Unfortunately, what was not assessed was what their health care providers were recommending for

exercise and whether they advised continuing exercise during and after treatment. The American College of Sports Medicine reviewed the literature on exercise and cancer treatment and concluded that exercise is safe in patients undergoing cancer treatment and that exercise improves physical functioning, quality of life, and fatigue.<sup>36</sup> In a population-based study of breast cancer patients, consistent and long-term, higher activity (more than 3 hours/week) exercisers had lower risk of cancer mortality than did women with low activity levels.<sup>37</sup> In another study of breast cancer survivors, women who had 2 to 3 hours of walking per week after diagnosis reduced their mortality risk by 45% compared with sedentary women. Women who decreased their activity after diagnosis increased their mortality risk fourfold.<sup>38</sup> In another study, a simple walking intervention reduced pain and maintained cardiorespiratory fitness in patients with breast cancer undergoing radiation therapy and chemotherapy.<sup>39</sup> (See Chapter 88, Writing an Exercise Prescription.)

## Nutrition

### Mediterranean Diet

Diets high in fruits and vegetables, fish, fresh foods, and olive oil and low in animal fat (the Mediterranean diet) reduce the risk of breast cancer and many other cancers.<sup>40</sup> In one large French study of 2381 women with invasive postmenopausal breast cancer, a Western/alcohol-dominant diet was associated with higher risk of breast cancer incidence compared with a healthy Mediterranean diet. The Western diet included meat products, French fries, alcohol, pizza, high-fat foods, and processed foods. The Mediterranean diet included fruits and vegetables, fish, olive and sunflower oils, and nonprocessed fresh foods. This difference was especially significant in women with estrogen-positive, progesterone-negative (ER<sup>+</sup>/PR<sup>-</sup>) tumors.<sup>40</sup>

### Fiber

Food intake high in fiber, in the National Institutes of Health–AARP Diet and Health Study, can reduce the risk of breast cancer, especially for ER<sup>-</sup>/PR<sup>-</sup> tumors.<sup>41</sup> In the Malmö Diet and Cancer cohort, intake of high-fiber bread reduced the risk of breast cancer.<sup>42</sup> High-fiber foods are preferable to fiber supplements because of the beneficial nutrients intrinsic to food sources such as fruits, vegetables, beans, nuts and seeds, whole grains, and legumes.<sup>13</sup>

### Alcohol

Controversy exists about the role of alcohol and risk in breast cancer. In primary prevention, alcohol intake and lower folate levels are associated with increased risk.<sup>43</sup> In one study of secondary prevention, low to moderate alcohol intake was not associated with increased risk of recurrence or increased mortality.<sup>44</sup> Alcohol (in women, more than one alcohol drink per day) increases circulation of androgens and estrogens, and use of alcohol is associated with lower levels of important nutrients such as folate and B vitamins, with a protective effect noted in women with increased folate intake who drink alcohol.<sup>6</sup> Many studies have linked alcohol intake of more than one alcoholic drink per day in women with a number of cancers, including breast cancer. In women, one alcoholic drink per day is associated with positive cardiac health benefits. Alcohol has both risks and benefits in women.<sup>13</sup> In the Women's Health Initiative study, women who consumed more than seven



## Mammograms and Breast Ultrasound Examination

Mammography is the only screening test found effective in detecting breast cancer. In the 2009 U.S. Preventive Services Task Force (USPSTF) guidelines, screening mammography on an annual or biennial basis continues to be recommended for women aged 50 to 74 years with a grade B recommendation. The teaching of breast self-examination by health practitioners to women is no longer recommended with a grade D recommendation.<sup>24</sup> Controversy continues for women aged 40 to 49 years and women 75 years or older. In these age groups, physicians and other practitioners must assess risk versus potential harm of screening for each individual woman. Possible earlier detection of breast cancer must be discussed together with risks of false-positive results and unnecessary procedures such as biopsy, anxiety caused by false-positive results, and treatment of indolent breast cancers. Risk factors for breast cancer are absent in 75% of women. Assessment of which women younger than 49 years are at higher risk of aggressive breast cancer and who might benefit from routine mammography is problematic. Continuing screening mammography in older women is also controversial and depends on the life expectancy of the woman and whether she would choose or be willing to undergo treatment of breast cancer. Breast cancer risk increases with age.<sup>25-27</sup> Ultrasound examination increases the sensitivity of mammography in women with dense breasts by about 16% to 28% in node-

negative breast cancer. A positive screening ultrasound study leads to 11% of biopsy specimens being malignant.<sup>28</sup>

Screening decreases the chances of dying of breast cancer during a 10-year period from 3.5 to 3.0/1000 women in the 40- to 49-year age group and from 5.3 to 4.6/1000 women in the 50- to 59-year age group. During a 10-year period, the number of women per 1000 who avoided breast cancer death as a result of routine mammography was 0.5/1000 and 0.7/1000 women, respectively. False-positive results requiring further biopsy were 60 to 200/1000 women and 50 to 200/1000 women, respectively. Unnecessary treatment of breast cancer was 1 to 5/1000 women and 1 to 7/1000 women, respectively. Harm versus benefit must be assessed for each individual woman in dialogue with her health practitioner because potential harm is present and not trivial.<sup>27</sup> The USPSTF gave this category of screening for this age group a grade C recommendation.<sup>24</sup>

Cancer screening in patients with advanced cancer may not be cost-effective, and the utility of routine screening must be assessed for each unique patient and situation.<sup>29</sup>

## Breast Magnetic Resonance Imaging

Magnetic resonance imaging of the breasts is indicated in high-risk women only and can increase sensitivity of screening over mammography and ultrasonography by 40%. Forty percent of biopsy specimens from a positive screening magnetic resonance imaging study were malignant.<sup>28</sup>

alcoholic drinks per week doubled their risk of hormone receptor–positive invasive lobular carcinoma. This effect was not seen in ER<sup>-</sup> women or women with ductal breast cancer. Alcohol has a differing effect on breast cancer risk, depending on the subtype of the breast cancer.<sup>45</sup> Deandrea et al<sup>46</sup> found increased risk for alcohol and ER<sup>+</sup> tumors.

### Sugar

High sugar intake increases calories in the diet (sometimes excluding more nutritious food), contributes to weight gain, and increases insulin levels, which can have other deleterious metabolic effects that contribute to cancer cell growth.<sup>13,47</sup> High sugar intake in the form of products with high-fructose corn syrup, sugar, honey, and molasses is not recommended.<sup>13</sup>

### Polyunsaturated Fatty Acids

Polyunsaturated fatty acids include omega-3 and omega-6 fatty acids. In large quantities and especially if hydrogenated for extended shelf life, sunflower, safflower, soy, sesame, and corn oils can be proinflammatory in the body. Omega-3 fatty acids (eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]) are antiinflammatory and are contained in fish oil, flaxseed oil, and the oil in walnuts. Omega-3 fatty acids are present in fatty fish (such as salmon, sardines, and mackerel), walnuts, green leafy vegetables, and flaxseed meal. The VITamins And Lifestyle (VITAL) study demonstrated that fish oil reduced the risk of ductal but not lobular breast cancers.<sup>48</sup> In a case-controlled study of patients with breast cancer with case controls with no malignant disease, fish omega-3 intake was found to reduce risk of breast cancer in premenopausal and postmenopausal women, with the greatest reduction in postmenopausal women.<sup>49</sup> Cottet et al<sup>40</sup> demonstrated in a large cohort study of postmenopausal women that there was a lower risk of invasive breast cancer with a Mediterranean diet (high in fish, fruits, and vegetables) but a higher risk on a Western/alcohol-type diet (high in saturated meat fat and processed foods). These omega-3 fatty acids may also enhance the effects of chemotherapy.<sup>50</sup>

#### ■ Dosing

Approximately 1000 mg of combined DHA and EPA daily in less than 3 g of total high-potency fish oil is recommended. Flaxseed oil can be substituted on a vegan diet. If any fishy aftertaste occurs, remember not to take with hot food or drinks and to take before eating; if these measures do not work, freeze fish oil capsules.

#### ■ Precautions

If any bleeding occurs, stop fish oil immediately because its action on decreasing adhesiveness of platelets in clotting can increase bleeding. Stop 1 week before surgery or any invasive procedure. Fish oil is contraindicated with platelet counts of less than 20,000. A more conservative approach is to discontinue fish oil if the platelet count is less than 50,000. Use with caution if the patient is taking any other anticoagulants. If the international normalized ratio becomes too high with anticoagulants, stop fish oil to avoid bleeding.

### Monounsaturated Fatty Acids

Oleic acid (omega-9 fatty acid) is found in olive oil, avocados, hazelnuts, and cashew nuts. It can help with suppression of HER2/neu tumor cell growth and can help enhance the

action of trastuzumab.<sup>51</sup> Eating these nuts and using olive oil in cooking and as a salad dressing are recommended.

### Green Tea

Green tea is a polyphenol that is a natural aromatase inhibitor. Green tea consumption of more than three cups per day reduced the risk of breast cancer recurrence by 27%, but no consistent effect could be found on cancer incidence.<sup>52</sup> In a Chinese population, green tea and dietary mushrooms decreased the risk for development of breast cancer.<sup>53</sup>

#### ■ Dosing

Three cups a day is a recommended intake.

### Soy

In the recent past, a scarcity of research on soy made this food controversial with estrogen-sensitive tumors because soy is a phytoestrogen and theoretically could stimulate estrogen receptors. Studies in mice using the isoflavone genistein in isolation raised concerns about soy. In mice, genistein stimulated ER<sup>+</sup> tumors; but in clinical studies of soy consumption, opposite effects are found.<sup>54</sup> Because they are weak estrogens, however, they might also block receptors from being stimulated by stronger exogenous and intrinsic sources of estrogen. The Shanghai Breast Cancer Survival Study, which included 5042 breast cancer survivors, showed that soy food intake is inversely associated with breast cancer mortality and recurrence. The benefits existed for ER<sup>+</sup> and ER<sup>-</sup> tumors and for both users and nonusers of tamoxifen.<sup>55</sup> In another study of soy food intake, high soy intake reduced the risk of breast cancer recurrence in patients with ER<sup>+</sup>/PR<sup>+</sup> tumors receiving the aromatase inhibitor anastrozole.<sup>56</sup> In another study of soy intake and breast cancer risk, an inverse association was found for high intake to lower risk of breast cancer.<sup>57</sup> In Korean women, soy intake was associated with lower breast cancer risk in postmenopausal women, and the inverse association was marked in women with ER<sup>+</sup>/PR<sup>+</sup> tumors.<sup>58</sup>

Soy isoflavones in supplements may be avoided, given concerns in mice; but soy foods do not appear to be contraindicated and indeed seem to be valuable in reducing risk of breast cancer, recurrence, and mortality.

#### ■ Dosing

One to three servings a day, in a balanced diet with other foods, are recommended unless an individual has sensitivity to soy.

Other phytoestrogens, plant lignans, can help reduce risk of breast cancer, especially in postmenopausal women.<sup>59</sup>

### Flax

Flax, usually consumed as flaxseed meal or oil, is a rich source of phytoestrogens containing alpha-linoleic acid. It has protective effects by decreasing inflammation in the body as an omega-3 fatty acid, inhibits aromatase activity, binds weakly to estrogen receptors, and increases the weaker 2-hydroxyestrogens. It reduces the risk of breast cancer and decreases breast cancer cell growth.<sup>18,19,60</sup>

#### ■ Dosing

One to 2 tablespoons a day of the meal can be added to food. Flaxseed meal and oil can become rancid easily and should be kept in an airtight container, refrigerated, and used promptly.

## Antioxidants

Diets high in fruits and vegetables are high in antioxidants and can lower risk of breast cancer.<sup>40</sup> Carotenoids in fruits and vegetables that were consumed in large amounts reduced the risk of invasive breast cancer in premenopausal women.<sup>61</sup> Antioxidants in foods are safer and preferable to high-dose supplement forms, given their bioavailability, synergistic effects, and better absorption. Given scant evidence for benefit of antioxidant supplements during cancer treatment and potential risks of interfering with treatment, antioxidant supplements are not recommended during cancer treatment.<sup>62</sup>

### ■ Dosing

Five to nine servings of fruits and vegetables daily are recommended.

## Edible (Medicinal) Mushrooms

Medicinal mushrooms that have an antiinflammatory and immune-enhancing effect include maitake (*Grifola frondosa*), shiitake (*Lentinus edodes*), reishi (*Ganoderma lucidum*), and turkey tail (*Trametes versicolor*).<sup>62</sup> Mushrooms also have a number of other properties, including antifungal, antibacterial, antiviral, and tumor attenuating. Each mushroom has different characteristics. Maitake mushrooms in particular have high antitumor and antiinflammatory activity.<sup>63</sup> In one phase I/II trial of maitake extract, a statistically significant association was found with positive immune response. There was no dose-limiting toxicity.<sup>64</sup> In a review of *T. versicolor* research in Japan and China, Standish et al<sup>65</sup> discuss data suggesting that this mushroom improves disease-free intervals and overall survival in breast cancer patients by immune modulation. More research is warranted.

### ■ Dosing

Mushrooms can be eaten in the diet or taken as a dried supplement.

## Whey Protein

Whey protein, which is a byproduct of cheese making, is of the highest protein quality and high in glutamine, which helps prevent mouth sores (stomatitis) in patients receiving chemotherapy and may be useful in preventing the peripheral neuropathy of certain chemotherapy agents, such as taxanes (Taxol). Glutamine is abundant in whey, and this is the preferred manner of ingesting this nutrient.

### ■ Dosing

Whey protein powder, 20 to 30 g twice daily in smoothies, will provide adequate glutamine to prevent these complications of chemotherapy. If whey is not tolerated because of allergy or sensitivity, glutamine can be taken as a supplement, 3 to 5 g one to three times daily.<sup>66</sup>

## Brassica (Cruciferous) Vegetables

Cruciferous vegetables include kale, broccoli, cauliflower, Brussels sprouts, and cabbage. Indole-3-carbinol is an important constituent of these vegetables that helps decrease cancer cell proliferation, increase apoptosis, and alter the ratio of weak to strong estrogens (2-hydroxyestrone/16-hydroxyestrone) favorably. Breast cancer risk can be reduced by 20% to 40% with one or two servings of cruciferous vegetables daily.<sup>22,67–69</sup> Indole-3-carbinol can interfere with tamoxifen and is safer to eat in vegetable form than in supplement form.<sup>1</sup>

### ■ Dosing

One or two servings per day is the recommended intake. In supplement form, 400 mg/day is recommended.<sup>19,70,71</sup>

One head of cabbage contains approximately 1200 mg of indole-3-carbinol. Eating of one third of a head of cabbage daily would equal the common supplemental dose of 400 mg daily and offer the other synergistic properties of the whole plant.

## Supplements

Botanicals and supplements can be useful in promoting health; some have an anticancer effect or immunity-enhancing effect, and some are useful in attenuating the side effects of conventional cancer therapies. It is important to consider the interactions of some botanicals and supplements with chemotherapy and radiation therapy that might decrease the effectiveness of these modalities and in some cases increase toxicity. Antioxidants taken in high-dose supplement form can theoretically interfere with radiation therapy and chemotherapy by neutralizing free radical formation key to the effectiveness of these agents. Controversy remains, but most practitioners agree that foods high in antioxidants are safe, given the variety of antioxidants naturally occurring in many foods that act synergistically, are better absorbed, and do not reduce the effectiveness of radiation therapy and chemotherapy because they are in concentrations lower than in supplement forms.



More information on this topic can be found online at [expertconsult.com](http://expertconsult.com).

## Vitamin D

Vitamin D deficiency is common, especially in patients chronically or acutely ill and in northern climates (above 35 to 40 degrees north or south of the equator). Those individuals with darker skin, who are obese, who have little unprotected sun exposure, who are older than 65 years, and who are taking particular medications such as glucocorticoids or anticonvulsants are also at risk for deficiency. It can express itself as diffuse body aches and can contribute to osteopenia and osteoporosis. It can also be manifested as low back pain, proximal muscle weakness, and bone pain, especially over the sternum or tibia.<sup>74,75</sup> Vitamin D is also important in immunity and has an anticancer effect. Vitamin D is ingested as vitamin D<sub>2</sub> (ergocalciferol) or vitamin D<sub>3</sub> (cholecalciferol), which is converted in the liver to 25-hydroxyvitamin D (calcidiol), the circulating form of vitamin D. Vitamin D<sub>3</sub> is also formed in the skin when 7-dehydrocholesterol, the skin precursor, is exposed to ultraviolet B light. Calcidiol is converted in the kidney to 1,25-dihydroxyvitamin D (calcitriol), the active metabolite. Calcitriol significantly inhibits cancer cell growth, especially in breast, colon, prostate, and ovarian tissue.<sup>74</sup> In testing for vitamin D deficiency, the 25-hydroxyvitamin D level is most accurate.

Strong evidence exists that vitamin D and calcium intake can help reduce the risk of breast cancer.<sup>76</sup> In a meta-analysis of 36 studies, 45% lowered risk was found in those women whose 25-hydroxyvitamin D levels were in the highest quartile versus the lowest quartile. Decreased cancer risk was also found in those with the highest quartile of calcium intake.<sup>77</sup> Blackmore et al<sup>78</sup>

One important resource for evaluating which supplements can improve the effectiveness of chemotherapy agents and which interfere is *The Definitive Guide to Cancer: An Integrative Approach to Prevention, Treatment, and Healing* by Lise Alschuler and Karolyn Gazella.<sup>1</sup>

Some supplements are potentially harmful in certain populations or of no benefit. Antioxidants such as beta-carotene and vitamin E are of no benefit in large doses, and beta-carotene can have a harmful effect in patients who smoke or have asbestos exposures. In these subpopulations, increased lung cancer risk has been found.<sup>72</sup> In one phase III trial of vitamin E in a low dose (400 mg/day), which is generally the dose in a multivitamin, vitamin E significantly lowered the neurotoxicity occurring with cisplatin.<sup>73</sup>

found reduced risk of ER<sup>+</sup>/PR<sup>+</sup> breast cancer in women with the highest intake of vitamin D. Nonsignificant positive trends were also seen in women with ER<sup>+</sup>/PR<sup>-</sup> and ER<sup>-</sup>/PR<sup>-</sup> tumors. Dark-skinned individuals such as African Americans convert less vitamin D in their skin and are more likely to be vitamin D deficient without supplementation. This increases cancer risk, which may help explain why this population group is more at risk for cancer with higher mortality.<sup>79</sup>

Aromatase inhibitors can contribute to myalgias, arthralgias, and loss of bone mass. In combination with other therapies that cause significant side effects and may further prevent meaningful sun exposure, vitamin D deficiency can contribute to these adverse effects of conventional therapy. Medications such as anticonvulsants and glucocorticoids increase metabolism and reduce vitamin D levels.<sup>75</sup>

Vitamin D–fortified foods contain vitamin D in small and inconsistent amounts. Reliable and potent food sources of vitamin D are oily fish, including salmon, mackerel, and sardines.<sup>74,75</sup> Supplements are usually needed to obtain adequate amounts of vitamin D. Amounts generally obtained in multivitamins (400 units of vitamin D) are too low to prevent deficiency in most individuals.<sup>74</sup> According to research, the body metabolizes about 4000 units of vitamin D daily.<sup>80</sup> Current recommendations of 800 units of vitamin D daily are extremely conservative.

Optimal serum levels of vitamin D are controversial. In general, a 25-hydroxyvitamin D level of less than 20 ng/mL (50 nmol/L) is deficiency range, and 20 to 30 ng/mL (50 to 75 nmol/L) is in the insufficiency range. Treatment of vitamin D deficiency includes oral vitamin D<sub>2</sub> (ergocalciferol) at 50,000 units per week for 8 weeks. After vitamin D levels are normalized, current recommendations are conservative at 800 to 1000 units daily.<sup>75</sup> Vitamin D is relatively contraindicated in patients with hypercalcemia, which can occur in metastatic breast cancer with bone involvement, granulomatous disease such as tuberculosis and sarcoidosis, and Williams syndrome.<sup>75</sup> In an epidemiologic projection of optimal serum 25-hydroxyvitamin D levels, Garland et al<sup>81</sup> estimated prevention of 58,000 cases of breast cancer per year with year-round levels of 40 to 60 ng/mL (100 to 150 nmol/L). Abbas et al<sup>82</sup> found that vitamin D lowered the risk of premenopausal breast cancer. Other studies in Norway and England have found that patients with cancers diagnosed in summer or fall, when vitamin D levels are highest, had longer survival and a milder clinical course than did patients diagnosed in the winter or spring, when vitamin D levels are lowest.<sup>83</sup>

### ■ Dosing

The recommended dose of vitamin D<sub>3</sub> is 1000 to 2000 units daily.<sup>84–86</sup> In the summer months at latitudes higher than 35 to 40 degrees away from the equator or daily at latitudes closer to the equator, moderate exposure to sun, at least 20 minutes midday without sunscreen in patients who are not at risk for sunburn or skin cancer, will maintain normal vitamin D levels.<sup>87</sup> Serum levels of 25-hydroxyvitamin D can be used to determine optimal dosing of vitamin D, which can vary from person to person and by time of year, latitude, and degree of sun exposure.

### ■ Precautions

Signs of vitamin D toxicity include nausea and vomiting, pancreatitis, nephrocalcinosis or vascular calcinosis, metallic taste, and headache.<sup>75</sup>

## Melatonin

Melatonin has antioxidant, immune-enhancing, cytotoxic, and estrogen-regulating properties. It is also useful in the treatment of insomnia. Melatonin comes in an immediate preparation for individuals having difficulty in falling asleep and a sustained-release preparation for those having difficulty staying asleep.<sup>88,89</sup>

### ■ Dosing

Doses range from 1 to 20 mg before bed; a starting dose is 3 mg before bed. Titration occurs to effect, without causing a hangover the next day.

### ■ Precautions

Melatonin is contraindicated in bipolar illness, and it can worsen depression in some vulnerable individuals. Monitoring for optimal effect with minimal side effects is recommended. Caution must be exercised in use with other sedative medication.

## Botanicals

Botanicals can be helpful in the treatment of cancer but must be used carefully during chemotherapy because many botanicals can interfere with the metabolism of the chemotherapy agent by increasing or decreasing its metabolism in the body. Refer to the text *The Definitive Guide to Cancer: An Integrative Approach to Prevention, Treatment, and Healing* by Alschuler and Gazella for specific information on botanical and supplement interactions with chemotherapy drugs. For example, certain botanicals can interfere with the metabolism of taxanes, platinum-based drugs, cyclophosphamide, doxorubicin, etoposide, and irinotecan.<sup>1</sup> In general, botanicals do not interfere with radiation therapy. Botanicals such as St. John's wort can interact with a number of other drugs the patient may be taking through the cytochrome P-450 metabolic pathway.

## Spiritual and Emotional Care

Patients who have social support, empowerment, and meaning often have more positive lifestyle behaviors and coping strategies. Those patients with lack of meaning and purpose often have more symptoms from treatment and more difficulty in coping, leading to more negative choices.<sup>90</sup> Small-group psychological interventions for breast cancer patients led by a psychologist and concentrating on stress management and strategies to optimize conventional treatment and to improve mood helped decrease recurrence and mortality.<sup>91</sup> Emerging evidence on life review and Internet-based social networking shows improvement in quality of life measures; it is another intervention that is simple yet powerful in cultivating meaning through the challenges of cancer.<sup>92,93</sup> Spiritual and emotional assessment and recommendations for interventions such as support groups, journaling, life review, and psychotherapy with oncology health professionals are reviewed in other chapters (see Chapter 80, End-of-Life Care, and Chapter 110, Taking a Spiritual History).

## Conventional Treatment

Breast cancer treatment and prognosis depend on staging and pathologic examination of tumor tissue. Lymph node and vascular spread of tumor, histologic staging of degree of

invasion and type of tissue, hormone receptor expression, and epidermal growth factor receptor 2 (ERBB2, formerly HER2 or HER2/neu) overexpression are all included in describing breast cancer. Stage 0 describes lobular or ductal carcinoma in situ without spread of tumor. Lobular carcinoma in situ does not progress to breast cancer, but its presence increases the risk of breast cancer by 7% over 10 years. Ductal carcinoma in situ can progress to invasive breast cancer.<sup>3</sup>

## Surgery

Because ductal carcinoma in situ can progress to invasive breast cancer, local breast-conserving surgical therapy with radiation therapy afterward is generally the treatment offered. Mastectomy may be needed for more extensive or multifocal involvement. Use of tamoxifen in stage 0 breast cancer is controversial, and benefits of treatment may not outweigh risks.<sup>3</sup>

For stage 1 and stage 2 invasive cancer, lumpectomy (breast-conserving surgery) with sentinel node biopsy is favored when it is followed by radiation therapy. The addition of radiation therapy improves long-term survival on par with mastectomy. Full axillary lymph node dissection is favored in patients with palpable lymph nodes or a positive sentinel node. Sentinel node biopsy has a sensitivity of 95%.<sup>94–98</sup> This procedure reduces the occurrence of lymphedema in the affected arm and breast. Lymphedema can cause arm and breast swelling and pain, numbness, and decreased mobility in the affected arm.<sup>3</sup>

Other therapies to reduce estrogen stimulation in select women include oophorectomy and ovarian ablation.<sup>3</sup>

## Radiation Therapy

Radiation therapy to the entire involved breast is recommended after breast-conserving surgical therapy and should occur within 7 months after surgery for optimal benefit. Radiation therapy reduces risk of local recurrence within 5 years from 7% to 26% (number needed to treat [NNT] = 5). Reduction in 15-year mortality is 30.5% to 35.9% (NNT = 18).<sup>99</sup> Brachytherapy and shorter radiation therapy regimens are currently being evaluated.<sup>3</sup>

## Pharmacologic Agents

Chemotherapy, endocrine therapies, and targeted molecular therapies are used in conjunction with surgical and radiation therapies for prevention of recurrence and for cure or control of disease. Tumors larger than 1 cm and positive lymph nodes are generally treated with chemotherapy. Hormone receptor–negative tumors have improved outcomes with chemotherapy compared with hormone receptor–positive tumors.<sup>100</sup> Regimens including anthracyclines and taxanes have improved disease-free intervals and improved survival in both premenopausal and postmenopausal women and may have small increased benefit in patients with ERBB2.<sup>101–103</sup> Herbs can interfere with both anthracyclines and taxanes by preventing drug conversion to its active form in the liver.<sup>1</sup>

Endocrine therapies are effective only in hormone receptor–positive women. These agents (including selective estrogen receptor modulators such as tamoxifen; aromatase inhibitors such as anastrozole, exemestane, and letrozole; and gonadotropin-releasing hormone agonists such as goserelin)

either block or prevent estrogen production to reduce stimulation of estrogen-sensitive tumor cells. Tamoxifen reduces 15-year mortality by 9.2% (NNT = 11).<sup>3,104</sup>

Tamoxifen is used in premenopausal women; aromatase inhibitors (anastrozole) are more effective in postmenopausal women. Use of tamoxifen in stage 0 breast cancer is controversial, and benefits of treatment may not outweigh risks.<sup>3</sup>

Overexpression of ERBB2 occurs in 20% to 30% of early-stage breast cancers. This characteristic of certain breast cancers has a worse prognosis. Trastuzumab is a humanized anti-ERBB2 monoclonal antibody that improves effectiveness of treatment with anthracyclines and taxanes but carries a 2% to 3% risk of cardiac toxicity during a 2-year period.<sup>105,106</sup>

In stage III locally advanced breast cancers, chemotherapy often precedes surgery, radiation therapy, or both. In this stage, tumors are often larger. There may be extensive lymph node involvement, invasion into the chest wall, or inflammatory breast cancer. These tumors do not have distant metastases. Outcomes are similar to those of early breast cancer treatment if a favorable response is achieved with induction chemotherapy. Tumor decrease can allow breast-conserving surgery, usually with axillary lymph node dissection. If chemotherapy is not successful, mastectomy is often the surgical treatment option. Endocrine therapy is generally not used in the induction phase unless advanced age or the patient's preference makes chemotherapy a less desirable option. Trastuzumab is generally not used in the induction phase, but it is used postoperatively for 12 months. Radiation therapy is generally advised after induction chemotherapy (even if complete remission occurs) and surgery to help prevent local recurrence.<sup>3</sup>



More information on this topic can be found online at [expertconsult.com](http://expertconsult.com).

## New Biomarkers and Treatments

New biomarkers are being identified that will help indicate which patients with breast cancer are at low risk for recurrence and may not benefit from adjuvant chemotherapy. The Oncotype DX assay helps identify patients with node-negative disease who have low risk of recurrence by identifying the expression of 21 genes. These markers will help individualize approaches to treatment of patients with conventional therapies that have the highest benefit with least harm.<sup>3</sup> These markers might also help identify those patients most likely to benefit from alternative and complementary therapies as well.

## Integrative Management of Side Effects From Breast Cancer Treatment

Block<sup>107,108</sup> has described chronomodulation of chemotherapy to help reduce toxicities of chemotherapy. Chronomodulation involves not only the optimal timing of chemotherapy but also strengthening of circadian rhythms. Interventions

Inflammatory breast cancer can be manifested at stage III or stage IV. It is usually characterized by inflammatory skin changes without a palpable mass; it is hormone receptor negative, poorly differentiated, and rare in occurrence. Prognosis is guarded. In general, mastectomy with full axillary lymph node dissection and radiation therapy is advised after induction chemotherapy.<sup>3</sup>

In metastatic breast cancer, metastases usually occur in bone, brain, and lungs; treatment can include chemotherapy, endocrine therapy, and radiation therapy. Bisphosphonates and radiation therapy can reduce pain from metastases to bone. Trastuzumab is used in patients with overexpression of ERBB2 with or without chemotherapy and endocrine therapy, depending on hormone receptor status.<sup>3</sup>

In recurrent disease, the course of therapy depends on whether the recurrence is locoregional or metastatic. If locoregional recurrence is early, this can indicate an aggressive tumor with a poor prognosis. In patients with recurrence with no metastases, 5-year survival with treatment is about 40%. Mastectomy is indicated with or without axillary lymph node dissection if breast-conserving therapy was initially done. Radiation therapy is advised if the tumor is inoperable. Chemotherapy is currently recommended, although randomized clinical trials to determine benefit of this approach are under way. Endocrine therapy is recommended for hormone receptor-positive tumors and trastuzumab for ERBB2-expressive tumors.<sup>3</sup>

to strengthen these rhythms include lifestyle modifications (diet, exercise) and mind-body therapies, all of which increase melatonin levels in the brain at night, producing a more restful and restorative and healing sleep. Inflammatory and stress hormones that disrupt the circadian rhythm can be addressed with herbs, diet, supplements, and mind-body therapies (meditation and meditative movement), which optimize the internal biochemical milieu.

Cannabinoids are used in symptom management of nausea and vomiting, anorexia, and pain, including neuropathic pain (see Chapter 80, End-of-Life Care, for description of use in symptom management). Cannabinoids may also have a role as anticancer agents.<sup>109</sup>

## Fatigue

Exercise throughout treatment for cancer and beyond is essential to help prevent fatigue and weakness from muscle mass loss. Rest, if it is not balanced with gentle exercise, can increase fatigue rather than alleviate it. Initial weight loss with cancer treatment is often associated with muscle mass loss. In general, cancer treatment causes weight gain, and this can be alleviated with regular exercise within an individual's limitations.<sup>33,110</sup>

An 8-week acupuncture course in one study reduced fatigue and other symptoms that can contribute to fatigue, such as depression, anxiety, and pain.<sup>111</sup> In a small study, Takahashi<sup>112</sup> found that acupuncture could help relieve fatigue, dyspnea, and constipation in terminal cancer patients.

## Vasomotor Instability

In a systematic review of nonhormonal interventions for hot flashes in women with a history of breast cancer, relaxation was the only nonpharmaceutical intervention that reduced hot flashes significantly. Black cohosh and other botanicals were not evaluated. Only one study of acupuncture and a few other complementary and alternative medicine therapies was included; the interventions of vitamin E, acupuncture, and magnetic devices did not show evidence of benefit. Clonidine, selective serotonin reuptake inhibitors, selective norepinephrine reuptake inhibitors, and gabapentin showed mild to modest benefits in reducing the number and intensity of hot flashes.<sup>113</sup> Evening primrose oil is a botanical occasionally used in treatment of menopausal symptoms such as hot flashes that can occur with cancer treatment. There is insufficient evidence to recommend it for this indication.<sup>114</sup>

Twelve weeks of acupuncture versus venlafaxine was found to be equivalent in effectiveness to control hot flashes in hormone receptor–positive breast cancer patients in a randomized controlled trial. Both groups experienced decrease in hot flashes and improvement in depressed mood and quality of life. The drug group had numerous side effects, whereas the acupuncture group experienced improved libido, energy, thinking, and well-being.<sup>115</sup> Acupuncture reduced hot flashes and night sweats in a study of breast cancer patients receiving tamoxifen. Emotional and physical well-being were also improved without significant side effects.<sup>116</sup> In another randomized controlled trial, 10 weeks of acupuncture versus sham acupuncture significantly decreased day and night hot flashes in breast cancer patients receiving tamoxifen.<sup>117</sup>

In one large study, phytoestrogen botanicals and black cohosh, used to treat vasomotor symptoms, were found to lower risk of invasive breast cancer in postmenopausal women.<sup>118</sup> In a large study, black cohosh was not effective in decreasing hot flashes, but another smaller study did show a positive effect.<sup>62</sup> Of note, black cohosh is not estrogenic.<sup>119</sup> Black cohosh may cause liver toxicity and needs to be used with caution. It is not recommended during chemotherapy, and evidence for its benefits is inconclusive.

## Atrophic Vaginitis

See Chapter 56, Vaginal Dryness, for recommendations on nonhormonal lubricants.

## Osteopenia and Osteoporosis

Strength training and weight-bearing exercise are known to help prevent bone loss in postmenopausal women. Yoga is a form of meditative exercise that can also help maintain bone mineral density. Other strategies to help maintain bone health are vitamin D and calcium. One clinical trial of weight training in postmenopausal breast cancer survivors showed that a 24-month weight training program with adherence greater than 50% improved bone mineral density. Both groups took bisphosphonates, vitamin D, and calcium but were randomized to the program or no exercise.<sup>120</sup>

## Nausea and Vomiting

Moxibustion, which stimulates acupuncture points with heat generated from burning herbal preparations, was evaluated in several clinical trials; some evidence showed that this therapy could significantly reduce nausea and vomiting in patients undergoing chemotherapy.<sup>121</sup> The National Institutes of Health endorsed acupuncture for chemotherapy-associated nausea.<sup>122</sup> The Society of Integrative Oncology, on review of the evidence, also strongly endorsed acupuncture for this indication.<sup>32</sup> Acupressure of acupuncture point 6 at the wrist, sometimes stimulated with specialized wrist bands, can alleviate chemotherapy-related nausea<sup>32,123</sup> (see Chapter 108, Acupuncture for Nausea and Vomiting).

Lee et al<sup>124</sup> found that nausea intensity was less in breast cancer patients receiving adjuvant chemotherapy or radiation therapy who engaged in moderate exercise as opposed to no exercise.

## Ginger (*Zingiber officinale*)

Ginger can help alleviate nausea. It has been found efficacious for nausea associated with chemotherapy but not for postoperative nausea. Its mechanism of action is unknown, but ginger appears to have a prokinetic effect.<sup>125</sup>

### ■ Dosage

Take 500 to 1000 mg of ginger root extract every 4 to 6 hours as needed, or eat 1 tsp or 5 g of crystallized ginger every 2 to 3 hours as needed.

### ■ Precautions

Ginger candy or tea is less potent than the root and may yield anti-nausea effects that do not interfere with certain chemotherapy agents.<sup>1</sup>

Side effects are rare. Excessive doses can cause heartburn.



## Anxiety, Stress, and Depression

One 8-week acupuncture course significantly improved anxiety and depression in patients with advanced cancer. It also helped improve psychological distress and life satisfaction.<sup>111</sup>

An 8-week mindfulness-based stress reduction (MBSR) program improved depression and medical symptoms, mindfulness, coping with illness and stress, and sense of coherence after completion of the primary cancer treatment.<sup>126</sup> In another study on MBSR in cancer patients, similar results were found.<sup>127</sup> In a study of MBSR by Kieviet-Stijnen et al,<sup>128</sup> positive effects on mood and vitality strengthened 1 year after completion of the program. A study of an 8-week program using imagery found positive results on anxiety, stress, and depression.<sup>129</sup>

Art therapy can be helpful in improving general quality of life measures, including physical and psychological functioning, in breast cancer patients undergoing radiation therapy.<sup>130</sup>

Anxiety can be managed effectively with exercise. Yoga in particular can help with anxiety, depression, mood, and quality of life with its meditative and restorative movement.<sup>131,132</sup>

Massage can help relieve anxiety and stress during chemotherapy.<sup>133</sup> The Society of Integrative Oncology also strongly endorsed massage for anxiety during cancer treatment.<sup>32</sup> Art therapy, dance, journaling, and aromatherapy all have positive effects on anxiety, depression, and quality of life.<sup>62</sup>

Support groups can be helpful with improvements in mood, less anxiety and depression, better coping, and decrease in pain, but the survival benefits reported by Spiegel et al<sup>134</sup> in 1989 have not been duplicated in subsequent studies.<sup>135–138</sup> In a review of psychosocial interventions, Zimmerman et al<sup>139</sup> found that psychoeducation had the strongest effect size for breast cancer patients. Other psychological interventions led by a psychologist were conducted individually. In a meta-analysis of 116 mind-body therapies, guided imagery, biofeedback, cognitive-behavioral therapy, meditation, relaxation, and hypnosis were effective in improving mood states, coping, anxiety, and depression.<sup>140</sup>

## Insomnia and Other Sleep Disturbances

Good sleep hygiene can help induce sleep at night when production of melatonin is optimal. Minimizing sleep during the day, exercising regularly, sleeping in a quiet dark room, and going to sleep at a similar time each night promote sleep. Relaxation, meditation, and yoga can have positive effects on melatonin and sleep states.<sup>141</sup> Cognitive-behavioral therapy has also shown positive effects on sleep.<sup>142</sup>

Regular exercise can help reinforce normal circadian rhythm and maximum endogenous melatonin production by increasing awakeness during the day and sleep at night.<sup>33</sup> Melatonin in supplemental form can also be helpful.

Breast cancer survivors tend to have 10% more sleep disturbances even long term compared with age-matched women without breast cancer. These sleep disturbances in both groups are associated with hot flashes, depression, more distress, and worse physical conditioning.<sup>143</sup> Breast cancer survivors tended to do less physical activity and had more hot flashes than did women without breast cancer<sup>144</sup> (see Chapter 8, Insomnia).

## Pain and Peripheral Neuropathy

Pain and other uncomfortable neurologic sensations can occur in posttreatment breast cancer survivors. In 1543 patients studied, Gartner et al<sup>145</sup> found that 47% of women

reported pain, and 13% of this group had severe pain. Pain was associated with young age (younger than 40 years) and adjuvant radiation therapy; axillary lymph node dissection was associated with increased likelihood of pain compared with sentinel lymph node dissection; and pain complaints from other parts of the body were associated with increased risk of pain in the surgical area. Pain was not associated with chemotherapy. Women undergoing mastectomy versus breast-conserving surgery did not significantly differ in frequency of reporting pain, but pain was generally more severe in patients reporting pain after mastectomy. Thus, type of surgical technique and radiation therapy do affect chronic pain incidence during and after treatment of breast cancer.

Acupuncture can help with pain relief. One study showed improved pain scores and psychological functioning with an 8-week course of acupuncture.<sup>111</sup> The Society for Integrative Oncology, on review of the literature, strongly endorsed acupuncture for this indication.<sup>32</sup> Massage can also be helpful in relieving pain.<sup>32</sup>

Exercise (a walking intervention) during radiation therapy and chemotherapy can attenuate the negative side effects on physical functioning, increase cardiorespiratory fitness, and reduce pain in breast cancer patients, especially in those who are younger.<sup>39</sup>

Cannabinoids can help with neuropathic pain associated with the neuropathy that can be caused by some chemotherapeutic agents, such as taxanes and platinum-derived drugs.<sup>109</sup>

## Lymphedema and Musculoskeletal Issues

Concerns are expressed by clinicians that exercise involving the upper extremities might increase lymphedema. In a review of exercise programs in the recovery of breast cancer patients, early exercise with the upper extremities improved shoulder function and range of motion but did not increase lymphedema. Early exercise interventions were superior to delayed exercise interventions.<sup>146</sup> In a randomized controlled trial of progressive weightlifting twice weekly in patients with breast cancer, this program did not exacerbate lymphedema but instead reduced lymphedema and its symptoms and increased strength.<sup>147</sup>

Moderate exercise can help relieve limited range of motion of the shoulder, pain, and fatigue during radiation therapy in breast cancer patients.<sup>148</sup>

Aromatase inhibitors can cause arthralgias and joint stiffness. In a randomized controlled trial of acupuncture, these symptoms were significantly relieved.<sup>149</sup> Acupuncture also increased shoulder range of motion and decreased lymphedema and its symptoms of heaviness and tightening in a small study by Alem and Gurgel.<sup>150</sup>

Massage can help with pain and edema control. Massage is recommended only with a trained health professional in this area of treatment. Deep massage into vulnerable tissue is not recommended.<sup>32</sup>

## Dermatitis From Radiation Therapy

Calendula cream applied multiple times daily to the skin being irradiated can reduce the severity of dermatitis from therapy.<sup>151</sup>

## PREVENTION PRESCRIPTION

- Eat primarily a plant-based diet rich in cruciferous vegetables (broccoli, cauliflower, Brussels sprouts, cabbage, and kale). Eat one or two servings of cruciferous vegetables daily.
- Follow an antiinflammatory and Mediterranean diet. This diet avoids saturated fat in dairy and meats; it has no trans-fats and includes increased amounts of omega-3 fatty acids (ocean fish, walnuts, soybeans, greens, flaxseed meal). See Chapter 86, The Antiinflammatory Diet.
- Avoid processed foods.
- Organic foods are not contaminated with pesticides and herbicides. Many organic meats, poultry, and produce can be purchased from local farms or farmers' markets.
- Fatty fish such as herring, mackerel, tuna, salmon, and sardines have high levels of omega-3 fatty acids. Minimize your eating of albacore tuna, shark, swordfish, king mackerel, and tile fish because they can have higher levels of contamination with mercury. You may want to take omega-3 supplements that are detoxified. Fish, however, is an excellent protein source. Eat fish often (three times per week or less) or take fish oil supplements daily. (If you eat fish high in omega-3 content, do not take your fish oil supplements that day.)
- Do not skip meals. If breakfast is a problem, try protein-fortified smoothies in the morning. Whey protein powder is best, and if you are lactose intolerant, buy whey protein powder without lactose.
- Drink lots of water, filtered if possible. Bring it with you everywhere (reuse water bottles). Flavor it with lime or lemon (or cucumber, orange, or any other natural flavor you like).
- Drink green tea, two or three cups a day.
- Moderate alcohol intake if you drink alcohol (no more than one serving per day for women). Do not drink it at all if it makes you feel not well.
- Mushrooms contribute to a healthy diet, especially adding medicinal mushrooms (i.e., maitake, shiitake, reishi, turkey tail) as food or supplement.
- Eat one to three servings of soy food daily. Avoid soy (isoflavone) supplements.
- Eat one or two tablespoons of flaxseed meal daily.
- Vitamin D can be obtained from adequate sun exposure or a supplement. For most people, 2000 units/day will maintain adequate levels. I recommend determination of a 25-hydroxyvitamin D level in winter to asses for adequate intake.
- Maintain healthy weight with a BMI of less than 30 and ideally 25 (not overweight).
- Avoid smoking and passive tobacco exposure.
- Exercise for 30 to 60 minutes at least 5 days a week (more than 3 hours per week is recommended). Combine aerobic activity such as walking with a resistance or strength training program two or three times a week. Nordic walking sticks can increase the overall conditioning of walking while improving posture, balance, and core strengthening. Yoga, tai chi, and qi gong are meditative movement with the benefit of relaxation and exercise. Do exercise that is enjoyable to you.
- Optimize sleep at night. Melatonin can be added if sleeping difficulties are occurring, starting at 3 mg before bed. Sleep in a darkened room at regular hours to improve sleep quality. Do not sleep with a television on in the bedroom.
- Maintain spiritual practices that give meaning and relaxation to your life.
- Maintain a strong support network with family and friends.
- Consider testing for a 2-hydroxyestrone/16-hydroxyestrone ratio, and consider interventions to improve the ratio in favor of weak estrogens. (See the Appendix for laboratories that offer this testing.)
- Minimize use of estrogen replacement medication. For menopausal symptoms, consider nonhormonal measures first.
- Attend to self-care every day. Make healthy lifestyle choices a part of your routine.



## THERAPEUTIC REVIEW

### ■ Nutrition

- The Mediterranean diet can lower the risk of breast cancer and other chronic health conditions, such as heart disease, diabetes, and obesity. This diet is high in omega-3 and omega-9 fatty acids; add five to nine servings of fruit and vegetables per day. A ↑ 1
- Cruciferous vegetables are beneficial in a healthy diet to decrease cancer risk. A ↑ 1

- In general, antioxidants are preferably obtained in food rather than in supplements. B ⊙ 1
- Three cups of green tea per day can decrease breast cancer risk. B ⊙ 1
- Soy foods in moderation are safe and protective for breast cancer. One to three servings of soy foods daily are recommended. Avoid isolated isoflavone supplements. A ↑ 1
- Flaxseed meal can lower breast cancer risk. B ⊙ 1
- Avoid excessive alcohol intake. Drink no more than one alcoholic beverage daily. B ⊙ 1

Continued

- Weight control and gradual weight loss if the patient is obese or very overweight can reduce risk of breast cancer. Weight loss can be achieved with regular exercise, portion control, and eating more fruits and vegetables and fewer calorie-dense foods. A<sup>1</sup>
- Vitamin D in supplement form when adequate sun exposure is not available is important for bone health, anticancer effect, immunity, and muscle health. Higher levels of vitamin D are associated with decreased risk of breast cancer. Monitor levels of 25-hydroxyvitamin D in the winter to ensure adequate intake of vitamin D<sub>3</sub>. A<sup>1</sup>
- Medicinal mushrooms have many potential beneficial effects during cancer treatment and can be part of a healthy diet. C<sup>1</sup>

**Medication**

- Avoid prolonged HRT of both estrogen and progesterone. A<sup>1</sup>
- Nonhormonal therapies for postmenopausal symptoms of hot flashes can be effective. These include regular exercise, medications, and acupuncture. A<sup>1</sup>
- Tamoxifen is commonly used for ER<sup>+</sup> tumors for 5 years after treatment to prevent recurrence. The dose is 20 mg daily. A<sup>2</sup>
- Aromatase inhibitors (anastrozole, exemestane, letrozole) are used in postmenopausal treatment of breast cancer to prevent recurrence. A<sup>2</sup>

**Exercise**

- Exercising more than 3 hours per week can decrease cancer risk. A<sup>1</sup>

**Lifestyle**

- Sleep is important in decreasing cancer risk. Melatonin is implicated in this mechanism of reduced cancer cell proliferation when melatonin levels are high. Supplemental melatonin can help improve circadian rhythms and quality of sleep. The dose is 1 to 3 mg at bedtime. Up to 20 mg has been used. B<sup>2</sup>
- Psychological interventions can be helpful in cancer care. Those most helpful are psychoeducation and psychotherapy conducted by a psychotherapist individually. A<sup>1</sup>
- Mindfulness-based stress reduction programs can enhance well-being and coping and decrease anxiety during and after treatment. See [Table 75-1](#). A<sup>1</sup>

**TABLE 75-1. Integrative Medicine and Breast Cancer Treatment Symptoms**

SYMPTOM	TREATMENT	EVIDENCE VS. HARM RATING
Fatigue	Exercise	A <sup>1</sup>
	Acupuncture	B <sup>1</sup>
Postmenopausal symptoms of hot flashes	Medications such as selective serotonin reuptake inhibitors, selective norepinephrine reuptake inhibitors, and gabapentin	A <sup>2</sup>
	Acupuncture	A <sup>1</sup>
	Exercise	A <sup>1</sup>
Nausea and vomiting due to chemotherapy	Acupuncture	A <sup>1</sup>
	Ginger	B <sup>1</sup>
	Cannabis	B <sup>2</sup>
Anxiety, stress, and depression	Acupuncture	B <sup>1</sup>
	Mindfulness-based stress reduction	A <sup>1</sup>
	Art therapy	B <sup>1</sup>
	Exercise	A <sup>1</sup>
	Yoga	B <sup>1</sup>
	Massage	A <sup>1</sup>
	Support groups	A <sup>1</sup>
Insomnia	Exercise	A <sup>1</sup>
	Melatonin	A <sup>2</sup>
	Relaxation techniques	B <sup>1</sup>
	Sleep hygiene	A <sup>1</sup>
Pain and peripheral neuropathy	Acupuncture	A <sup>1</sup>
	Exercise	A <sup>1</sup>
	Cannabinoids	A <sup>2</sup>
	Massage	A <sup>1</sup>
	Mind-body therapies	A <sup>1</sup>
Lymphedema	Acupuncture	B <sup>1</sup>
	Exercise	A <sup>1</sup>
Radiation dermatitis	Calendula cream	B <sup>1</sup>

Modified from Deng G, Cassileth BR, Yeung KS. Complementary therapies for cancer-related symptoms. *J Support Oncol*. 2004;2:419-426.

## KEY WEB RESOURCES

[www.bmj.com/cgi/content-nw/full/337/jul11\\_2/a540/FIG3](http://www.bmj.com/cgi/content-nw/full/337/jul11_2/a540/FIG3) (login to *British Medical Journal* required to view)

<http://www.cancer.gov/bcrisktool/Default.aspx>

InspireHealth Integrated Cancer Care *Research Updates*  
To subscribe to newsletters, email: [mwiebe@inspirehealth.ca](mailto:mwiebe@inspirehealth.ca); hard copy or electronic copy  
Phone: 604-734-7125  
#200-1330 West 8th Avenue, Vancouver, BC V6H 4A6

American Cancer Society: <http://www.cancer.org/Cancer/BreastCancer/index?ssSourceSiteId=null>

Susan G. Komen Breast Cancer Foundation: [www.komen.org](http://www.komen.org)

Society for Integrative Oncology: [www.integrativeonc.org](http://www.integrativeonc.org)

Deng GE, Frenkel M, Cohen L, et al. Evidence-based clinical practice guidelines for integrative oncology: complementary therapies and botanicals. *J Soc Integr Oncol*. 2009;7:85-120.

Breast Cancer Recovery: [www.bcrecovery.org](http://www.bcrecovery.org)

National Institutes of Health National Cancer Institute (NCI): <http://www.cancer.gov/cancertopics/cam/>  
Office of Cancer Complementary and Alternative Medicine (OCCAM): <http://www.cancer.gov/cam/>

National Institutes of Health, Office of Dietary Supplements: [http://ods.od.nih.gov/research/pubmed\\_dietary\\_supplement\\_subset.aspx](http://ods.od.nih.gov/research/pubmed_dietary_supplement_subset.aspx)

Memorial Sloan-Kettering Cancer Center: <http://www.mskcc.org/cancer-care/integrative-medicine/about-herbs-botanicals-other-products>

The University of Texas MD Anderson Cancer Center Complementary and Integrative Medicine Educational Resources: [www.mdanderson.org/CIMER](http://www.mdanderson.org/CIMER)

Adjuvant therapy predictor for breast cancer  
Predicts what chemotherapy and endocrine or targeted therapies might be helpful, given tumor markers and staging

National Cancer Institute Breast Cancer Risk Assessment Tool

Summary of important research studies that inform integrative cancer care  
International studies are reviewed.

Monographs cited in references on the research of exercise and nutrition in the prevention of cancer and during and after cancer treatment

Dedicated to education and research about causes, treatment, and search for a cure

International organization of clinicians, researchers, and others interested in evidence-based integrative oncology  
A monograph is available for integrative oncology practice guidelines.

Breast Cancer Recovery's mission is to help women heal mind, body, and spirit after breast cancer. All programs are designed and conducted by survivors for survivors.

Evidence-based information on complementary and alternative medicine and its applications in oncology

Provides information on dietary supplements. The PubMed Dietary Supplement Subset succeeds the International Bibliographic Information on Dietary Supplements (IBIDS) database active from 1999-2010.

A searchable database provides evidence-based information on herbs, botanicals, vitamins, and other supplements. It includes evaluations of alternative or unproven cancer therapies.

Evidence-based review of complementary and alternative medicine and integrative medicine therapies



Also see [Table 75-2e](#) online at [expertconsult.com](http://expertconsult.com) for further reading on integrative oncology.

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## Acknowledgments

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**TABLE 75-2e. Recommended Reading in Integrative Oncology\***

AUTHOR	TITLE	PUBLISHER	SUMMARY	NOTES
David Servan-Schreiber, MD, PhD	<i>Anti Cancer: A New Way of Life</i>	New York: Viking; 2007	The author's narrative of cancer is interwoven with research on nutrition, exercise, and mind-body interventions in reducing risk and recurrence of cancer.	Supplements are not emphasized.
Lise Alschuler, ND, and Karolyn Gazella	<i>The Definitive Guide to Cancer: An Integrative Approach to Prevention, Treatment, and Healing. 3rd ed.</i>	Berkeley, CA: Celestial Arts; 2010	This book is a guide to health practitioners on interactions of botanicals and supplements with cancer treatments. General information on integrative oncology is provided for a number of audiences.	
Anna Schwartz, PhD	<i>Cancer Fitness: Exercise Programs for Patients and Survivors</i>	New York: Simon and Schuster; 2004	Primarily research and exercise programs for cancer survivorship are presented. Important areas of how exercise helps reduce effects of cancer and treatment are described.	Strength training and aerobic exercise are included. The author's cancer experience informs the book.
Keith Block, MD	<i>Life Over Cancer: The Block Center Program for Integrative Cancer Treatment</i>	New York: Bantam Books; 2009	Dr. Block describes his integrative oncology program, including conventional treatment of cancer combined with nutrition, nutraceuticals, movement, and other therapies to optimize outcomes and well-being in treatment and recovery from cancer.	Dr. Block's integrative oncology program is individualized to the patient's particular profile.
Donald Abrams, MD and Andrew Weil, MD	<i>Integrative Oncology</i>	New York: Oxford University Press; 2009	This edited book describes how conventional therapies are combined with alternative therapies and healthy lifestyle for optimal cancer care.	Many experts contributed to this edited book.
Steven Pratt, MD and Kathy Matthews	<i>SuperFoods HealthStyle: Proven Strategies for Lifelong Health</i>	New York: HarperCollins; 2006	This is an excellent, practical guide on what to eat and how to create a healthy lifestyle.	The book is geared to general public and not specifically to patients with cancer.
Kris Carr	<i>Crazy Sexy Cancer Tips</i>	Guilford, CT: Morris Publishing Group; 2007	A refreshing look is taken at the cancer journey and survivorship with use of integrative approaches.	The author does not have breast cancer but speaks to younger individuals in cancer survivorship.
Jennifer Barraclough	<i>Enhancing Cancer Care: Complementary Therapy and Support</i>	New York: Oxford University Press; 2007	This is an edited book on complementary therapies in cancer care.	
Rachel Remen, MD	<i>Kitchen Table Wisdom: Stories That Heal</i>	New York: Riverhead Books; 1996	Inspiring stories on the topic of healing and what that means are told.	
Miriam Nelson, PhD and Sarah Wernick, PhD	<i>Strong Women Stay Young</i>	New York: Bantam; 1997	A gentle strength training program that will maintain muscle mass and bone integrity and improve muscle-to-fat ratio is presented.	Simple, gentle exercises for any age group can easily be modified for the limitations of a particular patient. The program is helpful to maintain balance.
Michael Murray, ND, Joseph Pizzorno, ND, and Lara Pizzorno, MA, LMT	<i>The Encyclopedia of Healing Foods</i>	New York: Atria Books; 2005	Everything you might want to know about foods is described: history, how to choose and prepare them, nutritional constituents.	This useful and practical guide describes how to use each food.

\*All readings are appropriate for public and professional audiences.

## References

1. Alschuler LN, Gazella KA. *The Definitive Guide to Cancer: An Integrative Approach to Prevention, Treatment, and Healing*. 3rd ed. Berkeley, CA: Celestial Arts; 2010.
2. Jemal A, Siegel R, Xu J, Ward E. Cancer statistics 2010. *CA Cancer J Clin*. 2010;60:277–300.
3. Maughan KL, Lutterbie MA, Ham PS. Treatment of breast cancer. *Am Fam Physician*. 2010;81:1339–1346.
4. Jemal A, Murray T, Ward E, et al. Cancer statistics 2005. *CA Cancer J Clin*. 2005;55:10–30.
5. Pasqualini JR, Schatz B, Varin C, et al. Recent data on estrogen sulfatases and sulfotransferases activities in human breast cancer. *J Steroid Biochem Mol Biol*. 1992;41:323–329.
6. Dumestrescu RG, Cotarla I. Understanding breast cancer risk—where do we stand in 2005? *J Cell Mol Med*. 2005;9:208–221.
7. Collaborative Group on Hormonal Factors in Breast Cancer. Familial breast cancer: collaborative reanalysis of individual data from 52 epidemiological studies including 58,209 women with breast cancer and 101,986 women without the disease. *Lancet*. 2001;358:1389–1399.
8. Domchek SM, Friebel TM, Singer CF, et al. Association of risk-reducing surgery in BRCA1 and BRCA2 mutation carriers with cancer risk and mortality. *JAMA*. 2010;304:967–975.
9. Pijpe A, Manders R, Brohet M, et al. Physical activity and the risk of breast cancer in BRCA1/2 mutation carriers. *Breast Cancer Res Treat*. 2010;120:235–244.
10. De Silva M, Senarath U, Gunatilake M, Lokuhetty D. Prolonged breastfeeding reduces risk of breast cancer in Sri Lankan women: a case-control study. *Cancer Epidemiol*. 2010;34:267–273.
11. Awatef M, Olfa G, Imed H, et al. Breastfeeding reduces breast cancer risk: a case-controlled study in Tunisia. *Cancer Causes Control*. 2010;213:393–397.
12. Willett J, Willett J, Mayr A, et al. Telomere length and risk of incident cancer and cancer mortality. *JAMA*. 2010;304:69–75.
13. Doyle C, Kushi LH, Byers T, et al. Nutrition and physical activity during and after cancer treatment: an American cancer society guide for informed choices. *CA Cancer J Clin*. 2006;56:323–353.
14. Rolls BJ, Drewnowski A, Ledikwe JH. Changing the energy density of the diet as a strategy for weight management. *J Am Diet Assoc*. 2005;105(suppl):S98–S103.
15. Megdal SP, Kroenke CH, Laden F, et al. Night work and breast cancer risk: a systematic review and meta-analysis. *Eur J Cancer*. 2005;41:2023–2032.
16. Hanson J. Increased breast cancer risk among women who work predominantly at night. *Epidemiology*. 2001;12:74–77.
17. Schernhammer ES, Rosner B, Willett W, et al. Epidemiology of urinary melatonin in women and its relation to other hormones and night work. *Cancer Epidemiol Biomarkers Prev*. 2004;13:936–943.
18. Clemons M, Goss P. Estrogen and the risk of breast cancer. *N Engl J Med*. 2001;344:276–285.
19. Lord RS, Bongiovanni B, Bralley JA. Estrogen metabolism and the diet-cancer connection: rationale for assessing the ratio of urinary hydroxylated estrogen metabolites. *Altern Med Rev*. 2002;7:112–129.
20. Kabat GC, O'Leary ES, Gammon MD, et al. Estrogen metabolism and breast cancer. *Epidemiology*. 2006;17:80–88.
21. Bentz AT, Schneider CM, Westerlind KC. The relationship between physical activity and 2-hydroxyestrone, 16 $\alpha$ -hydroxyestrone, and the 2/16 ratio in premenopausal women. *Cancer Causes Control*. 2005;16:455–461.
22. Terry P, Wolk A, Persson I, et al. Brassica vegetables and breast cancer risk. *JAMA*. 2001;285:2975–2977.
23. Saxena T, Lee E, Henderson KD, et al. Menopausal hormone therapy and subsequent risk of specific invasive breast cancer subtypes in the California Teachers Study. *Cancer Epidemiol Biomarkers Prev*. 2010;19:2366–2378.
24. US Preventive Services Task Force. Screening for breast cancer: US Preventive Task Force recommendation statement. *Ann Intern Med*. 2009;151:716–726.
25. Berg WA. Benefits of screening mammography. *JAMA*. 2010;303:168–169.
26. Woolf SH. The 2009 breast cancer screening recommendations of the US Preventive Services Task Force. *JAMA*. 2010;303:162–163.
27. Woloshin S, Schwartz LM. The benefits and harms of mammography screening: understanding the trade-offs. *JAMA*. 2010;303:164–165.
28. Berg WA. Tailored supplemental screening for breast cancer: what now and what next? *AJR Am J Roentgenol*. 2009;192:390–399.
29. Sima CS, Panageas KS, Schrag D. Cancer screening among patients with advanced cancer. *JAMA*. 2010;304:1584–1591.
30. Ford ES, Bergmann MM, Kröger J, et al. Healthy living is the best revenge: findings from the European Prospective Investigation into Cancer and Nutrition—Potsdam Study. *Arch Intern Med*. 2009;169:1355–1362.
31. Block K, Gyllenhaal C, Tripathy D, et al. Survival impact of integrative cancer care in advanced metastatic breast cancer. *Breast J*. 2009;15:357–366.
32. Deng GE, Frenkel M, Cohen L, et al. Evidence-based clinical practice guidelines for integrative oncology: complementary therapies and botanicals. *J Soc Integr Oncol*. 2009;7:85–120.
33. Schwartz AL. *Cancer Fitness: Exercise Programs for Patients and Survivors*. New York: Simon and Schuster; 2004.
34. Saeed SA, Antonacci DJ, Bloch RM. Exercise, yoga and meditation for depressive and anxiety disorders. *Am Fam Physician*. 2010;81:981–986.
35. Smith SG, Chagpar AB. Adherence to physical activity guidelines in breast cancer survivors. *Am Surg*. 2010;76:962–965.
36. Schmitz KH, Courneya KS, Matthews C, et al. American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Med Sci Sports Exerc*. 2010;42:1409–1426.
37. West-Wright CN, Henderson KD, Sullivan-Halley J, et al. Long-term and recent recreational physical activity and survival after breast cancer: the California Teachers Study. *Cancer Epidemiol Biomarkers Prev*. 2009;18:2851–2859.
38. Irwin ML, Smith AW, McTiernan A, et al. Influence of pre- and postdiagnosis physical activity on mortality in breast cancer survivors: the health, eating, activity and lifestyle study. *J Clin Oncol*. 2008;26:3958–3964.
39. Griffith K, Wenzel J, Shang J, et al. Impact of a walking intervention on cardiorespiratory fitness, self-reported physical function, and pain in patients undergoing treatment for solid tumors. *Cancer*. 2009;115:4874–4884.
40. Cottet V, Touvier M, Fournier A, et al. Postmenopausal breast cancer risk and dietary patterns in the E3N-EPIC prospective cohort study. *J Epidemiol*. 2009;170:1257–1267.
41. Park Y, Brinton LA, Subar AF, et al. Dietary fiber intake and risk of breast cancer development in postmenopausal women: the National Institutes of Health—AARP Diet and Health Study. *J Clin Nutr*. 2009;90:664–671.
42. Sonestedt E, Borgquist S, Ericson U, et al. Plant foods and oestrogen receptor alpha and beta-defined breast cancer: observations from the Malmö Diet and Cancer cohort. *Carcinogenesis*. 2008;29:2203–2209.
43. Kushi LH, Byers T, Doyle C, et al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin*. 2006;56:254–281.
44. Flatt SW, Thomson CA, Gold EB, et al. Low to moderate alcohol intake is not associated with increased mortality after breast cancer. *Cancer Epidemiol Biomarkers Prev*. 2010;19:681–688.
45. Li CI, Chlebowski RT, Freiberg M, et al. Alcohol consumption and risk of postmenopausal breast cancer by subtype: the Women's Health Initiative Observational Study. *J Natl Cancer Inst*. 2010;102:1422–1431.
46. Deandrea S, Talamini R, Foschi R, et al. Alcohol and breast cancer risk defined by estrogen and progesterone receptor status: a case control study. *Cancer Epidemiol Biomarkers Prev*. 2008;17:2025–2028.
47. Servan-Schreiber D. *Anti Cancer: A New Way of Life*. New York: Viking; 2007.
48. Brasky TM, Lampe JW, Potter JD, et al. Specialty supplements and breast cancer risk in the Vitamins and Lifestyle (VITAL) cohort. *Cancer Epidemiol Biomarkers Prev*. 2010;19:1696–1708. 2009:9216.
49. Kim J, Lim SY, Shin A, et al. Fatty fish and fish omega-3 fatty acid intakes decrease the breast cancer risk: a case-control study. *BMC Cancer*. 2009;9:216.
50. Biondo PD, Brindley DN, Sawyer MB, Field CJ. The potential for treatment with dietary long-chain polyunsaturated n-3 fatty acids during chemotherapy. *J Nutr Biochem*. 2008;19:787–796.
51. Menendez JA, Vellon L, Colomer R, et al. Oleic acid, the main monounsaturated fatty acid of olive oil, suppresses Her-2/neu (erbB-2) expression and synergistically enhances the growth inhibitory effects of trastuzumab (Herceptin) in breast cancer cells with Her-2/neu oncogene amplification. *Ann Oncol*. 2005;16:359–371.
52. Ogunleye AA, Xue F, Michels KB. Green tea consumption and breast cancer risk or recurrence: a meta-analysis. *Breast Cancer Res Treat*. 2010;119:477–484.

53. Zhang M, Huang J, Xie X, Holman CD. Dietary intakes of mushrooms and green tea combine to reduce the risk of breast cancer in Chinese women. *Int J Cancer*. 2009;124:1404–1408.
54. Messina M, Wu AH. Perspectives on the soy–breast cancer relation. *Am J Clin Nutr*. 2009;89:1673s–1679s.
55. Shu XO, Zheng Y, Cai H, et al. Soy food intake and breast cancer survival. *JAMA*. 2009;302:2437–2443.
56. Kang X, Zhang Q, Wang S, et al. Effect of soy isoflavones on breast cancer recurrence and death for patients receiving adjuvant endocrine therapy. *CMAJ*. 2010;182:1857–1862.
57. Iwasaki M, Hamada GS, Nishimoto IN, et al. Dietary isoflavone intake and breast cancer risk in case controlled studies in Japanese, Japanese Brazilians, and non-Japanese Brazilians. *Breast Cancer Res Treat*. 2009;116:401–411.
58. Cho YA, Kim K, Park S, et al. Effect of dietary soy intake on breast cancer risk according to menopause and hormone receptor status. *Eur J Clin Nutr*. 2010;64:924–932.
59. Velentzis LS, Cantwell MM, Cardwell C, et al. Lignans and breast cancer risk in pre- and post menopausal women: meta-analyses of observational studies. *Br J Cancer*. 2009;100:1492–1498.
60. Thompson LU, Chen JM, Li T, et al. Dietary flaxseed alters tumor biological markers in postmenopausal breast cancer. *Clin Cancer Res*. 2005;11:3828–3835.
61. Mignone LI, Giovannucci E, Newcomb PA, et al. Dietary carotenoids and the risk of invasive breast cancer. *Int J Cancer*. 2009;124:2929–2937.
62. Tripathy D. Integrative medicine and breast cancer. In: Abrams D, Weil A, eds. *Integrative Oncology*. New York: Oxford University Press; 2009:396–412.
63. Lindequist U, Niedermeyer TH, Jülich WD. The pharmacological potential of mushrooms. *Evid Based Complement Alternat Med*. 2005;2:285–299.
64. Deng G, Lin H, Seidman A, et al. A phase I/II trial of a polysaccharide extract of *Grifola frondosa* (Maitake mushroom) in breast cancer patients: immunological effects. *J Cancer Res Clin Oncol*. 2009;135:1215–1221.
65. Standish LJ, Wenner CA, Sweet ES, et al. *Trametes versicolor* mushroom immune therapy in breast cancer. *J Soc Integr Oncol*. 2008;6:122–128.
66. Murray M, Pizzorno J, Pizzorno L. *The Encyclopedia of Healing Foods*. New York: Atria Books; 2005.
67. Brew CT, Aronchik I, Hsu JC, et al. Indole-3-carbinol activates the ATM signaling pathway independent of DNA damage to stabilize p53 and induce G<sub>1</sub> arrest of human mammary epithelial cells. *Int J Cancer*. 2006;118:857–868.
68. Ambrosone CB, McCann SE, Freudenheim JL, et al. Breast cancer risk in premenopausal women is inversely associated with consumption of broccoli, a source of isothiocyanates, but is not modified by GST genotype. *J Nutr*. 2004;134:1134–1138.
69. Fowke JH, Chung FL, Jin F, et al. Urinary isothiocyanate levels, brassica, and human breast cancer. *Cancer Res*. 2003;63:3980–3986.
70. Reed GA, Peterson KS, Smith HJ, et al. A phase I study of indole-3-carbinol in women: tolerability and effects. *Cancer Epidemiol Biomarkers Prev*. 2005;14:1953–1960.
71. Brignall MS. Prevention and treatment of cancer with indole-3-carbinol. *Altern Med Rev*. 2001;6:580–589.
72. Druesne-Pecollo N, Latino-Martel P, Norat T, et al. Beta-carotene supplementation and cancer risk: a systematic review and meta-analysis of randomized controlled trials. *Int J Cancer*. 2010;127:172–184.
73. Pace A, Giannarelli D, Galie E, et al. Vitamin E neuroprotection for cisplatin neuropathy: a randomized, placebo-controlled trial. *Neurology*. 2010;74:762–766.
74. Meyer C. Scientists probe role of vitamin D. *JAMA*. 2004;292:1416–1418.
75. Bordelon P, Ghetu MV, Langan R. Recognition and management of vitamin D deficiency. *Am Fam Physician*. 2009;80:841–846.
76. Edlich R, Mason SS, Chase ME, et al. Scientific documentation of the relationship of vitamin D deficiency and the development of cancer. *J Environ Pathol Toxicol Oncol*. 2009;28:133–141.
77. Chen P, Hu P, Xie D, et al. Meta-analysis of vitamin D, calcium and the prevention of breast cancer. *Breast Cancer Res Treat*. 2010;121:469–477.
78. Blackmore KM, Lesosky M, Barnett H, et al. Vitamin D from dietary intake and sunlight exposure and the risk of hormone-receptor-defined breast cancer. *Am J Epidemiol*. 2008;168:915–924.
79. Giovannucci E. Vitamin D and cancer incidence in the Harvard cohorts. *Ann Epidemiol*. 2009;19:84–88.
80. Heaney RP, Davies KM, Chen TC, et al. Human serum 25-hydroxycholecalciferol response to extended oral dosing with cholecalciferol. *Am J Clin Nutr*. 2003;77:204–210.
81. Garland CF, Gorham ED, Mohr SB, Garland FC. Vitamin D for cancer prevention: global perspective. *Ann Epidemiol*. 2009;19:468–483.
82. Abbas S, Chang-Claude J, Linseisen J. Plasma 25-hydroxyvitamin D and premenopausal breast cancer risk in a German case-control study. *Int J Cancer*. 2009;124:250–255.
83. Grant WB, Mohr SB. Ecological studies of ultraviolet B, vitamin D and cancer since 2000. *Ann Epidemiol*. 2009;19:446–454.
84. Bischoff-Ferrari HA. Optimal serum 25-hydroxyvitamin D levels for multiple health outcomes. *Adv Exp Med Biol*. 2008;624:55–71.
85. Ingraham BA, Bragdon B, Nohe A. Molecular basis of the potential of vitamin D to prevent cancer. *Curr Med Res Opin*. 2008;24:139–149.
86. Garland CF, Gorham ED, Mohr SB, et al. Vitamin D and prevention of breast cancer: pooled analysis. *J Steroid Biochem Mol Biol*. 2007;103:708–711.
87. Holick MF. Sunlight, UV-radiation, vitamin D and skin cancer: how much sunlight do we need? *Adv Exp Med Biol*. 2008;624:1–15.
88. Natural Standard Research Collaboration. *An evidence based systematic review of melatonin*. <[www.naturalstandard.com](http://www.naturalstandard.com)>; Accessed 12/12/2011.
89. Blask DE, Dauchy RT, Sauer LA. Putting cancer to sleep at night: the neuroendocrine/circadian melatonin signal. *Endocrine*. 2005;27:179–188.
90. Park CL, Edmonson D, Fenster JR, Blank TO. Positive and negative health behavior changes in cancer survivors: a stress and coping perspective. *J Health Psychol*. 2008;13:1198–1206.
91. Andersen BL, Yang HC, Farrar WB, et al. Psychologic intervention improves survival for breast cancer patients: a randomized controlled trial. *Cancer*. 2008;113:3450–3458.
92. Wise M, Marchand L, Aeschlimann E, et al. Integrating a narrative telephone interview with online life review education for cancer patients: lessons learned and future directions. *J Soc Integr Oncol*. 2009;7:19–25.
93. Wise M, Marchand L. My living story: testing life review and online social networks for people with advanced cancer. Abstracts from the 7th International Conference of the Society for Integrative Oncology. *J Soc Integr Oncol*. 2010;8:160.
94. Gill GSNAC Trial Group of the Royal Australasian College of Surgeons (RACS) and NHMRC Clinical Trials Centre. Sentinel-lymph-node-based management or routine axillary clearance? One-year outcomes of sentinel node biopsy versus axillary clearance (SNAC): a randomized controlled surgical trial. *Ann Surg Oncol*. 2009;16:266–275.
95. Van der Ploeg IM, Nieweg OE, Van Rijk MC, et al. Axillary recurrence after a tumour-negative sentinel node biopsy in breast cancer patients: a systematic review and meta-analysis of the literature. *Eur J Surg Oncol*. 2008;34:1277–1284.
96. Salem A. Sentinel lymph node biopsy in breast cancer: a comprehensive literature review. *J Surg Educ*. 2009;66:267–275.
97. Langer I, Guller U, Hsu-Schmitz SF, et al. Sentinel lymph node biopsy is associated with improved survival compared to level I and II axillary lymph node dissection in node negative breast cancer patients. *Eur J Surg Oncol*. 2009;35:805–813.
98. Lyman GH, Giuliano AE, Somerfield MR, et al. American Society of Clinical Oncology guideline recommendations for sentinel lymph node biopsy in early-stage breast cancer. *J Clin Oncol*. 2005;23:7703–7720.
99. Clark M, Collins R, Darby S, et al. Early Breast Cancer Trialists' Collaborative Group (EBCTCG). Effects of radiotherapy and of differences in the extent of surgery for early breast cancer on local recurrence and 15-year survival: an overview of the randomised trials. *Lancet*. 2005;366:2087–2106.
100. Goldhirsch A, Wood WC, Gelber RD, et al. Progress and promise: highlights of the international expert consensus on the primary therapy of early breast cancer 2007 [published correction appears in *Ann Oncol* 2007;18:1917]. *Ann Oncol*. 2007;18:1133–1144.
101. Pritchard KI, Shepherd LE, O'Malley FP, et al. National Cancer Institute of Canada Clinical Trials Group. HER2 and responsiveness of breast cancer to adjuvant chemotherapy. *N Engl J Med*. 2006;354:2103–2111.
102. Ferguson T, Wilcken N, Vagg R, et al. Taxanes for adjuvant treatment of early breast cancer. *Cochrane Database Syst Rev*. 2007;(4):CD004421.
103. De Laurentis M, Canello G, D'Agostino D. Taxane-based combinations as adjuvant chemotherapy of early breast cancer: a meta-analysis of randomized trials. *J Clin Oncol*. 2008;26:44–53.
104. Early Breast Cancer Trialists' Group (EBCTCG). Effects of chemotherapy and hormonal therapy for early breast cancer on recurrence and 15-year survival: an overview of the randomised trials. *Lancet*. 2005;365:1687–1717.

105. Smith I, Procter M, Gelber RD, et al., HERA Study Team. A 2-year follow-up of trastuzumab after adjuvant chemotherapy in HER2-positive breast cancer: a randomised controlled trial. *Lancet*. 2007;369:29–36.
106. Romond EH, Perez EA, Bryant J, et al. Trastuzumab plus adjuvant chemotherapy for operable HER2-positive breast cancer. *N Engl J Med*. 2005;353:1673–1684.
107. Block KI, Block PB, Fox SR. Making circadian cancer therapy practical. *Integr Cancer Ther*. 2009;8:371–386.
108. Block KI. *Life Over Cancer: The Block Center Program for Integrative Cancer Treatment*. New York: Bantam Books; 2009.
109. Abrams DI, Guzman M. Cannabinoids and cancer. In: Abrams D, Weil A, eds. *Integrative Oncology*. New York: Oxford University Press; 2009:147–170.
110. Courneya KS. Exercise in cancer survivors: an overview of research. *Med Sci Sports Exerc*. 2003;35:1846–1852.
111. Dean-Clower E, Doherty-Gilman AM, Keshaviah A, et al. Acupuncture as palliative therapy for physical symptoms and quality of life for advanced cancer patients. *Integr Cancer Ther*. 2010;9:158–167.
112. Takahashi H. Effects of acupuncture on terminal cancer patients in home care setting. *Medical Acupuncture*. 2009;212:123–129.
113. Rada G, Capurro D, Pantoja T, et al. Non-hormonal interventions for hot flashes in women with a history of breast cancer. *Cochrane Database Syst Rev*. 2010;(9): CD004923.
114. Bayles B, Usatine R. Evening primrose oil. *Am Fam Physician*. 2009;80:1405–1408.
115. Walker EM, Rodriguez AI, Kohn B, et al. Acupuncture versus venlafaxine for the management of vasomotor symptoms in patients with hormone-receptor-positive breast cancer: a randomized controlled trial. *J Clin Oncol*. 2010;28:634–640.
116. de Valois BA, Young TE, Robinson N, et al. Using traditional acupuncture for breast cancer-related hot flashes and night sweats. *J Altern Complement Med*. 2010;16:1047–1057.
117. Hervik J, Mjåland O. Acupuncture for the treatment of hot flashes in breast cancer patients: a randomized controlled trial. *Breast Cancer Res Treat*. 2009;116:311–316.
118. Obi N, Chang-Claude J, Berger J, et al. The use of herbal preparations to alleviate climacteric disorders and risk of postmenopausal breast cancer in a German case-control study. *Cancer Epidemiol Biomarkers Prev*. 2009;18:2207–2213.
119. Ruhlen RL, Haubner J, Tracy JK, et al. Black cohosh does not exert an estrogenic effect on the breast. *Nutr Cancer*. 2007;59:269–277.
120. Waltman NL, Twiss JJ, Ott CD, et al. The effect of weight training on bone mineral density and bone turnover in postmenopausal breast cancer survivors with bone loss: a 24-month randomized controlled trial. *Osteoporosis Int*. 2010;21:1361–1369.
121. Lee MS, Choi TY, Park JE, et al. Moxibustion for cancer care: a systematic review and meta-analysis. *BMC Cancer*. 2010;10:130.
122. NIH Consensus Statement on Acupuncture. <http://consensus.nih.gov/1997/1997Acupuncture107html.htmInt>; 1997.
123. Roscoe JA, Jean-Pierre P, Morrow GR, et al. Exploratory analysis of the usefulness of acupressure bands when severe chemotherapy-related nausea is expected. *J Soc Integr Oncol*. 2006;4:16–20.
124. Lee J, Dodd MJ, Dibble SL, et al. Nausea at the end of adjuvant cancer treatment in relation to exercise during treatment in patients with breast cancer. *Oncol Nurs Forum*. 2008;9:830–835.
125. Ernst E, Pittler EE. Efficacy of ginger for nausea and vomiting: a systematic review of randomized clinical trials. *Br J Anaesth*. 2000;84:367–371.
126. Matousek RH, Dobkin PL. Weathering storms: a cohort study of how participation in a mindfulness-based stress reduction program benefits women after breast cancer treatment. *Curr Oncol*. 2010;17:62–70.
127. Foley E, Baillie A, Price M, et al. Mindfulness-based cognitive therapy for individuals whose lives have been affected by cancer: a randomized controlled trial. *J Consult Clin Psychol*. 2010;78:72–79.
128. Kieviet-Stijnen A, Visser A, Garssen B, Hudig W. Mindfulness-based stress reduction training for oncology patients: patients' appraisal and changes in well-being. *Patient Educ Couns*. 2008;72:435–442.
129. Freeman L, Cohen L, Stewart M, et al. Imagery intervention for recovering breast cancer patients: clinical trial of safety and efficacy. *J Soc Integr Oncol*. 2008;6:67–75.
130. Svensk A, Oster I, Thyme E, et al. Art therapy improves experienced quality of life among women undergoing treatment for breast cancer: a randomized controlled study. *Eur J Cancer Care (Engl)*. 2009;18:69–77.
131. Rao MR, Raghuram N, Nagendra HR, et al. Anxiolytic effects of a yoga program in early breast cancer patients undergoing conventional treatment: a randomized controlled trial. *Complement Ther Med*. 2009;17:1–8.
132. Danhauer SC, Tooze JA, Farmer DE, et al. Restorative yoga for women with ovarian or breast cancer: findings from a pilot study. *J Soc Integr Oncol*. 2008;6:47–58.
133. Stringer J, Swindell R, Dennis M. Massage in patients undergoing intensive chemotherapy reduces serum cortisol and protein. *Psychooncology*. 2008;17:1024–1031.
134. Spiegel D, Bloom JR, Kraemer HC, Gotthel E. Effect of psychosocial treatment on survival of patients with metastatic breast cancer. *Lancet*. 1989;2:888–891.
135. Edmonds CV, Lockwood GA, Cunningham AJ. Psychological response to long-term group therapy: a randomized trial with metastatic breast cancer patients. *Psychooncology*. 1999;8:74–91.
136. Edelman S, Bell DR, Kidman AD. A group cognitive behaviour therapy programme with metastatic breast cancer patients. *Psychooncology*. 1999;8:295–305.
137. Goodwin PJ, Leszcz M, Ennis M, et al. The effect of group psychosocial support on survival in metastatic breast cancer. *N Engl J Med*. 2001;345:1719–1726.
138. Classen C, Butler LD, Koopman C, et al. Supportive-expressive group therapy and distress in patients with metastatic breast cancer: a randomized clinical intervention trial. *Arch Gen Psychiatry*. 2001;58:494–501.
139. Zimmermann T, Heinrichs N, Baucom DH. Does one size fit all? Moderators in psychosocial interventions for breast cancer patients: a meta-analysis. *Ann Behav Med*. 2007;34:225–239.
140. Devine EC, Westlake SK. The effects of psychoeducational care provided to adults with cancer: meta-analysis of 116 studies. *Oncol Nurs Forum*. 1995;22:1369–1381.
141. Carlson LE, Speca M, Patel KD, Goodey E. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulphate (DHEAS) and melatonin in breast and prostate cancer outpatients. *Psychoneuroendocrinology*. 2004;29:448–474.
142. Espie CA, Fleming L, Cassidy J, et al. Randomized controlled clinical effectiveness trial of cognitive behavior therapy compared with treatment as usual for persistent insomnia in patients with cancer. *J Clin Oncol*. 2008;26:4651–4658.
143. Otte JL, Carpenter JS, Russell KM, et al. Prevalence, severity, and correlates of sleep-wake disturbances in long-term breast cancer survivors. *J Pain Symptom Manage*. 2010;39:535–547.
144. Berger AM, Farr L. The influence of daytime inactivity and nighttime restlessness on cancer-related fatigue. *Oncol Nurs Forum*. 1999;26:1663–1671.
145. Gartner R, Jensen MB, Nielsen J, et al. Prevalence of and factors associated with persistent pain following breast cancer surgery. *JAMA*. 2009;302:1985–1992.
146. McNeely ML, Campbell K, Ospina M, et al. Exercise interventions for upper limb dysfunction due to breast cancer treatment. *Cochrane Database Syst Rev*. 2010;(6): CD005211.
147. Schmitz KH, Ahmed RL, Troxel A, et al. Weight lifting in women with breast-cancer-related lymphedema. *N Engl J Med*. 2009;361:664–673.
148. Hwang JH, Chang HJ, Shim YH, et al. Effects of supervised exercise therapy in patients receiving radiotherapy for breast cancer. *Yonsei Med J*. 2008;49:443–450.
149. Crew KD, Capodice JL, Greenlee H, et al. Randomized, blinded, sham-controlled trial of acupuncture for the management of aromatase inhibitor-associated joint symptoms in women with early-stage breast cancer. *J Clin Oncol*. 2010;28:1154–1160.
150. Alem M, Gurgel MSC. Acupuncture in the rehabilitation of women after breast cancer surgery—a case series. *Acupunct Med*. 2008;26:86–93.
151. Kassab S, Cummings M, Berkovitz S, et al. Homeopathic medicines for adverse effects of cancer treatments. *Cochrane Database Syst Rev*. 2009;(2): CD004845.





# 76

## Lung Cancer

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Lung cancer is the second most common type of cancer in the United States and the leading cause of cancer death in both men (accounting for 29% of deaths due to cancer) and women (accounting for 26%). The annual percentage change based on incidence of new cases in men decreased by 1.8% between 1991 and 2006. For women, the annual percentage change based on incidence increased by 0.4% between 1991 and 2006. Mortality began leveling off in 1995 after increasing for several decades. Deaths from lung cancer decreased in men but remained stable in women from 2003 to 2006. The lifetime probability for development of lung cancer is 1 in 13 in men and 1 in 16 in women. The 5-year survival rate is poor (16%), often owing to the late diagnosis.<sup>1</sup>

### Pathophysiology

There are two major types of lung cancer: small cell lung cancer (SCLC), which accounts for 10% to 15%; and non-small cell lung cancer (NSCLC), which encompasses squamous cell carcinoma, large cell carcinoma, and adenocarcinoma (the most common form). Lung cancer that has features of both types is identified as mixed small cell/large cell cancer.

### Tobacco Use

It is well documented that cigarette smokers have a higher risk of morbidity from cardiovascular disease, pulmonary disease, and various cancers. Approximately 85% to 90% of lung cancers are believed to be due to tobacco smoking. Squamous cell carcinoma and small cell carcinoma are most commonly associated with smoking. Actually, it is uncommon for someone who has never smoked to have SCLC. The risk for lung cancer increases with earlier age of smoking, number of cigarettes, number of years smoked, extent of inhalation, and higher tar content of cigarettes. Smoking of low-tar cigarettes, pipes, or cigars does not reduce the risk of acquiring lung cancer. The risk declines gradually after a person quits smoking, reaching the risk level of nonsmokers after 20 to 25 years.

Passive smoking has been the subject of intense discussion as an additional cause of lung cancer. In 2000, the National Institutes of Health declared passive smoking a known human carcinogen.<sup>2</sup> Passive smoking is responsible for approximately 3000 lung cancer deaths each year in non-smoking adults.

Exposure to the gas phase and the aqueous tar extracts of tobacco induces mitochondrial DNA damage and lowers levels of plasma antioxidants. Because mitochondria play a central role in apoptosis, tobacco-induced mitochondrial DNA damage would cause cells to forgo apoptosis.

### Other Environmental Carcinogens

Other environmental carcinogens are capable of generating reactive oxygen species, which in turn can lead to DNA damage. Asbestos, arsenic, chromium, nickel, tar, mineral oils, mustard gas, radon, silica, diesel exhaust, ionizing radiation, and bis(chloromethyl)ether have been implicated in lung cancer.

### Screening

#### *Chest Radiography*

The sensitivity of chest radiography for lung cancer detection depends on the location and size of the lesion and the skill of the interpreting physician. Use of chest radiography has a limited potential in screening for lung cancer, particularly in comparison with newer technologies with higher resolution. A review concluded that the evidence does not support the use of chest radiography (with or without sputum cytology) as a screening test for lung cancer.<sup>3</sup>

#### *Spiral (Helical) Computed Tomography*

Spiral (helical) computed tomography (CT) is a low-radiation dose radiologic modality in which multiple thin-slice (5-mm) images are obtained and then assembled into a three-dimensional model of the anatomic structures examined. Evidence obtained from an ongoing clinical trial, the

Early Lung Cancer Action Project (ELCAP), suggests that the cure rate of screen-diagnosed lung cancer, using the trial's regimen of CT screening, may exceed 70%, compared with 10% for usual care and 20% for chest radiography.<sup>4</sup> Current observational and prevalence studies on the role of spiral CT screening have failed to establish whether it has an impact on improved disease-free survival, despite consistently higher early detection rates of lung cancer.<sup>5</sup>

The National Cancer Institute reported that annual CT scans of current and former smokers may detect early cancers and reduce the risk of death by 20%. The U.S. Preventive Services Task Force makes no recommendations for the use of CT in an asymptomatic person.<sup>6</sup>

### Sputum Cytology

Sputum cytology was evaluated in a large multicenter lung cancer screening trial, but this modality did not positively predict lung cancer development. Results of the National Cancer Institute cooperative trials showed no added benefit over chest radiography.<sup>7</sup>

### Positron Emission Tomography

Positron emission tomography is increasingly being used for cancer staging. The absence of glucose uptake is a reliable criterion to exclude malignant change; however, false-positive findings can occur in inflammatory conditions (e.g., pneumonia, granulomatous diseases).

### Laser Bronchoscopy

In laser technology, light of a special wavelength can be used to stimulate different intracellular components (fluorophores, which include flavins, riboflavins, nucleic acids, and proteins) to emit a spectral pattern specific to the particular tissue. By use of this principle, laser bronchoscopy can differentiate dysplastic from neoplastic tissue, which contains altered levels of fluorophores. The usefulness of this technique for lung cancer screening remains uncertain.<sup>8</sup>

### Genetic and Other Biomarkers

Mutations of the *p53* gene have been found in approximately 50% of persons with NSCLC and in bronchial dysplasia. However, use of *p53* mutation as a biomarker is limited by technical difficulty and variability of its detection.

Another biomarker being investigated as a screening tool is the *K-ras* gene. However, owing to the gene's low prevalence in NSCLC (30% of the cases), *K-ras* gene assay is not an effective screening method.

In up to 80% of smokers, evidence of loss of heterozygosity (loss of one chromosomal allele) or genomic instability (loss or gain of genetic material within a chromosomal region) in bronchial tissue can be demonstrated. Use of these markers as intermediate end points in lung cancer prevention studies is under investigation.

Another potentially useful biomarker is the retinoic acid receptor-beta, levels of which are reduced in bronchial metaplasia, dysplasia, and NSCLC.

A rise in the level of the epidermal growth factor receptor (EGFR) has been noted in bronchial metaplasia, and proliferating cell nuclear antigen (PCNA) levels are increased in dividing cells and in NSCLC. Both EGFR and PCNA assays may therefore prove useful in lung cancer screening.

## Integrative Therapy

In addition to the measures discussed here, [Table 76-1](#) lists resources that clinicians may find valuable in treatment of patients with lung cancer.

### Lifestyle

#### Smoking Cessation

There is abundant evidence that smoking cessation is the single most important factor in reducing the incidence of lung cancer. Patients should be counseled to abstain from smoking. Various products and programs, such as acupuncture, hypnosis, bupropion (Zyban), and nicotine analogues (gum, patch), are available to assist in smoking cessation, and the costs of these interventions are covered by some insurance providers (see [Table 76-1](#)).

Smoking cessation is the single most important factor in lung cancer prevention.

**TABLE 76-1. Resources for Treatment of Patients With Lung Cancer**

Cancer Trials A great resource for up-to-date information on ongoing trials and preliminary results of ongoing studies	Web site: <a href="http://cancertrials.nci.nih.gov">http://cancertrials.nci.nih.gov</a> Telephone: 1-800-4-CANCER
National Center for Complementary and Alternative Medicine (NCCAM) An excellent resource for different complementary and alternative medicine information, research centers, and database; also a connection to other relevant agencies in the National Institutes of Health	Web site: <a href="http://nccam.nih.gov">http://nccam.nih.gov</a>
American Cancer Society A rich source of information on prevention and treatment options for professionals and consumers; a great site for national and local resources and for general information on some dietary supplements	Web site: <a href="http://www.cancer.org/">http://www.cancer.org/</a> Telephone: 1-800-227-2345
Helpful Smoking Cessation Resources Centers for Disease Control and Prevention: "How to Quit" for support in quitting, including coaching, a free quit plan, educational materials, and referrals to local resources	Web site: <a href="http://www.cdc.gov/tobacco/quit_smoking/">http://www.cdc.gov/tobacco/quit_smoking/</a> Telephone: 1-800-QUIT-NOW (1-800-784-8669)
Quit Smoking Today!	Web site: <a href="http://www.smokefree.gov/">http://www.smokefree.gov/</a>
Office of the Surgeon General	Web site: <a href="http://www.surgeongeneral.gov/tobacco/">http://www.surgeongeneral.gov/tobacco/</a>

### Exercise

The evidence, albeit limited, suggests that exercise may limit the development of lung cancer. The exact mechanism for this action remains unclear.

### Nutrition

Major limitations of the assessment of nutritional approaches to the prevention of lung cancer are the low accuracy of dietary questionnaires and the poor specificity of instruments used to collect the information. Case-control studies of subjects with lung cancer found that high sugar and saturated fat intake increased the risk of lung cancer.<sup>9,10</sup> The joint effect of pack-years, total fat intake, and sucrose intake was associated with an increased risk of 28.3 (95% confidence interval [CI], 13.4-59.7) of the three variables. A large case-cohort study conducted during 13.3 years in The Netherlands found an inverse association between acrylamide intake (fried French fries, potato crisps) and lung cancer (adenocarcinoma) in women, but no association was found in men.<sup>11</sup>

Acrylamide is a potential carcinogen that is produced when starchy foods (French fries, potato chips) are heated with frying or baking, but not boiling. Cigarette smoking and coffee are significant sources of acrylamide.

Other evidence points to a potential beneficial effect of some nutrients. Consumption of green leafy vegetables and carrots has been strongly correlated with a reduction in the risk of lung cancer. The protective effect persisted after tobacco use was removed as a possible confounder of results. Consumption of cruciferous vegetables (broccoli, Brussels sprouts, cauliflower, mustard greens, turnips, and rutabagas) has been suggested to have a protective effect against cancer of the aerodigestive tract owing to their high content of glucosinolates. Prospective cohort studies and case-control studies have yielded mixed results. However, consumption of *Brassica* vegetables, particularly cabbage, appears to have an inverse association with cancer risk. A large European study found that consumption of a variety of vegetables is inversely associated with lung cancer risk among current smokers.<sup>12</sup> Risk of squamous cell carcinomas was reduced with increasing variety in fruit and vegetable consumption.

Other types of food—meat, fish, eggs, and legumes—have not been shown to have a protective effect. A cohort study conducted in The Netherlands found no relation between the consumption of onions, leeks, or garlic and a reduction in risk of lung cancer.<sup>13</sup> An observational study on the consumption of black tea did not show a protective effect against lung cancer.<sup>13,14</sup>

## Botanicals

### Green Tea

Animal studies point to a possible protective effect of the polyphenolic fraction and water extract of green tea. Green tea has been shown to inhibit the formation of DNA strand and lipid peroxidation in cultured human lung cells,<sup>15</sup> and its consumption with meals may inhibit the formation of

nitrosamines. In animal studies, green tea reduced lung oncogene expression by induction of phase II enzymes, inhibition of tumor necrosis factor- $\alpha$  expression and release, inhibition of cell proliferation, and induction of apoptosis,<sup>16,17</sup> and it was very effective in inhibiting lung carcinogenesis induced by asbestos and benzo[*a*]pyrene.<sup>18,19</sup> Results of human studies on the role of green tea in lung cancer prevention remain limited and inconclusive.<sup>20</sup> Few studies indicate a small beneficial association, particularly among never-smokers.<sup>21</sup> Better-designed studies are needed to evaluate the effect of green tea for cancer prevention. Although green tea is considered safe, precautions should be taken to limit its intake in pregnant and lactating women because of its significant caffeine content. Decaffeinated forms are available.

### Ginseng

Results of animal studies of ginseng in cancer suggest variable outcomes based on the type and age of ginseng used. The majority of studies have indicated a tendency for Panax ginseng to decrease the incidence of lung cancer. In laboratory studies, an acidic polysaccharide, ginsan, was found to be safe and effective in lowering the incidence of lung cancer<sup>22</sup>; a purified ginseng saponin also resulted in G<sub>1</sub> phase arrest with progression to apoptosis<sup>23</sup>; and the oral administration of lipid-soluble red ginseng extract to mice bearing lung cancer cells showed a potent anticancer activity.<sup>24</sup> Human studies showed a dose-response inhibitory effect. Smokers who used ginseng had a lower odds ratio (OR) for development of lung cancer than nonusers did; these results were substantiated by a cohort study (relative risk [RR], 0.3; 95% CI, 0.1-0.7). The available evidence points to a significant preventive effect against cancer for Panax ginseng.<sup>25,26</sup>

### Chinese Herbs

Studies of Chinese herbs have focused mainly on their use in the treatment of persons with cancer. In laboratory studies, herbal extracts used routinely in Chinese medicine inhibited the growth of several tumor cells. The possible role of Chinese herbs in the prevention of lung cancer remains to be investigated. A review of clinical and experimental evidence of commonly used compounded Chinese medicines in the treatment of lung cancer was conducted by Tian et al.<sup>27</sup>

### Maitake Mushroom

Maitake mushroom has been used in tonics, soups, teas, and herbal formulas by Asian therapists to promote health. Laboratory studies indicate that it has an immune-enhancing effect and inhibits the spread of different tumors.<sup>28,29</sup> These findings remain to be verified by human studies.

### Kombucha Tea

Kombucha tea is promoted to enhance and boost the immune system and to fight cancer in the early stages. There is no scientific evidence to support its use. A 2003 systematic review concluded that the undetermined benefits do not outweigh the documented risks.<sup>30</sup> The U.S. Food and Drug Administration has issued a warning to consumers to exercise caution with use of this botanical after two reports of Kombucha-related acidosis.<sup>31</sup>

## Supplements

Cancer risk is associated with elevated oxidative stress, accounting for interest in the use of antioxidants such as vitamin C and vitamin E in lowering the risk of lung cancer.

Findings from the VITamins And Lifestyle (VITAL) study (N = 77,125) suggest that some herbals and supplements may be associated with lower risk of lung cancer.<sup>32</sup> A significantly lower risk of lung cancer was associated with use during the previous 10 years of glucosamine (OR, 0.74; 95% CI, 0.58-0.94) and chondroitin (OR, 0.72; 95% CI, 0.54-0.96). These associations persisted after adjustment for other risk factors. No other herbal or specialty supplement was associated with decreased risk of lung cancer.

### Selenium

Selenium is not an antioxidant; however, it is essential for the production of two enzymes that affect the antioxidant network. It is not produced in the body and must be obtained through food. The amount of selenium in foods varies according to the soil in which the food is grown. Foods rich in selenium are garlic, onions, broccoli, egg yolks, and wheat germ.

The exact mechanism by which selenium may prevent cancer is unclear. Proposed mechanisms are through apoptosis, antiandrogen activity, growth inhibitory effects by producing superoxide that activates p53 antioxidant function, and DNA damage.

Several cohort studies have evaluated the effect of selenium serum level on the development of lung cancer.<sup>33,34</sup> Results are controversial; a few studies show an inverse relationship, and others show a direct relationship with lung cancer. Three randomized studies looked at the effect of selenium supplementation on lung cancer prevention.<sup>35-37</sup> A 2004 meta-analysis found some protective effect against lung cancer (RR, 0.74; 95% CI, 0.57-0.97), mainly in populations in which the average selenium level is low.<sup>38</sup> A 10-year phase III clinical trial conducted at the University of Texas M.D. Anderson Cancer Center found that selenium offered no protection against recurrence or onset of a new cancer or second primary cancer. The study was halted because those taking a placebo appeared to be living longer.

### Vitamin A, Beta-Carotene, and Retinoids

The term *vitamin A* is popularly used to indicate two different families of dietary factors: retinyl esters, retinol, and retinal (preformed vitamin A); and beta-carotene and other carotenoids (pro-vitamin A) that serve as precursors to vitamin A.<sup>39</sup> The seven predominant carotenoids in human beings are beta-carotene, lycopene, lutein, alpha-carotene, alpha-cryptoxanthin, beta-cryptoxanthin, and zeaxanthin. Different carotenoids are concentrated in different organs. The circulating level of beta-carotene is influenced by retinol intake, or retinol suppresses its conversion to vitamin A.

Several theories have been advanced to explain the role of vitamin A in fighting cancer. Specifically, vitamin A activity may

- have antioxidant properties in conditions of low oxygen tension
- inhibit proliferation and induce differentiation of epithelial cells
- modulate cytochrome P-450

- inhibit arachidonic acid metabolism
- modulate immune function
- induce gap junction communication
- inhibit chromosome instability and damage
- influence apoptosis.<sup>40</sup>

Several studies evaluated the effect of beta-carotene on lung cancer. Diet, serum level, and supplement use were examined. Interest in vitamin A and beta-carotene for the prevention of lung cancer is based on initial animal and epidemiologic data, which suggested a protective effect in lung cancer.<sup>41</sup> Even in early-stage cancer, questions are raised about whether smoking status, type of food, and food ingredient (other than carotenoids) may influence the outcome.

Some of the early epidemiologic studies tried to determine whether the effect of vitamin A or carotenoids differs between genders. Two studies found similar results in both men and women, whereas other studies found a protective effect in men and an adverse effect in women.<sup>42</sup>

Lung cancer risk was reduced in case-control studies<sup>33</sup> with consumption of large quantities of vegetable and fruits; however, this effect was found to be stronger for vegetable and fruit intake than for beta-carotene intake. Prospective and pooled analysis studies looking at the effect of dietary beta-carotene intake on decreasing the risk of lung cancer found a nonsignificant association for alpha-carotene, lutein/zeaxanthin, and lycopene.<sup>42-44</sup> In contrast, beta-cryptoxanthin intake has been found to be inversely associated with lung cancer risk (RR, 0.76; 95% CI, 0.67-0.86).<sup>45</sup> Thus, the inverse relationship found with vegetable and fruit intake was not maintained in beta-carotene studies except for beta-cryptoxanthin.

Plasma or serum beta-carotene levels were found to be lower in several studies exploring the prediagnostic level of beta-carotene in persons in whom lung cancer developed.<sup>46,47</sup> However, interpretation of these studies was based on one measurement taken several years before the onset of cancer.

Smokers (particularly those who smoke more than 20 cigarettes per day) should avoid vitamin A and beta-carotene supplements.

Studies looking at the association of other carotenoids found an inverse association of lung cancer with dietary intake of lutein and alpha-carotene. Prospective studies, however, failed to establish such an association for lutein, alpha-carotene, or lycopene.<sup>48</sup>

Several multicenter double-blind, controlled trials explored a possible role for beta-carotene supplements in the primary prevention of lung cancer. Two studies, the Alpha-Tocopherol and Beta-Carotene Cancer Prevention (ATBC) study and the Beta-Carotene and Retinol Efficacy Trial (CARET), indicated a higher incidence of lung cancer among the group receiving beta-carotene supplementation. Follow-up data from subjects previously enrolled in the active arm of the CARET indicate persistence of all-cause mortality (RR, 1.12; 95% CI, 0.99-1.17) 6 years after the intervention.<sup>49</sup> In contrast, the Physicians' Health Study (PHS) reported no

effect of beta-carotene supplementation on the incidence of lung cancer. The low number of smokers (11%) in the PHS study group may explain the discrepancy. The VITAL study found that longer duration of use of individual retinol was associated with significantly high risk of NSCLC and total lung cancer.<sup>50</sup> Long-term use of individual beta-carotene supplements was associated with elevated SCLC risk, and use of individual lutein supplements was associated with elevated NSCLC. In ATBC and CARET, a higher incidence of lung cancer was noted among smokers, whereas the VITAL study did note a difference between genders or smoking status. Above-average alcohol consumption was also noted to be a predisposing factor.

### Vitamin B

In 2001, a case-nested study found significantly lower risk of lung cancer among men who had higher serum vitamin B<sub>6</sub> levels.<sup>51</sup> Those with the highest vitamin B<sub>6</sub> concentration had about half the risk of lung cancer (OR, 0.51; 95% CI, 0.23-0.93). More recently, the European Prospective Investigation into Cancer and Nutrition (EPIC), which investigated the role of vitamin B in lung cancer, observed 519,978 subjects from 10 countries during 12 years.<sup>52</sup> Higher levels of vitamin B<sub>6</sub> (OR, 0.44; 95% CI, 0.33-0.60) and methionine (OR, 0.52; 95% CI, 0.30-0.69) were strongly associated with a reduced risk of lung cancer in people who never smoked, those who quit, and current smokers. Folate, combined with above-average levels of vitamin B<sub>6</sub> and methionine, was associated with a two-thirds reduction in lung cancer risk.

Vitamin B<sub>6</sub> in high concentrations in the blood has been associated with a lower risk of lung cancer. Foods rich in B<sub>6</sub> include cereal grains, legumes, vegetables, meat, fish, and eggs. B<sub>6</sub> has also been found to be beneficial in the prevention of colon cancer.

### Vitamin E

The association between dietary intake of alpha-tocopherol and lung cancer was explored in a few studies, with variable results. In the ATBC study, a protective effect for lung cancer was not demonstrated in a cohort of persons receiving alpha-tocopherol (dose, 50 mg/day). Most cohort studies of serum concentrations of alpha-tocopherol showed no association, except for one study, which showed an inverse relationship. Evidence from a pooled analysis<sup>53</sup> and prospective cohort study<sup>54</sup> confirmed that supplementation with vitamin E is not associated with decreased risk. In fact, the VITAL study reported that prolonged supplementation with high-dose vitamin E is associated with a small increased risk.

### Vitamin C

Several prospective studies examined the effect of dietary vitamin C on the risk of lung cancer. The effect of vitamin C and a mixture (vitamins C and E and alpha-lipoic acid) on lipid peroxidation biomarkers was not found to decrease the oxidative stress in passive smokers.<sup>55</sup> In another double-blind study, smokers were randomly allocated to receive antioxidants (500 mg of vitamin C and 400 units

of vitamin E per day) or placebo. No effect of antioxidants on benzo[*a*]pyrene-DNA adducts were seen in male smokers, but a 31% decrease was noted among female participants.<sup>56</sup> Overall, the results do not support a role of vitamin C, although additional studies are needed to evaluate its role.

### Vitamin D

In the past few years, interest in vitamin D and its anticancer activities increased significantly. Vitamin D receptor (VDR) gene polymorphisms are reported to influence the cancer risk by their antiproliferative, antiangiogenic, antimetastatic, and apoptotic effects. A small study reported that genetic variation at the VDR locus may influence lung cancer risk, and the association may be modified by age, gender, and smoking.<sup>57</sup> A prospective cohort study that observed 6937 subjects during 24 years found no association between vitamin D and lung cancer (RR, 0.72; 95% CI, 0.43-1.19).<sup>58</sup> However, women and young subjects, with higher levels of vitamin D, were observed to have a lower risk of lung cancer. Evidence is mounting that improved vitamin D status would have a protective effect against the development of cancer, although no agreement has been reached in regard to optimal dose or level. Unfortunately, the lack of high-quality scientific evidence and standardization in testing was reflected in a recent Institute of Medicine report, which concluded that “we could not find solid evidence that consuming more of either nutrient [i.e., vitamin D and calcium] would protect the public from chronic diseases ranging from cancer to diabetes to improved immune function.”<sup>59</sup>

### Melatonin

Melatonin is popular as an antidote to jet lag and as a sleep aid. It also has antioxidant properties and acts to stimulate the main antioxidant of the brain, glutathione peroxidase. In vitro studies have reported a possible anticancer role. The proposed mechanism is an antiestrogenic activity and augmentation of the anticancer effect of interleukin-2. Melatonin (in a dose of 10 mg/day) has been studied in patients with metastatic NSCLC; results included a higher 1-year survival rate and disease stabilization.<sup>60</sup> The melatonin/cortisol mean nocturnal level ratio was also found to decrease in cancer patients.<sup>61</sup> A reduction in risk of death and low adverse effects were reported by several randomized controlled trials of melatonin treatment in cancer patients. In a 5-year follow-up study, melatonin plus chemotherapy was seen to enhance the quality of life and to prolong survival.<sup>62</sup> The role of melatonin in the prevention of lung cancer is still to be determined.

### Pharmaceuticals

Etretinate, a synthetic retinoid, was found in a nonrandomized study to decrease bronchial metaplasia in smokers. However, a randomized study did not substantiate this benefit.<sup>63</sup>

### Therapies to Consider

Hypnosis and acupuncture can be helpful as adjuvant or stand-alone therapies in smoking cessation.

## PREVENTION PRESCRIPTION

- Patients should be assisted to stop smoking and to avoid smoke-filled areas.
- Appropriate precautions should be taken to prevent possible environmental exposure to known carcinogens and dusts.
- Consumption of *Brassica* vegetables, particularly cabbage, is recommended.
- A low-saturated fat and simple carbohydrate diet should be encouraged.
- Use of green tea (two or three cups a day; three cups = ~300 mg of polyphenols) and ginseng (*Panax ginseng*, 100 mg daily) in moderate doses may have a preventive effect.
- Intake of vitamin A and beta-carotene should be increased through dietary means by eating yellow, orange, and red fruits and vegetables.
- Use of folate (1 mg) combined with above-average levels of vitamin B<sub>6</sub> (50 mg) may be protective.



### THERAPEUTIC REVIEW

#### ■ Remove Exacerbating Factors

- Stop smoking and exposure to passive smoke or chemicals. Consider use of masks and other filters to minimize the exposure to harmful chemicals. A 1

#### ■ Nutrition

- Encourage the regular consumption of green leafy vegetables and *Brassica* vegetables. B 1
- Avoid foods rich in simple carbohydrates and saturated fats. B 1
- Avoid foods rich in acrylamide, including heated starches such as fried or baked potato products (French fries, potato chips) and coffee. B 1

#### ■ Supplements

- Advise smokers to avoid high and prolonged intake of beta-carotene and vitamin E supplements. A 1
- Folate (1 mg), combined with above-average levels of vitamin B<sub>6</sub> (50 mg), may have a protective effect. B 1

- Consider recommending a cryptoxanthin-rich smoothie consisting of the following: C 1

mango, peeled and cubed (can also use peaches, oranges, or watermelon)

1½ cups plain yogurt (beta-cryptoxanthin is a fat-soluble vitamin and is better absorbed if it is taken with fat)

¼ cup frozen tangerine juice concentrate (thawed)

2 tsp maple syrup

½ tsp vanilla extract

- Melatonin, 10 mg at bedtime, may benefit 1-year survival rates in those with metastatic NSCLC. B 2
- Supplement vitamin D to keep serum levels near 50 ng/dL (approximately 1000 units of vitamin D<sub>3</sub> will raise serum levels 8 to 10 points). C 2

#### ■ Botanicals

- *Panax ginseng* (100 to 200 mg/day) may decrease the incidence of lung cancer among smokers. B 2
- Glucosamine and chondroitin use may offer a protective effect. B 2

#### KEY WEB RESOURCES

<http://cancertrials.nci.nih.gov>

Up-to-date information on ongoing trials and cancer-related studies sponsored by the National Institutes of Health

<http://www.cancer.org/>

A rich source of information on prevention and treatment options for professionals and consumers  
A great site for national and local resources and for general information on some dietary supplements

[http://www.cdc.gov/tobacco/quit\\_smoking/](http://www.cdc.gov/tobacco/quit_smoking/);  
<http://www.smokefree.gov/>

Helpful Web sites for smoking cessation

<http://acor.org/>

Online community support and resources for patients with cancer

#### References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Jemal A, Clegg LX, Siegel R, et al. Cancer statistics 2010. *Cancer*. 2010;60:277–300.
- National Institutes of Health News Release. *Fact Sheet: The Report on Carcinogens*. <<http://www.nih.gov/news/pr/may2000/niehs-15.htm>>; Accessed 05/15/2000.
- Hunt I, Siva M, Southon R, Treasure T. Does lung cancer screening with chest X-ray improve disease-free survival? *Interact Cardiovasc Thorac Surg*. 2006;5:483–487.
- Henschke CI, Shaham D, Yankelevitz DF, Altorki NK. CT screening for lung cancer: past and ongoing studies. *Semin Thorac Cardiovasc Surg*. 2005;17:99–106.
- Hunt I, Siva M, Southon R, Treasure T. Does lung cancer screening with low-dose computerised tomography (LDCT) improve disease-free survival? *Interact Cardiovasc Thorac Surg*. 2006;5:612–661.
- Mulshine JL, Sullivan DC. Clinical practice: lung cancer screening. *N Engl J Med*. 2005;352:2714–2720.
- U.S. Preventive Services Task Force. *Guide to Clinical Prevention Services*. 2nd ed. Washington, DC: U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion; 1996.
- Haussinger K, Becker H, Stanzel F, et al. Autofluorescence bronchoscopy with white light bronchoscopy compared with white light bronchoscopy alone for the detection of precancerous lesions: a European randomised controlled multicentre trial. *Thorax*. 2005;60:496–503.
- De Stefani E, Fontham ET, Chen V, et al. Fatty foods and the risk of lung cancer: a case-control study from Uruguay. *Int J Cancer*. 1997;71:760–766.
- De Stefani E, Deneo-Pellegrini H, Mendilaharsu M, et al. Dietary sugar and lung cancer: a case-control study in Uruguay. *Nutr Cancer*. 1998;31:132–137.
- Hogervorst JG, Schouten LJ, Konings EJ, et al. Lung cancer risk in relation to dietary acrylamide intake. *J Natl Cancer Inst*. 2009;101:651–662.
- Büchner FL, Bueno-de-Mesquita HB, Ros MM, et al. Variety in fruit and vegetable consumption and the risk of lung cancer in the European prospective investigation into cancer and nutrition. *Cancer Epidemiol Biomarkers Prev*. 2010;19:2278–2286.
- Dorant E, van den Brandt PA, Goldbohm RA. A prospective cohort study on *Allium* vegetable consumption, garlic supplement use, and the risk of lung carcinoma in The Netherlands. *Cancer Res*. 1994;54:6148–6153.
- Goldbohm RA, Hertog MG, Brants HA, et al. Consumption of black tea and cancer risk: a prospective cohort study. *J Natl Cancer Inst*. 1996;88:93–100.
- Leanderson P, Faresjo AO, Tagesson C. Green tea polyphenols inhibit oxidant-induced DNA strand breakage in cultured lung cells. *Free Radic Biol Med*. 1997;23:235–242.
- Hu G, Han C, Chen J. Inhibition of oncogene expression by green tea and (–)-epigallocatechin gallate in mice. *Nutr Cancer*. 1995;24:203–209.
- Clark J, You M. Chemoprevention of lung cancer by tea. *Mol Nutr Food Res*. 2006;50:144–151.
- Luo SQ, Liu XZ, Wang CJ. Inhibitory effect of green tea extract on the carcinogenesis induced by asbestos plus benzo(a)pyrene in rat. *Biomed Environ Sci*. 1995;8:54–58.
- Chung FL, Schwartz J, Herzog CR, Yang YM. Tea and cancer prevention: studies in animals and humans. *J Nutr*. 2003;133:3268S–3274S.
- Boehm K, Borrelli F, Ernst E, et al. Green tea (*Camellia sinensis*) for the prevention of cancer. *Cochrane Database Syst Rev*. 2009;(3): CD005004.
- Arts IC. A review of the epidemiological evidence on tea, flavonoids, and lung cancer. *J Nutr*. 2008;138:1561S–1566S.
- Lee YS, Chung IS, Lee IR, et al. Activation of multiple effector pathways of immune system by the antineoplastic immunostimulator acidic polysaccharide ginsan isolated from Panax ginseng. *Anticancer Res*. 1997;17:323–331.
- Cheng CC, Yang SM, Huang CY, et al. Molecular mechanisms of ginsenoside Rh2-mediated G<sub>1</sub> growth arrest and apoptosis in human lung adenocarcinoma A549 cells. *Cancer Chemother Pharmacol*. 2005;55:531–540.
- Lee SD, Park SK, Lee ES, et al. A lipid-soluble red ginseng extract inhibits the growth of human lung tumor xenografts in nude mice. *J Med Food*. 2010;13:1–5.
- Shin HR, Kim JY, Yun TK, et al. The cancer-preventive potential of Panax ginseng: a review of human and experimental evidence. *Cancer Causes Control*. 2000;11:565–576.
- Yun TK, Choi SY, Yun HY. Epidemiological study on cancer prevention by ginseng: are all kinds of cancers preventable by ginseng? *J Korean Med Sci*. 2001;16(suppl):S19–S27.
- Tian G, Guo L, Gao W. Use of compound Chinese medicine in the treatment of lung cancer. *Curr Drug Discov Technol*. 2010;7:32–36.
- Nanba H, Kubo K. Effect of Maitake D-fraction on cancer prevention. *Ann N Y Acad Sci*. 1997;833:204–207.
- Kodama N, Komuta K, Nanba H. Can maitake MD-fraction aid cancer patients? *Altern Med Rev*. 2002;7:236–239.
- Ernst E. Kombucha: a systematic review of the clinical evidence. *Forsch Komplementarmed Klass Naturheilkd*. 2003;10:85–87.
- U.S. Food and Drug Administration. *FDA Talk Paper: FDA cautions consumers on “Kombucha mushroom tea”*. Rockville, MD: National Press Office; March 23, 1995. Talk Paper T95-15.
- Satia JA, Littman A, Slatore CG, et al. Associations of herbal and specialty supplements with lung and colorectal cancer risk in the VITamins and Lifestyle study. *Cancer Epidemiol Biomarkers Prev*. 2009;18:1419–1428.
- Knekt P, Jarvinen R, Seppanen R, et al. Dietary antioxidants and the risk of lung cancer. *Am J Epidemiol*. 1991;134:471–479.
- Koo LC. Diet and lung cancer 20+ years later: more questions than answers? *Int J Cancer*. 1997;(suppl 10):22–29.
- Yu SY, Mao BL, Xiao P, et al. Intervention trial with selenium for the prevention of lung cancer among tin miners in Yunnan, China: a pilot study. *Biol Trace Elem Res*. 1990;24:105–108.
- Blot WJ, Li JY, Taylor PR, et al. Nutrition intervention trials in Linxian, China: supplementation with specific vitamin/mineral combinations, cancer incidence, and disease-specific mortality in the general population. *J Natl Cancer Inst*. 1993;85:1483–1492.
- Clark LC, Combs GF Jr, Turnbull BW, et al. Effects of selenium supplementation for cancer prevention in patients with carcinoma of the skin: a randomized controlled trial. Nutritional Prevention of Cancer Study Group. *JAMA*. 1996;276:1957–1963.
- Zhuo H, Smith AH, Steinmaus C. Selenium and lung cancer: a quantitative analysis of heterogeneity in the current epidemiological literature. *Cancer Epidemiol Biomarkers Prev*. 2004;13:771–778.
- Omenn GS. Chemoprevention of lung cancer: the rise and demise of beta-carotene. *Annu Rev Public Health*. 1998;19:73–99.
- Pryor WA, Stahl W, Rock CL. Beta carotene: from biochemistry to clinical trials. *Nutr Rev*. 2000;58:39–53.
- Ziegler RG, Mason TJ, Stemhagen A, et al. Carotenoid intake, vegetables, and the risk of lung cancer among white men in New Jersey. *Am J Epidemiol*. 1986;123:1080–1093.
- Bandera EV, Freudenheim JL, Marshall JR, et al. Diet and alcohol consumption and lung cancer risk in the New York State Cohort (United States). *Cancer Causes Control*. 1997;8:828–840.
- Yong LC, Brown CC, Schatzkin A, et al. Intake of vitamins E, C, and A and risk of lung cancer. The NHANES I epidemiologic followup study. First National Health and Nutrition Examination Survey. *Am J Epidemiol*. 1997;146:231–243.
- Ocke MC, Bueno-de-Mesquita HB, Feskens EJ, et al. Repeated measurements of vegetables, fruits, beta-carotene, and vitamins C and E in relation to lung cancer. The Zutphen Study. *Am J Epidemiol*. 1997;145:358–365.
- Mannisto S, Smith-Warner SA, Spiegelman D, et al. Dietary carotenoids and risk of lung cancer in a pooled analysis of seven cohort studies. The Beta-Carotene and Retinol Efficacy Trial: incidence of lung cancer and cardiovascular disease mortality during 6-year follow-up after stopping beta-carotene and retinol supplements. *Cancer Epidemiol Biomarkers Prev*. 2004;13:40–48.
- Comstock GW, Alberg AJ, Huang HY, et al. The risk of developing lung cancer associated with antioxidants in the blood: ascorbic acid, carotenoids, alpha-tocopherol, selenium, and total peroxyl radical absorbing capacity. *Cancer Epidemiol Biomarkers Prev*. 1997;6:907–916.
- Stahelin HB, Gey KF, Eichholzer M, et al. Plasma antioxidant vitamins and subsequent cancer mortality in the 12-year follow-up of the prospective Basel Study. *Am J Epidemiol*. 1991;133:766–775.
- Steinmetz KA, Potter JD, Folsom AR. Vegetables, fruit, and lung cancer in the Iowa Women's Health Study. *Cancer Res*. 1993;53:536–543.
- Goodman GE, Thornquist MD, Balmes J, et al. The Beta-Carotene and Retinol Efficacy Trial: incidence of lung cancer and cardiovascular disease mortality during 6-year follow-up after stopping beta-carotene and retinol supplements. *J Natl Cancer Inst*. 2004;96:1743–1750.
- Satia JA, Littman A, Slatore CG, et al. Long-term use of beta-carotene, retinol, lycopene, and lutein supplements and lung cancer risk: results

- from the VITamins And Lifestyle (VITAL) study. *Am J Epidemiol*. 2009;169:815–828.
51. Hartman TJ, Woodson K, Stolzenberg-Solomon R, et al. Association of the B-vitamins pyridoxal 5'-phosphate (B<sub>6</sub>), B<sub>12</sub>, and folate with lung cancer risk in older men. *Am J Epidemiol*. 2001;153:688–694.
  52. Johansson M, Relton C, Ueland PM, et al. Serum B vitamin levels and risk of lung cancer. *JAMA*. 2010;303:2377–2385.
  53. Cho E, Hunter DJ, Spiegelman D, et al. Intakes of vitamins A, C and E and folate and multivitamins and lung cancer: a pooled analysis of 8 prospective studies. *Int J Cancer*. 2006;118:970–978.
  54. Slatore CG, Littman AJ, Au DH, et al. Long-term use of supplemental multivitamins, vitamin C, vitamin E, and folate does not reduce the risk of lung cancer. *Am J Respir Crit Care Med*. 2008;177:524–530.
  55. Dietrich M, Block G, Benowitz NL, et al. Vitamin C supplementation decreases oxidative stress biomarker f2-isoprostanes in plasma of nonsmokers exposed to environmental tobacco smoke. *Nutr Cancer*. 2003;45:176–184.
  56. Mooney LA, Madsen AM, Tang D, et al. Antioxidant vitamin supplementation reduces benzo(a)pyrene-DNA adducts and potential cancer risk in female smokers. *Cancer Epidemiol Biomarkers Prev*. 2005;14:237–242.
  57. Dogan I, Onen HI, Yurdakul AS, et al. Polymorphisms in the vitamin D receptor gene and risk of lung cancer. *Med Sci Monit*. 2009;15:BR232–BR242.
  58. Kilkkinen A, Knekt P, Heliövaara M, et al. Vitamin D status and the risk of lung cancer: a cohort study in Finland. *Cancer Epidemiol Biomarkers Prev*. 2008;17:3274–3278.
  59. Institute of Medicine. *Dietary Reference Intakes for Calcium and Vitamin D*. Washington, DC: The National Academies Press; 2010.
  60. Lissoni P, Tisi E, Barni S, et al. Biological and clinical results of a neuroimmunotherapy with interleukin-2 and the pineal hormone melatonin as a first line treatment in advanced non-small cell lung cancer. *Br J Cancer*. 1992;66:155–158.
  61. Mazzoccoli G, Vendemiale G, De Cata A, et al. Altered time structure of neuro-endocrine-immune system function in lung cancer patients. *BMC Cancer*. 2010;10:314.
  62. Lissoni P, Chieffelli M, Villa S, et al. Five years survival in metastatic non-small cell lung cancer patients treated with chemotherapy alone or chemotherapy and melatonin: a randomized trial. *J Pineal Res*. 2003;35:12–15.
  63. Arnold AM, Brouman GP, Levine MN, et al. The effect of the synthetic retinoid etretinate on sputum cytology: results of a randomized trial. *Br J Cancer*. 1992;65:737–743.





# 77

## Prostate Cancer

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### Etiology

Prostate cancer is the leading cause of cancer and the second leading cause of cancer-related death in men in the United States.<sup>1</sup> Nevertheless, only 3% of men ultimately die as a result of prostate cancer, even though the majority of men will harbor prostate cancer cells (usually undetected) if they live long enough. Among other things, this dichotomy reflects the marked variability in prostate cancer growth rates.

Tumor doubling times can vary from every 2 weeks to 5 years or longer. Faster growing tumors, especially those with dividing times of less than 12 months, are more likely to cause signs and symptoms and premature death if they are left untreated.

At the other end of the spectrum, slower growing tumors, particularly in men older than 65 years, usually remain indolent and are rarely life-threatening. Unfortunately, it is not possible to predict exactly when a prostate cancer becomes life-threatening. Nevertheless, it is possible to modify prostate cancer's behavior.

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### Prevention

A substantial body of in vitro laboratory and animal data and evolving epidemiologic and human in vivo data suggest that complementary therapies such as dietary and lifestyle interventions, botanical and nutritional supplements, and selected vitamins can complement conventional therapies to modulate the initiation, promotion, and progression of prostate cancer, to improve quality of life, and to prolong survival.<sup>2-8</sup> Encouraged by these findings, researchers are actively pursuing primary and secondary prevention strategies for prostate cancer.<sup>9</sup>

#### Primary Prevention

The goal of primary prevention is to prevent persons without evidence of clinical prostate cancer from development of invasive, life-threatening disease.<sup>10</sup> Carcinogenesis is a

complex multistep process that is characterized by genetic and epigenetic alterations that disrupt immune function and regulation of cellular proliferation, apoptosis, and differentiation. The transformation from a normal to a malignant prostate cell can span decades. Therefore, it may be possible to prevent or even to reverse the neoplastic process, even in patients with a genetic risk for prostate cancer.<sup>11</sup> According to the results of a seminal study that examined cancer incidence among a cohort of 44,788 twins from Sweden, Denmark, and Finland, environmental influences were more important than genetic predisposition as a determinant of prostate cancer risk.<sup>12</sup>

#### Secondary Prevention

The goals of secondary prevention are to detect and treat men with prostate cancer at a curable stage and to prevent the spread or recurrence of disease. Researchers have identified certain risk factors for the development of prostate cancer, most notably age, family history of prostate cancer, and ethnicity.<sup>12,13</sup>

According to autopsy data, a small percentage of teenagers harbor latent prostate cancer cells, and the incidence of occult prostate cancer in men rises with each decade.<sup>14,15</sup> Among ethnic groups, African American men have one of the highest incidences of prostate cancer. They are 1.6 times more likely than white men and 2.8 times more likely than Asian/Pacific Islander men to develop prostate cancer.<sup>16</sup> A family history of prostate cancer is also relevant. The risk for development of prostate cancer increases 2.2-fold if a single relative is affected and 3.9-fold or greater if two or more relatives have a history of prostate cancer, especially if they are first-degree relatives or diagnosed with prostate cancer before the age of 55 years.<sup>17</sup>

Although data are inconclusive and contradictory, other risk factors for development of prostate cancer include obesity, smoking, high-fat diet, and occupational exposure (Box 77-1).<sup>13</sup> Obesity also significantly increases the risk for fatal prostate cancer and recurrent prostate cancer after radical prostatectomy.<sup>18</sup>

**BOX 77-1. Risk Factors for Prostate Cancer**

- Age
- Family history
- African American race
- Obesity
- Smoking
- High-fat diet
- Occupational exposure (e.g., farming, lawn care, exterminator)
- Initial PSA level > 2 ng/mL, abnormal percentage free PSA, elevated PSA velocity

Men who have been treated with curative intent for localized prostate cancer deserve special attention. According to various reports, between 15% and 40% of these men will ultimately have recurrent disease that is heralded by a steadily increasing prostate-specific antigen (PSA) level.<sup>19,20</sup>

Early recurrence of prostate cancer is usually a manifestation of preexisting occult metastatic disease. Researchers postulate that the same situation may account for delayed prostate cancer recurrence. The results of two research studies using refined histologic techniques to evaluate pelvic lymph node tissue and specialized antibody testing of bone marrow aspirates suggest that the majority of men with clinically localized prostate cancer harbor disseminated prostate cancer cells in their bone marrow and up to 30% of men with presumed localized disease have micrometastatic prostate cancer cells in their pelvic nodes.<sup>21–23</sup> Even so, the presence of micrometastatic disease does not necessarily equate with biochemical recurrence or overt metastatic disease. Only a tiny subset of cells are capable of surviving over time, and even a smaller percentage of cells are capable of producing a metastatic tumor.<sup>24</sup> Moreover, alterations in the microenvironment can prevent metastatic tumor cells from successfully colonizing elsewhere in the body.<sup>25</sup> Therefore, secondary prevention therapies should be considered for every man diagnosed with prostate cancer.

## Prostate Cancer Screening

Prostate cancer screening (PCS) is an important component of secondary prostate cancer prevention. PCS consists of a yearly digital rectal examination, PSA blood test (controversial), and validated questionnaire of urinary symptoms. The American Cancer Society (ACS) and the American Urological Association (AUA) currently recommend PCS for informed men who wish to be tested and who have a life expectancy of at least 10 years.

The ACS recommends starting at the age of 50 years for the general male population, 45 years for men with increased risk factors, and 40 years for men with a risk for hereditary prostate cancer (several first-degree relatives diagnosed before the age of 65 years). In the 2009 ACS guidelines, there are some notable differences from earlier recommendations: digital rectal examination is optional; men with a PSA level of more than 2.5 ng/mL should be screened annually; men with a PSA level of less than 2.5 ng/mL can be screened every 2 years; and an individualized risk assessment should be part of the referral decision for patients with a PSA level between 2.5 and 4.0 ng/mL.<sup>26</sup>

The 2009 AUA guidelines for PCS also contain several new recommendations from earlier guidelines: a baseline PSA level should be obtained at the age of 40 years, and there is no single, threshold PSA value that should prompt a prostate biopsy—other factors that influence risk for prostate cancer should be considered.<sup>27</sup>

Although PCS can detect prostate cancer at an early stage, professional medical organizations are divided on the value of routine PCS. Opponents claim that routine PCS often detects insignificant cancers, fails to have an impact on overall survival, and may adversely affect quality of life. Instead of routine PCS, opponents recommend informed decision-making for the individual patient.

In contrast, proponents of routine PCS claim that the majority of PSA-detected prostate cancers are clinically significant, that is, life-threatening if left untreated, and evolving data suggest that routine screening improves disease-specific survival.<sup>27</sup>

Two large randomized controlled trials were conducted to determine whether evidence-based data support PCS. The trials reached different conclusions. At 7 years or 10 years, the Prostate, Lung, Colorectal, and Ovarian (PLCO) cancer screening trial failed to show a reduction in prostate cancer-related mortality in men who underwent PCS compared with the control arm.<sup>28</sup> Conversely, the European Randomized Study for Prostate Cancer (ERSPC) showed 20% fewer deaths in the screening arm than in the control arm after a mean of 8.8 years.<sup>29</sup> To prevent one prostate cancer death, though, 1410 men (or 1068 men who were actually participated in PCS) would have to be screened (NNS), and an additional 48 men would have to be treated (NNT). A further decrease in prostate cancer–specific mortality was seen for men who had been in the trial for 12 years (36% lower mortality; NNS = 500). In addition, the incidence of T3 and T4 tumors was 22% lower and the incidence of M1 lesions was 41% lower in the screening arm of the ERSPC trial than in the control arm. Fundamental differences between the two studies may account for the divergent conclusions.

The ERSPC trial studied 162,000 men from seven European countries, whereas the PLCO trial studied 76,693 men from a single country. The majority of men (85%) with indications for biopsy in the ERSPC trial accepted a prostate biopsy. In contrast, only 30% of men in the screening arm in the PLCO study with an abnormal PSA level had a prostate biopsy. Moreover, in the PLCO trial, 52% of the men in the control arm had PSA screening during the study, which may explain why the incidence of and death rate from prostate cancer were not significantly different between the screening and control arms.

Other data from the United States are consistent with the findings of the ERSPC trial. Age-adjusted data from the prostate cancer Surveillance, Epidemiology, and End Results (SEER data) show that the incidence of metastatic disease has dropped more than threefold since the advent of PCS in 1990. Furthermore, data from the ACS show that the death rate from prostate cancer has dropped by almost 50% during the past two decades.

Certain other caveats must also be considered. Normal PSA values may vary with prostate volume, age, and race (Table 77-1), and refinements of PSA testing, such as percentage free PSA and PSA velocity, can help identify men with the greatest risk of harboring prostate cancer.<sup>27</sup>

**TABLE 77-1.** “Normal” PSA (ng/mL) Thresholds Based on Age and Race

AGE RANGE (yr)	ASIAN MEN	BLACK MEN	WHITE MEN
40–49	0–2	0–2	0–2.5
50–59	0–3	0–4	0–3.5
60–69	0–4	0–4.5	0–4.5
70–79	0–5	0–5.5	0–5.5

Percentage free PSA measures the ratio between total PSA (bound and unbound) and unbound or “free” PSA. This test is most useful for PSA values between 4 and 10 ng/mL. The lower the percentage, the higher the risk of prostate cancer.<sup>30</sup> For example, in men aged 50 to 64 years, if the percentage free fraction is more than 25%, there is only a 5% risk of prostate cancer; however, if it is less than 10%, the risk of prostate cancer jumps to 56%.

PSA velocity (PSAV) is determined by measuring three PSA values at least 6 months apart. A PSAV of more than 0.75 ng/mL per year in men with PSA values between 4 and 10 ng/mL is associated with an increased risk of prostate cancer.<sup>27</sup> PSAV is also relevant for men with PSA values below 4 ng/mL. A PSAV of more than 0.4 ng/mL per year may be associated with adverse pathologic features and a twofold increase in significant prostate cancer.<sup>31</sup>

PSAV is calculated as the running average of change in three consecutive visits according to the following formula<sup>32</sup>:

$$0.5\{[(PSA_2 - PSA_1)/\text{elapsed time in years}] + [(PSA_3 - PSA_2)/(\text{elapsed time in years})]\}$$

Unlike the total PSA value, the percentage free PSA is affected by manipulation of the prostate gland. Therefore, the clinician should not order a percentage free PSA test on the same day as a rectal examination or within 24 hours of intercourse.<sup>1</sup>

## Integrative Therapies

Integrative therapies for primary and secondary prostate cancer prevention should be considered for all men for many reasons. According to some estimates, the pool of men with prostate cancer in the United States exceeds 20 million. “Localized” prostate cancer is often disseminated in the peripheral bloodstream and bone marrow, yet only 0.3% of these men will ultimately have metastatic disease.<sup>33</sup> Therefore, fatal metastatic disease is an uncommon event that may be modified with integrative therapies.

Prostate cancer is a disease of aging; 75% of new prostate cancers are diagnosed in men older than 65 years. The median doubling time of prostate cancer is 2 to 4 years. Any treatment that can delay tumor growth rates by 75% or more

in older men will increase the likelihood that some event other than prostate cancer will cause death.<sup>33</sup> A provocative pilot study demonstrated that a plant-based diet in the context of mindfulness-based stress reduction delayed PSA doubling time by 272%, from 6.5 months to 17.7 months.<sup>34</sup> Another group of researchers reported that a similar program doubled survival time for a cohort of men with metastatic prostate cancer.<sup>35</sup>

Finally, integrative therapies for prostate cancer prevention improve overall health and decrease the risk of premature morbidity and mortality from diseases associated with a Western lifestyle.<sup>36,37</sup>

## Lifestyle

### Exercise

Although data are inconclusive, physical activity may reduce prostate cancer risk by lowering body fat and serum testosterone concentration and by improving use of insulin-like growth factor 1 (IGF-1).<sup>13</sup> IGF-1 has mitogenic and anti-apoptotic effects on normal and malignant prostate cells. In one study, men with the highest quartile of IGF-1 levels had a 4.3-fold greater risk of prostate cancer compared with men in the lowest quartile.<sup>38</sup>

Exercise can also lessen the risk for development of aggressive or advanced prostate cancer. Data from the Health Professionals Follow-up Study show that men older than 65 years who exercise vigorously at least 3 hours per week in activities such as running, biking, and swimming have a 70% lower risk of being diagnosed with high-grade, advanced, or metastatic prostate cancer.<sup>39</sup> Similarly, a British study of 45,887 men aged 45 to 79 years showed that men with the highest lifetime physical activity had a 16% overall lower incidence of prostate cancer as well as a lower risk of advanced prostate cancer compared with men with the lowest activity. Each 30-minute increment of activity reduced the risk of prostate cancer by 7%.<sup>40</sup>

Men should exercise (e.g., walking, jogging, swimming) 30 minutes or longer at least three times weekly.

Every 30-minute incremental increase in aerobic exercise per week has been associated with lowering of the risk of prostate cancer by 7%.

### Xenobiotic Exposure

A xenobiotic is any chemical or toxin that is foreign to the body. Findings vary, but herbicides and pesticide exposure may increase prostate cancer risk by causing DNA damage and altering hormone metabolism.<sup>13</sup> In the most mature study to date, Vietnam War veterans who had been exposed to the xenobiotic Agent Orange (dioxin) had twice the risk for development of prostate cancer, were diagnosed at a younger age, had twice the risk of Gleason 8 to 10 disease, and were at least three times more likely to have metastatic disease. Mean time from exposure to diagnosis was 407 months.<sup>41</sup>

Endocrine disruptors, substances that mimic natural hormones, increase prostate cancer risk by disrupting hormone metabolism. Common examples of endocrine disruptors are polychlorinated biphenyls (PCBs, used to make

plastic, ink, and electrical and electronic equipment) and plasticizers (substances used to make plastic food wrap more pliable).<sup>42</sup>

Finally, in addition to being high in fat, dairy and beef products are occasionally contaminated with toxic pesticide and hormone residues.<sup>13</sup>

Reduce prostate cancer risk by washing all produce, peeling nonorganic produce (when applicable), and buying organic fruits and vegetables whenever possible. Preserve and cook food in glass containers instead of plastic ones. Limit or eliminate meat and dairy consumption.

### Hormone-Altering Medications and Supplements

Injudicious use of dehydroepiandrosterone (DHEA), androstenedione, and human growth hormone may increase the risk for development of prostate cancer or promote the growth of existing prostate cancer by increasing IGF-1 levels.<sup>43,44</sup> Although testosterone has not been proved to cause prostate cancer, testosterone is a potent promoter of benign and malignant prostate cell growth.

Therefore, men should avoid taking these supplements or androgen replacement therapy unless it is medically indicated, especially men at increased risk for prostate cancer.

#### ■ Chondroitin Sulfate

This popular supplement is used to treat osteoarthritis. Researchers have shown that there may be a link between chondroitin sulfate and the spread of prostate cancer.<sup>45</sup> Although the results are inconclusive, men with prostate cancer (or a strong family history of prostate cancer) should avoid chondroitin sulfate pending further studies.

### Alcohol

Alcohol yields 9 calories per gram, the same as fat. Therefore, excessive alcohol consumption increases energy intake and promotes obesity. Nevertheless, only a few studies have found a direct association between alcohol consumption and prostate cancer risk. According to one study, excessive drinking of alcohol—more than 96 oz of alcohol weekly (about 10 drinks)—tripled the risk for development of prostate cancer.<sup>46</sup> On the other hand, moderate consumption of red wine may confer protection against prostate cancer. Red wine is a rich source of resveratrol, a polyphenol that induces apoptosis and modulates androgen receptor function in prostate cancer cell lines.<sup>47</sup> Researchers reported that men who drank 4 oz of red wine four times weekly experienced a 50% reduction in prostate cancer and a 60% reduction in the diagnosis of Gleason 8 disease.<sup>48</sup>

Avoid indiscriminant alcohol consumption.

### Smoking

Among other carcinogens, tobacco contains cadmium, a heavy metal that may increase prostate cancer risk.<sup>13</sup> Although data for smoking and an increased risk of prostate cancer are conflicting, smoking increases the risk of lung, bladder, and other epithelial cancers, and it may induce a more aggressive form of prostate cancer. According to a meta-analysis of 24 prospective cohort studies, the heaviest smokers had a 24% to 30% greater risk of death from prostate cancer compared with nonsmokers.<sup>49</sup>

The message is clear: do not smoke.

## Nutrition

### Animal Fat

The incidence of prostate cancer discovered at autopsy is similar worldwide. However, the incidence of clinical prostate cancer, particularly advanced prostate cancer, is greatest in countries with the highest calorie and saturated fat consumption.

Among other things, excessive calories and saturated fat, especially from dairy products and red meat, promote obesity and prostate cell growth by increasing the production of IGF-1 and inflammatory arachidonic acid (AA) byproducts.<sup>4,5,8</sup> Men in the highest quartile for red meat consumption have a significantly higher risk of being diagnosed with prostate cancer and a 30% increased chance for development of advanced disease. Processing of meat and barbecuing and grilling of meat also increased the risk of total and advanced prostate cancer.<sup>50</sup>

AA is converted to inflammatory prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) molecules and series 4 leukotrienes. These messenger molecules enable prostate cancer cells to evade the immune system, inactivate natural killer cells and cytotoxic T cells, promote angiogenesis, and prevent apoptosis.<sup>8</sup> Research has shown that prostate cancer cells produce 10 times as much PGE<sub>2</sub> as surrounding benign cells do.<sup>51</sup> Meat-based diets and most cooking oils (with the exception of canola and olive oils) increase AA formation. In contrast, a vegan vegetarian diet can lower AA production by 30%.<sup>33</sup>

Although the relationship is complex and data are conflicting, animal data have shown that excess dietary omega-6 polyunsaturated acids generally stimulate tumor growth, whereas omega-3 polyunsaturated fatty acids, especially from fish, and monounsaturated omega-9 fatty acids from olive oil have the opposite effect.<sup>52-54</sup>

Finally, regardless of the food source, excessive calorie intake promotes obesity, which increases premature mortality and overall cancer-related death rates, including prostate cancer.<sup>7,55</sup>

Decrease prostate cancer risk by limiting or eliminating food items that increase AA production (e.g., animal fat, hydrogenated oils, and dairy products) and by avoiding excessive calorie intake.

### Soy Protein

Even though the age-adjusted incidence of latent prostate cancer in native Japanese and American men is roughly the same, clinical prostate cancer is 10 times higher in American men. Researchers attribute this glaring discrepancy to dietary differences. A typical American diet is high in saturated animal fat but low in fruits, vegetables, fish, and soy protein, whereas a typical Japanese diet is the reverse. Japanese men consume substantially more soy protein and fish but less saturated fat from dairy and red meat than American men do.<sup>56</sup> According to one report, Japanese men have isoflavone concentrations 30 times higher in the urine and more than 100 times higher in the blood than Western men do.<sup>57</sup>

Soy protein isoflavones, most notably genistein, inhibit prostate cancer cell growth in vitro and in vivo by promoting apoptosis; by blocking beta-estrogen receptor activity in the prostate; by inhibiting angiogenesis and endothelial cell proliferation; and by blocking 5-alpha-reductase, aromatase, and tyrosine-specific protein kinase activity.<sup>9,56,58</sup>

Soy protein yields up to 3 mg of isoflavones per gram and provides five times as much protein as wheat and 25 times as much protein as beef. Soy protein is available in a variety of food items, including tofu, tempeh, soy milk, soy cheese, textured soy foods, and soy flour.

For prostate cancer prevention, consume enough soy protein to yield at least 80 mg of genistein daily (approximately 4 oz). Drinking of soy milk is also beneficial. A 16-year-long prospective health study showed that men who drank several glasses of soy milk daily lowered their risk of prostate cancer by 70%.<sup>59</sup>

For men with prostate cancer, higher doses of daily soy consumption may provide additional protection. Researchers found that men taking 100 mg of soy isoflavones twice daily slowed the growth of an aggressive form of prostate cancer called androgen-insensitive prostate cancer by 35% and slowed overall cancer growth by 84%.<sup>60,61</sup> Commercially available soy protein bars and sweetened or unsweetened soy powder can supplement dietary soy intake to provide at least 200 mg of isoflavones daily. Physicians Laboratories ([www.revivalsoy.com](http://www.revivalsoy.com)) offer non-genetically modified organisms (GMO) soy products that can help patients meet these requirements. Each Rival soy bar or soy shake provides 160 mg of soy isoflavones.

#### ■ Dosage

Drink soy milk and consume at least 4 oz of soy protein daily for prevention. Men with prostate cancer should consume at least 200 mg of isoflavones daily.

Nonfermented soy products (tofu, soy milk, and edamame) appear to be more protective than fermented ones (miso, tempeh, natto, soy sauce).

### Lycopene

Lycopene is a cancer-fighting antioxidant vitamin that gives tomatoes, strawberries, and watermelon their rosy color. Other natural sources of lycopene are apricots, pink grapefruit, and guava juice. Although not all studies have found that lycopene confers a protective effect against prostate cancer,<sup>62</sup> data from a variety of case-control and large prospective studies focusing on dietary assessment show a beneficial effect, especially against advanced prostate cancer.<sup>18,63,64</sup> According to one report, men who consumed tomato products four times weekly reduced their prostate cancer risk by 20%, and those who ate 10 or more helpings weekly reduced their risk by 45%.<sup>65</sup> Cooking tomatoes and adding a little olive oil improves lycopene absorption.

#### ■ Dosage

For prevention, eat at least four helpings of tomato products weekly or take one 10-mg lycopene capsule twice daily. Men with prostate cancer should eat at least 10 helpings of tomato products weekly or take one 10-mg lycopene capsule three times daily.

### Fruits and Vegetables

Packed with cancer-fighting vitamins, minerals, and fiber, fruits and vegetables, especially cruciferous vegetables, may decrease prostate cancer risk.<sup>66</sup> Data suggest that a

plant-based diet can slow PSA doubling time in men with recurrent prostate cancer.<sup>24</sup>

Follow National Cancer Institute guidelines and eat at least five to nine servings of fruits and vegetables daily.

### Pomegranate

Pomegranate juice contains polyphenolic compounds, especially ellagic acid, that exert antiproliferative and antimetastatic effects on prostate cancer cells. According to a phase II study of 46 men with recurrent prostate cancer after surgery or radiation therapy, consumption of 8 oz of pomegranate juice daily significantly slowed PSA doubling time from 15.6 months to 54.7 months.<sup>67</sup> Pomegranate extract also inhibits prostate cancer cell growth.<sup>9</sup> Long-term follow-up data (mean of 30 months) showed that the beneficial effect of consuming pomegranate juice remained durable or increased.<sup>68</sup>

#### ■ Dosage

Consume 8 oz of pomegranate juice or an equivalent amount of pomegranate extract daily.

## Supplements

### Vitamin E (Mixed Tocopherols) and Selenium

Secondary end points from several key epidemiologic and prospective cohort studies suggested that vitamin E and selenium supplementation could decrease prostate cancer incidence and mortality, especially among smokers.<sup>69,70</sup> Accordingly, the Southwest Oncology Group in collaboration with others sponsored a phase III randomized, placebo-controlled trial of 35,553 men to determine whether taking selenium (200 mcg/day from L-selenomethionine) and vitamin E (400 units/day of all-*rac*-tocopheryl acetate), either alone or in combination, could provide protective benefit against prostate cancer.<sup>71</sup> The Selenium and Vitamin E Cancer Prevention Trial (SELECT) was terminated prematurely after 4 years because of concern about a small but significant increased incidence of prostate cancer in the vitamin E-alone arm and a small but insignificant increase in prostate cancer in the combined vitamin E and selenium arm and the selenium-alone arm. Compared with placebo, the hazard ratios for prostate cancer were 1.13 in the vitamin E-alone cohort, 1.05 in the selenium and vitamin E cohort, and 1.04 in the selenium-alone cohort. There was also a nonsignificant increase in the risk for development of diabetes (RR, 1.07) in the selenium-alone arm. On the basis of these data, supplementation with vitamin E and selenium for the prevention of prostate cancer is not recommended.

### Vitamin D

Vitamin D is a steroid hormone that can be acquired from the diet and dietary supplements, or it can be synthesized in the skin from 7-dehydrocholesterol in response to ultraviolet radiation. Ultraviolet irradiation of ergosterol from yeast yields vitamin D<sub>2</sub>. Ultraviolet irradiation of 7-dehydrocholesterol from lanolin yields vitamin D<sub>3</sub>. Vitamin D<sub>2</sub> is approximately 30% as effective as vitamin D<sub>3</sub> in maintaining serum 25-hydroxyvitamin D levels.

Although there is no consensus on the optimal blood level of vitamin D, deficiency is defined as a 25-hydroxyvitamin D level of less than 30 ng/mL. According to several studies,

40% to 100% of men and women still living in the community are deficient in vitamin D. Both prospective and retrospective epidemiologic studies have shown that vitamin D deficiency is associated with an increased risk for development of prostate cancer. Prostate cancer cells have a vitamin D receptor. Vitamin D is involved in the regulation of more than 200 genes, including genes that are responsible for cellular proliferation, differentiation, apoptosis, and angiogenesis. Vitamin D decreases cellular proliferation of normal and cancer cells and promotes their terminal differentiation. It also inhibits prostate cancer invasion and metastasis.<sup>9,72</sup>

#### ■ Dosage

Supplement the diet with sufficient vitamin D<sub>3</sub> to maintain a vitamin D level of at least 30 ng/mL for prevention of prostate cancer and a level between 50 and 100 ng/mL for men with prostate cancer or an increased risk for development of prostate cancer.

#### ■ Precautions

Vitamin D intoxication is extremely rare, but it can occur with excessive consumption of vitamin D. Oral supplementation with vitamin D should be monitored with periodic laboratory testing for 25-hydroxyvitamin D levels.

#### Multivitamins

Researchers examined a cohort of 1,063,023 adult Americans between the years of 1982 and 1989 and compared the mortality of vitamin nonusers with that of users of multivitamins alone; vitamin A, C, or E alone; and vitamin A, C, or E in combination. Surprisingly, the risk of dying of prostate cancer significantly increased with more than 5 years of multivitamin use (RR, 1.31). Furthermore, male smokers who used vitamins A, E, or C alone or in combination with multivitamins had a greater risk of fatal cancer (RR, 1.44 and RR, 1.58) than that of vitamin nonusers.<sup>73</sup> Data from the National Institutes of Health–AARP Diet and Health Study showed that men who consumed multivitamins more than seven times per week had a significantly increased risk of advanced or fatal prostate cancer (RR, 1.32 and RR, 1.98).<sup>74</sup> Therefore, multivitamin consumption is not recommended for the prevention or treatment of prostate cancer.

Taking a multivitamin containing vitamins A, E, and C more than seven times a week may increase the risk of dying of prostate cancer.

### Botanicals

#### Green Tea (*Camellia sinensis*)

Green tea contains a variety of antioxidants called catechins that have antitumor activity against prostate cancer cells. In vitro and in vivo studies have shown that green tea can inhibit prostate cancer cell growth by inducing apoptosis, activating tumor suppressor genes, and mitigating the activity of stimulatory messenger molecules. According to preliminary data, the beneficial effect of green tea may be dose related, and it may be more effective against early-stage prostate cancer as opposed to end-stage disease.<sup>9</sup>

In 60 men with high-grade prostate intraepithelial neoplasia who took 200 mg three times a day of mixed green tea catechins, only 1 of 30 (3.3%) progressed to cancer compared with 9 of 30 (30%) in the placebo group. Taking the green tea catechins did not influence the PSA level.<sup>75</sup>

#### ■ Dosage

Drink three to five cups of decaffeinated green tea daily or take 500 mg of a standardized green tea extract composed of mixed catechins once daily for prevention or twice daily if prostate cancer is present.

#### ■ Precautions

No precautions are necessary.

### Pharmaceuticals

#### Finasteride

The Prostate Cancer Prevention Trial (PCPT) randomized 18,882 men to a 7-year course of placebo or 5 mg of the 5-alpha-reductase type 2 enzyme inhibitor finasteride daily.<sup>76</sup> The results showed a 24.4% prevalence rate of prostate cancer in the placebo arm (1147/4692) versus an 18.4% prevalence in the finasteride arm (803/4368). Although there were a higher number of high-grade tumors in the finasteride group, researchers attribute this difference to an artifact of trial design.

#### Dutasteride

The Reduction by Dutasteride of Prostate Cancer Events (REDUCE) trial data showed that dutasteride reduced the risk of prostate cancer during 4 years by 23% compared with placebo.<sup>77</sup> The REDUCE trial was a randomized, double-blind, placebo-controlled phase III trial of 8000 men from 42 different countries between the ages of 50 and 75 years with a PSA level of 2.5 to 10 ng/mL and normal findings on prestudy prostate biopsy. In contrast to finasteride, dutasteride inhibits both type 1 and type 2 5-alpha-reductase enzymes. Type 1 5-alpha-reductase enzyme predominates in prostate cancer, whereas type 2 enzyme predominates in normal and hyperplastic prostate tissue.

#### Nonsteroidal Antiinflammatory Drugs

Cancer initiation, promotion, progression, angiogenesis, and metastasis are modulated in part by the inflammatory cascade of eicosanoids, cyclooxygenases, and lipoxygenases.<sup>8</sup> Aspirin reduces inflammation by inhibiting cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2) enzymes. According to a systematic review of the literature and meta-analysis, long-term consumption of aspirin (5 years or more) was inversely associated with the risk for development of prostate cancer. The risk reduction was more pronounced for advanced prostate cancer (OR = 0.7) than for total prostate cancer (OR = 0.9).<sup>78</sup> A cohort study of 70,144 men reported similar findings; regular use of nonsteroidal antiinflammatory drugs (NSAIDs) decreased the risk of prostate cancer by 18% and the risk of advanced prostate cancer by 33%.<sup>79</sup> Taking one 81-mg baby aspirin daily may be sufficient to reduce prostate cancer risk.

Suppression of COX-2 activity with COX-2-selective inhibitors may also reduce prostate cancer risk.<sup>80–82</sup> Although rofecoxib was withdrawn because of adverse cardiovascular

side effects, high doses of the COX-2 inhibitor celecoxib markedly slowed PSA doubling times in men whose PSA level started to rise after local curative therapy without causing any serious adverse cardiovascular effects.<sup>83</sup>

### ■ Dosage

If there are no medical contraindications, take one baby aspirin daily. Men with an increased risk for development of prostate cancer may wish to consider taking dutasteride (Avodart), 0.5 mg daily, especially if they have symptomatic prostate enlargement.

### ■ Precautions

Patients taking anticoagulation or antiplatelet medication and patients with a history of heart, renal, or gastrointestinal disease should check with their health care provider before taking aspirin or NSAIDs. Finasteride and dutasteride can decrease libido and semen volume and cause gynecomastia.

## Mind-Body Medicine

Psychosocial interventions can improve the quality of life for cancer patients and significantly prolong survival. According to one study, men who were taught new coping skills (mental relaxation and imagery techniques, stress management, ways to develop self-esteem and spirituality, receptive imagery/intuition and problem solving, and how to create a personal health plan/goal) lived twice as long as men in the control group.<sup>84</sup> Similarly, mindfulness-based stress reduction coupled with a plant-based diet can slow PSA doubling time in men with biochemical recurrence after radical prostatectomy and prolong survival in men with metastatic prostate cancer.<sup>34,35</sup>

Men with prostate cancer should practice stress reduction and relaxation techniques daily.

## PREVENTION PRESCRIPTION

- For men at normal risk, discuss the pros and cons of PSA screening and provide information on prostate cancer prevention. For men at high risk, perform a digital rectal examination and PSA test yearly after the age of 40 years.
- Encourage exercise for 30 minutes or longer at least three times weekly.
- Avoid hormone-altering medications such as DHEA, androstenedione, human growth hormone, and testosterone, unless medically indicated.
- Instruct patients to buy organic produce whenever possible. They should also wash all produce and peel it when applicable, drink filtered water, and cook and store food in glass containers.
- Advise patients to reduce or to eliminate dairy and meat consumption.
- Instruct patients to use olive or canola oil instead of other vegetable oils.
- Emphasize that patients should avoid tobacco products and excessive alcohol consumption.
- Teach patients to drink soy milk and eat at least 4 oz of soy protein daily.
- Encourage intake of five to nine servings of fruits and vegetables daily.
- Instruct patients to drink three to five cups of decaffeinated green tea or to take 500 mg of a standardized green tea extract once daily.
- If there are no medical contraindications, advise taking one 81-mg baby aspirin daily.
- Suggest that patients practice stress reduction and relaxation techniques daily.



## THERAPEUTIC REVIEW

Men with a normal risk for development of prostate cancer should follow the recommendations listed here. Men with a high risk for development of prostate cancer should consider adopting the suggestions for high-risk patients. High-risk factors include any of the following: prior history of prostate cancer; recurrent prostate cancer; family history of prostate cancer; African American race; initial PSA value above 2 ng/mL; PSAV of more than 0.4 ng/mL per year for men with a PSA level of less than 4 ng/mL; and PSAV of more than 0.75 ng/mL for men with a PSA level between 4 and 10 ng/mL.

### ■ Remove Exacerbating Factors

- Avoid smoking and excessive alcohol consumption. Patients with high risk may consider drinking 4 oz of red wine or 8 oz of Concord grape juice four times weekly. B<sub>1</sub>

### ■ Lifestyle

- Exercise for 30 minutes or longer at least three times weekly. B<sub>1</sub>

### ■ Nutrition

- Reduce or eliminate dairy and meat consumption and eat at least five to nine servings of fruits and vegetables daily and at least 4 oz of soy products daily. Patients with high risk should consume at least 200 mg of soy isoflavones daily and consider adopting a plant-based diet. Refer receptive patients to a qualified dietitian. B<sub>1</sub>

### ■ Supplements

- Take 10 mg of lycopene twice daily (three times daily for high-risk patients). Men with high risk should avoid taking DHEA, human growth hormone, androstenedione, chondroitin sulfate, and supplemental androgens. B<sub>1</sub>

### ■ Botanicals

- Take 500 mg of green tea extract daily (twice daily for high-risk patients).



### ■ Mind-Body

- Discuss mindfulness-based stress reduction techniques, especially for men with high risk, and refer receptive patients to a qualified professional.



### ■ Pharmaceuticals

- Take one 81-mg baby aspirin daily (consider taking 5 mg of dutasteride daily for high-risk patients).



## KEY WEB RESOURCES

[www.prostate-cancer.org](http://www.prostate-cancer.org)

A comprehensive prostate cancer resource, sponsored by the Prostate Cancer Research Institute

<http://www.cancer.gov/cancertopics/types/prostate>

Prostate cancer home page of the National Cancer Institute

<http://acor.org/>

An online resource of cancer information for the patient with cancer

<http://deb.uthscsa.edu/URORiskCalc/Pages/calcs.jsp>

Risk calculator of biopsy-detectable prostate cancer for men older than 55 years

## References

References are available online at [expertconsult.com](http://expertconsult.com).



## References

- American Cancer Society Facts and Figures 2010. <<http://www.cancer.org/acs/groups/content/@epidemiologyandprevention/documents/document/acsc-026210.pdf>>; Accessed 20.11.10.
- Ornish D, Weidner G, Fair WR, et al. Intensive lifestyle changes may affect the progression of prostate cancer. *J Urol*. 2005;174:1065–1070.
- Van Patten CL, de Boer JG, Tomlinson G, et al. Diet and dietary supplement intervention for the prevention of prostate cancer recurrence: a review of the randomized trial evidence. *J Urol*. 2008;180:2314–2322.
- Berkow SE, Barnard ND, Saxe GA, et al. Diet and survival after prostate cancer diagnosis. *Nutr Rev*. 2007;65:391–403.
- Patel MI, Kurek C, Dong Q. The arachidonic acid pathway and its role in prostate cancer development and progression. *J Urol*. 2008;179:1668–1675.
- Rackley JD, Clark PE, Hall MC. Complementary and alternative medicine for advanced prostate cancer. *Urol Clin North Am*. 2006;33:237–246.
- Demark-Wahnefried W, Moyad MM. Dietary intervention in the management of prostate cancer. *Curr Opin Urol*. 2007;17:168–174.
- Wallace JM. Nutritional and botanical modulation of the inflammatory cascade—eicosanoids, cyclooxygenases, and lipoxygenases—as an adjunct in cancer therapy. *Integr Cancer Ther*. 2002;1:7–37.
- Syed DN, Khan N, Afaq F, et al. Chemoprevention of prostate cancer through dietary agents: progress and promise. *Cancer Epidemiol Biomarkers Prev*. 2007;16:2193–2203.
- Gann PH, Giovannucci E. Nutrition and prevention strategies for prostate cancer. In: Berman S, Britt GS, eds. *Report to the Nation on Prostate Cancer 2004*. Medscape. 2004:77–84.
- Parnes HL, House MG, Kagan J, et al. Prostate cancer chemoprevention agent development: the National Cancer Institute, Division of Cancer Prevention Portfolio. *J Urol*. 2004;171:S68–S75.
- Lichtenstein PW, Holm NV, Verkasalo PK, et al. Environmental and heritable factors in the causation of cancer. *N Engl J Med*. 2000;343:78–85.
- Bostwick DG, Burk HB, Djakiew D, et al. Human prostate cancer risk factors. *Cancer*. 2004;101:2371S–2490S.
- Boyle P, Severi G, Giles GG. The epidemiology of prostate cancer. *Urol Clin North Am*. 2003;30:209–217.
- Sakr W, Haas G, Cassin B. The frequency of carcinoma and intra-epithelial neoplasia of the prostate in young male patients. *J Urol*. 1993;150:379–385.
- Jemal A, Siegel R, Xu J, et al. Cancer statistics, 2010. *CA Cancer J Clin*. (online). 2010. <<http://caonline.amcancersoc.org/cgi/content/full/caac.20073v1/TBL11>>; Accessed 20.11.10.
- Bratt O. Hereditary prostate cancer: clinical aspects. *J Urol*. 2002;168:906–913.
- Giovannucci E, Liu Y, Platz EA, et al. Risk factors for prostate cancer incidence and progression in the health professionals follow-up study. *Int J Cancer*. 2007;121:1571–1578.
- Hull GW, Rabbani F, Abbas F, et al. Cancer control with radical prostatectomy alone in 1,000 consecutive patients. *J Urol*. 2002;167:528–534.
- Chan JM, Holick CN, Leitzmann MF, et al. Diet after diagnosis and the risk of prostate cancer progression, recurrence and death (United States). *Cancer Causes Control*. 2006;17:199–208.
- Miyake H, Hara I, Kurahashi T, et al. Quantitative detection of micrometastases in pelvic lymph nodes in patients with clinically localized prostate cancer by real-time reverse transcriptase-PCR. *Clin Cancer Res*. 2007;13:1192–1197.
- Pagliarulo V, Hawes D, Brands FH, et al. Detection of occult lymph node metastases in locally advanced node-negative prostate cancer. *J Clin Oncol*. 2006;24:2735–2742.
- Morgan TM, Lange PH, Porter MP, et al. Disseminated tumor cells in prostate cancer patients after radical prostatectomy and without evidence of disease predicts biochemical recurrence. *Clin Cancer Res*. 2009;15:677–683.
- Pienta KJ, Loberg R. The “emigration, migration, and immigration” of prostate cancer. *Clin Prostate Cancer*. 2005;4:24–30.
- Chung LWK, Baseman A, Assikis V, et al. Molecular insights into prostate cancer progression: the missing link of tumor microenvironment. *J Urol*. 2005;173:10–20.
- Wolf AMD, Wender RC, Etzioni RB, et al. American Cancer Society guideline for the early detection of prostate cancer: update 2010. *CA Cancer J Clin*. (online). 2010. <<http://caonline.amcancersoc.org/cgi/content/full/caac.20066v1>>; Accessed 21.11.10.
- Greene KL, Albertsen PC, Babaian RJ, et al. Prostate specific antigen best practice statement: 2009 update. *J Urol*. 2009;182:2232–2241.
- Andriole GL, Grubb RL, Buys SS, et al. Mortality results from a randomized prostate-cancer screening trial. *N Engl J Med*. 2009;360:1310–1319.
- Schroder FH, Hugosson J, Roobol MJ, et al. Screening and prostate-cancer mortality in a randomized European study. *N Engl J Med*. 2009;360:1320–1328.
- Catalona WJ, Partin AW, Slawin KM, et al. Use of percentage of free prostate-specific antigen to enhance differentiation of prostate cancer from benign prostatic disease. *JAMA*. 1998;279:1542–1547.
- Loeb S, Roehl KA, Helfand BT, et al. Can prostate specific antigen velocity thresholds decrease insignificant prostate cancer detection? *J Urol*. 2010;183:112–117.
- Fang J, Metter EJ, Landis P, et al. PSA velocity for assessing prostate cancer risk in men with PSA levels between 2.0 and 4.0 ng/mL. *Urology*. 2002;59:889–893.
- Myers CE. Differentiating agents and nontoxic therapies. *Urol Clin North Am*. 1999;26:341–351.
- Saxe GA, Hébert JR, Carmody JF, et al. Can diet in conjunction with stress reduction affect the rate of increase in prostate specific antigen after biochemical recurrence of prostate cancer? *J Urol*. 2001;166:2202–2207.
- Block KI. Integrative tumor board: recently diagnosed prostate cancer. *Integr Cancer Ther*. 2003;2:63–90.
- Vita AJ, Terry RB, Hubert HB, Fries JF. Aging, health risks, and cumulative disability. *N Engl J Med*. 1998;338:1035–1041.
- Moyad MA. Emphasizing and promoting overall health and nontraditional treatments after a prostate cancer diagnosis. *Semin Urol Oncol*. 1999;17:119–124.
- Chan JM, Stampfer MJ, Giovannucci E, et al. Plasma insulin-like growth factor-1 and prostate cancer risk: a prospective study. *Science*. 1998;279:563–566.
- Giovannucci EL, Liu Y, Leitzmann MF, et al. A prospective study of physical activity and incident and fatal prostate cancer. *Arch Intern Med*. 2005;165:1005–1010.
- Orsini N, Bellocco R, Bottai M, et al. A prospective study of lifetime physical activity and prostate cancer incidence and mortality. *Br J Cancer*. 2009;101:1932–1938.
- Chamie K, White DW, Volpp B, et al. Agent orange exposure, Vietnam war veterans, and the risk of prostate cancer. *Cancer*. 2008;113:2464–2470.
- Ritchie JM, Vial SL, Fuortes LJ, et al. Organochlorines and risk of prostate cancer. *J Occup Environ Med*. 2003;45:692–702.
- Jones JA, Nguyen A, Straub M. Use of DHEA in a patient with advanced prostate cancer: a case report and review. *Urology*. 1997;50:784–788.
- Arnold JT, Hahn L, McFann KK, et al. Comparative effects of DHEA vs. testosterone, dihydrotestosterone, and estradiol on proliferation and gene expression in human LNCaP prostate cancer cells. *Am J Physiol Endocrinol Metab*. (online). 2005;288:E573–E584. <<http://ajpendo.physiology.org/cgi/content/abstract/288/3/E573>>; Accessed 23.11.10.
- Ricciardelli C, Quinn DI, Raymond WA, et al. Elevated levels of peritumoral chondroitin sulfate are predictive of poor prognosis in patients treated by radical prostatectomy for early-stage prostate cancer. *Cancer Res*. 1999;59:2324. <<http://cebp.aacrjournals.org/content/17/9/2488.full.pdf>>; Accessed 23.11.10.
- Putnam SD, Cerhan JR, Parker AS, et al. Lifestyle and anthropometric risk factors for prostate cancer in a cohort of Iowa men. *Ann Epidemiol*. 2000;10:361–369.
- Ratan HL, Steward WP, Gescher AJ, et al. Resveratrol: a prostate cancer chemopreventive agent? *Urol Oncol*. 2002;7:223–227.
- Schoonen WM, Salinas CA, Kiemeny LA. Alcohol consumption and the risk of prostate cancer in middle aged men. *Int J Cancer*. 2005;113:133–140.
- Huncharek M, Haddock KS, Reid R, et al. Smoking as a risk factor for prostate cancer: a meta-analysis of 24 prospective cohort studies. *Am J Public Health*. 2010;100:693–701.
- Sinha R, Park Y, Graubard BI, et al. Meat and meat-related compounds and risk of prostate cancer in a large prospective cohort study in the United States. *Am J Epidemiol*. 2009;170:1165–1177.
- Ghosh J, Myers CE. Arachidonic acid metabolism and cancer of the prostate. *Nutrition*. 1998;14:48–49.
- Hakim I. Mediterranean diets and cancer prevention. *Arch Intern Med*. 1998;158:1169–1170.
- Schulman CC, Ekane S, Zlotta AR. Nutrition and prostate cancer: evidence or suspicion? *Urology*. 2001;58:318–334.
- Kolonel LN, Nomura MY, Cooney RV. Dietary fat and prostate cancer: current status. *J Natl Cancer Inst*. 1999;91:414–428.

55. Mukherjee P, Sotnikov AV, Mangian HJ, et al. Energy intake and prostate tumor growth, angiogenesis, and vascular endothelial growth factor expression. *J Natl Cancer Inst.* 1999;91:512–522.
56. Castle EP, Thrasher JB. The role of soy phytoestrogens in prostate cancer. *Urol Clin North Am.* 2002;29:71–81.
57. Aldercreutz H, Markkanen H, Watanabe S. Plasma concentration of phytoestrogens in Japanese men. *Lancet.* 1993;342:1209–1210.
58. Gruber CJ, Tschugguel W, Schneeberger C, Huber JC. Production and actions of estrogens. *N Engl J Med.* 2002;346:340–352.
59. Jacobsen BK, Knutsen SF, Fraser GE. Does high soymilk intake reduce prostate cancer incidence? The Adventist Health Study (United States). *Cancer Causes Control.* 1998;9:553–557.
60. Hussain M, Banerjee M, Sarkar FH, et al. Soy isoflavones in the treatment of prostate cancer. *Nutr Cancer.* 2003;47:111–117.
61. Yan L, Spitznagel EL. Soy consumption and prostate cancer risk in men: a revisit of a meta-analysis. *Am J Clin Nutr.* 2009;89:1155–1163.
62. Peters U, Leitzmann MF, Chatterjee N, et al. Serum lycopene, other carotenoids, and prostate cancer risk: a nested case-control study in the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial. *Cancer Epidemiol Biomarkers Prev.* (online). 2007;16:962–968. <<http://cebp.aacrjournals.org/content/16/5/962.full>>; Accessed 27.11.10.
63. Ansari MS, Gupta NP. Lycopene: a novel drug therapy in hormone refractory metastatic prostate cancer. *Urol Oncol.* 2004;22:415–420.
64. Hwang E-S, Bowen PE. Can the consumption of tomatoes or lycopene reduce cancer risk? *Integr Cancer Ther.* 2002;1:121–132.
65. Giovannucci E, Ascherio A, Rimm EB. Intake of carotenoids and retinol in relation to the risk of prostate cancer. *J Natl Cancer Inst.* 1995;87:1767–1776.
66. Cohen JH, Kristal AR, Stanford JL. Fruit and vegetable intakes and prostate cancer risk. *J Natl Cancer Inst.* 2000;92:61–68.
67. Pantuck AJ, Leppert JT, Zomorodian N, et al. Phase II study of pomegranate juice for men with rising prostate-specific antigen following surgery or radiation for prostate cancer. *Clin Cancer Res.* 2006;12:4018–4026.
68. Pantuck AJ. Pomegranate, polyphenols and prostate cancer. *AUA News.* 2008;13:8–9.
69. Heinonen OP, Albanes D, Virtamo J, et al. Prostate cancer and supplementation with alpha-tocopherol and beta-carotene: incidence and mortality in a controlled trial. *J Natl Cancer Inst.* 1998;90:440–446.
70. Clark LC, Combs GF Jr., Turnbull BW, et al. Effects of selenium supplementation for cancer prevention in patients with carcinoma of the skin. *JAMA.* 1996;276:1957–1963.
71. Lippman SM, Klein EA, Goodman PJ, et al. Effect of selenium and vitamin E on risk of prostate cancer and other cancers. The Selenium and Vitamin E Cancer Prevention Trial (SELECT). *JAMA.* (online). 2009;301:39–51. <[https://www.umi-due.de/imperia/md/content/arbeitsmedizin/lippman\\_sm\\_et\\_al\\_2009\\_jama\\_301\\_39\\_51.pdf](https://www.umi-due.de/imperia/md/content/arbeitsmedizin/lippman_sm_et_al_2009_jama_301_39_51.pdf)> Accessed 11.27.10.
72. Holick MF. Vitamin D deficiency. *N Engl J Med.* 2007;357:266–281.
73. Watkins ML, Erickson JD, Thun MJ, et al. Multivitamin use and mortality in a large prospective study. *Am J Epidemiol.* 2000;152:149–162.
74. Lawson KA, Wright ME, Subar A, et al. Multivitamin use and risk of prostate cancer in the National Institutes of Health–AARP Diet and Health Study. *J Natl Cancer Inst.* 2007;99:754–764.
75. Bettuzzi S, Brausi M, Rizzi F, et al. Chemoprevention of human prostate cancer by oral administration of green tea catechins in volunteers with high-grade prostate intraepithelial neoplasia: a preliminary report from a one-year proof-of-principle study. *Cancer Res.* 2006;66:1234–1240.
76. Thompson IM, Goodman PJ, Tangen CM, et al. The influence of finasteride on the development of prostate cancer. *N Engl J Med.* 2003;349:215–224.
77. Andriole GL, Bostwick DG, Brawley OW, et al. Effect of dutasteride on the risk of prostate cancer. *N Engl J Med.* (online). 2010;362:1192–1202. <<http://www.nejm.org/doi/full/10.1056/NEJMoa0908127#t=articleResults>>; Accessed 5.12.10.
78. Mahmud S, Franco E, Aprikian A. Prostate cancer and use of nonsteroidal anti-inflammatory drugs: systematic review and meta-analysis. *Br J Cancer.* 2004;90:93–99.
79. Jacobs EJ, Rodriguez C, Mondul AM, et al. A large cohort study of aspirin and other nonsteroidal anti-inflammatory drugs and prostate cancer incidence. *J Natl Cancer Inst.* 2005;97:975–980.
80. Pruthi RS, Derksen E, Gaston K. Cyclooxygenase-2 as a potential target in the prevention and treatment of genitourinary tumors: a review. *J Urol.* 2003;169:2352–2359.
81. Nelson WG, DeMarzo AM, DeWeese TL, et al. The role of inflammation in the pathogenesis of prostate cancer. *J Urol.* 2004;172:S6–S12.
82. Basler JW, Piazza GA. Nonsteroidal anti-inflammatory drugs and cyclooxygenase-2 selective inhibitors for prostate cancer chemoprevention. *J Urol.* 2004;171:S59–S63.
83. Pruthi RS, Kouba E, Carson CC, et al. Cyclooxygenase-2 inhibitors and other NSAIDs in urology: current peril or future promise? *Urology.* 2006;68:917–923.
84. Shrock D, Palmer RF, Taylor B. Effects of a psychosocial intervention on survival among patients with stage 1 breast and prostate cancer: a matched case-control study. *Altern Ther Health Med.* 1999;5:49–55.



# Colorectal Cancer

Matt P. Mumber, MD

## Incidence and Prevalence

Colorectal cancer is an important public health problem; nearly one million cases are diagnosed worldwide each year, with about half a million deaths.<sup>1</sup> The geographic distribution of colorectal cancer varies widely between westernized and developing countries. The highest rates are in North America, Australia, and Europe. Rates in Africa and Asia are low but are increasing in countries adopting Western-style dietary habits.<sup>2</sup> Colorectal cancer is the third most common malignant neoplasm in the United States. Men and women have a generally equal risk for development of the disease—a risk of about 1 in 20.<sup>3</sup> Survival rates have improved with multiple possible explanations: implementation of more consistent screening leading to earlier stage at presentation, improved diet and lifestyle patterns, and improvements in surgical and adjuvant therapies.<sup>4</sup> Patients with localized disease have a 90% 5-year survival rate. Epidemiologic factors and outcomes are different for disease originating above the peritoneal reflection (colon origin) and disease originating below the peritoneal reflection (rectal origin).<sup>5</sup>

## Risk Factors

Box 78-1 lists factors that place individuals at increased risk for colorectal cancer.<sup>5</sup> Several genetic factors can help define risk of patients for colorectal cancer. Hereditary syndromes such as Lynch syndrome (hereditary nonpolyposis colorectal cancer) and personal or family history of polyposis syndromes place an individual at high risk. African American race, diabetes mellitus, and history of *BRCA*-positive breast cancer are linked to higher incidence. Lifestyle and behavioral factors such as tobacco and alcohol use, sedentary lifestyle, obesity, Western-type dietary pattern, low fiber consumption, inflammatory bowel disease, and psychosocial distress are known potential modifiable risk factors for the development and progression of colorectal neoplasia.

## Natural History

The majority of colorectal cancer begins as benign polypoid changes in the colorectal mucosa, and progression to malignant features can take many years. The relatively slow and consistent progression from benign to malignant disease is the reason that screening and early detection can have a positive impact. The disease generally progresses locally to extend through the bowel wall, and after having done so, it can progress with either lymphatic or hematogenous spread. Metastatic disease that is limited to one or two lesions in organs such as the lung or liver is termed oligometastatic disease. Patients with oligometastatic disease that is surgically resectable can still experience long-term disease-free survival.<sup>6</sup>

## Screening

Screening has been proved to have an impact on stage at diagnosis and also to eliminate benign polypoid disease before malignant transformation. The initiation and frequency of screening should be driven by individual risk assessment based on family and personal history of colorectal cancer, inflammatory bowel disease, and other risk factors. Normal-risk individuals should have a screening colonoscopy at the age of 50 years. Despite strong recommendations for screening, rates are still relatively low; approximately 60% of the recommended population receives appropriate screening procedures. This level has increased from 52% in 2002 to 63% in 2008.<sup>4,7-9</sup>

Screening intervals should be adjusted for the individual patient's risk level, and any type of screening (endoscopy or fecal testing) is better than none at all.

**BOX 78-1. Factors Associated With Increased Risk for Colorectal Cancer**

- Age older than 50 years
- African American race
- Personal history of colorectal cancer or polyps
- Inflammatory bowel disease
- Inherited syndromes: familial polyposis and Lynch syndrome
- Family history of colorectal cancer and polyps
- Low-fiber, high-fat diet (Western-type diet)
- Sedentary lifestyle
- Diabetes
- Tobacco and alcohol use
- Previous radiation therapy to abdomen or pelvis
- Psychosocial distress

Colonoscopy, the most complete screening procedure, has a demonstrated 50% risk reduction on colorectal cancer incidence. Flexible sigmoidoscopy lowers incidence by 33%. Computed tomographic colonography, also known as virtual colonoscopy, is noninvasive and does not require sedation. It is still being studied in large trials but may prove to be an effective screening measure in the future. Fecal-based screening tests detect signs of cancer in stool samples by measuring the presence of either human blood products or cancer DNA signatures. Fecal occult blood testing has a 16% relative risk reduction for colorectal cancer death in large study populations. Different types of fecal testing are available, and all must be coordinated by physicians to increase sensitivity of detection. A single in-office guaiac test is not optimal. Any type of screening is better than no screening at all.<sup>7</sup> Different strategies are being investigated to increase the compliance of patients with screening recommendations, including patient navigation (see later).<sup>10</sup>

Individuals with high risk, such as those with Lynch syndrome, familial polyposis syndromes, and positive family or personal history of colorectal cancer, should have increased screening diligence (colonoscopy instead of fecal testing) and shorter intervals between screening procedures. Intervention with colonic resection as a risk reduction strategy is advisable in certain populations of patients, such as those with familial polyposis, who have a nearly 100% chance for development of cancer in their lifetime.<sup>6</sup>

## Primary and Secondary Prevention

Genetic risks are difficult to modify; these are mainly focused around family history of colorectal cancer. Modifiable risk factors, such as those in **Box 78-2**, have the advantage of relatively simple recommendations to lower risk. However, the actual initiation and maintenance of comprehensive diet and lifestyle changes is not an easy formula (simple, but not easy). It is important for the clinician to use the tools of motivational interviewing (see Chapter 99, Motivational Interviewing Techniques) and to have a full understanding of the stages of change for the best chance of guiding sustainable health practices.<sup>11,12</sup> It is estimated that at least 70% of colon cancers may be preventable through moderate changes in diet and lifestyle.<sup>13,14</sup>

**BOX 78-2. Modifiable Risk Factors That Lower Incidence of Colorectal Cancer**

- Avoidance of red meats, processed meat, and refined carbohydrates
- Maintenance of recommended physical activity levels
- Maintenance of healthy body weight (body mass index less than obese)
- Avoidance of alcohol and tobacco
- Avoidance of hyperinsulinemia (metabolic syndrome)

Up to 70% of colorectal cancer can be prevented through diet and lifestyle changes.

## Lifestyle

There are ample data that physical activity, a whole-food plant-based diet, and stress reduction can decrease the incidence of colorectal cancer. Because of the nature of these interventions and the difficulty in studying primary prevention, overwhelming randomized trial evidence is lacking, but multiple systematic reviews are available that at least support safety and hint at efficacy of these interventions.<sup>13-16</sup> There is also a plausible mechanism of action related to insulin sensitivity and production of insulin-like growth factor 1 (**Fig. 78-1**).

Physical activity should consist of 30 minutes of aerobic activity daily as well as resistance exercise several times weekly.

Nutrition should focus on a whole-food plant-based diet. Two questions can help define what to eat and what to avoid.

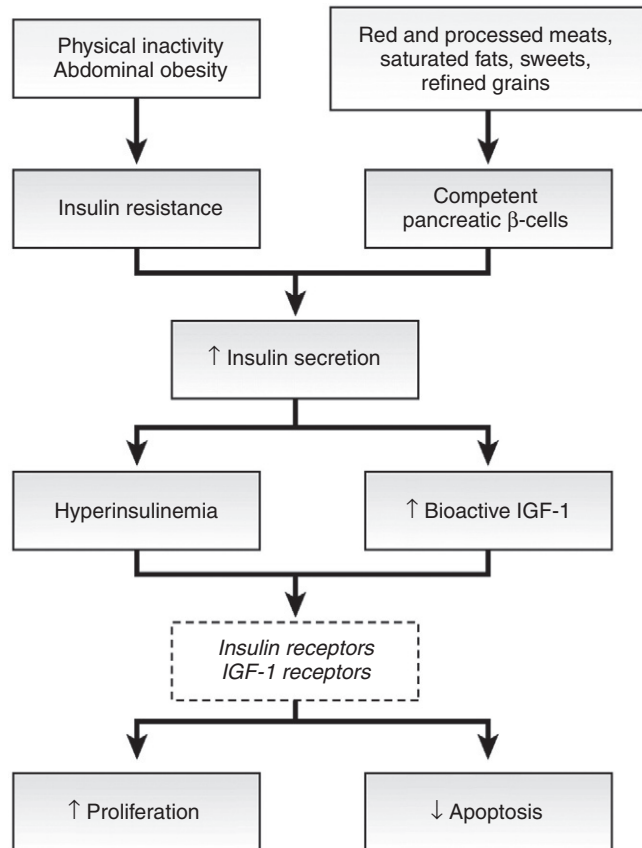
1. Is the food from an animal or a plant source? If it is from an animal source, either avoid the food or significantly limit use of it.
2. If the food is from a plant source, is it a whole part of the plant (root, stem, leaf, seed) or is it composed of a part of the plant that has been processed and then had extra ingredients added (such as sugar, salt, or oil)? Eat whole parts of plants and either avoid or limit processed foods.

A stress reduction practice can include a variety of modalities, such as mindfulness-based meditation, other forms of meditation, yoga, sitting in silence, listening to music, creative arts, massage, and guided imagery.

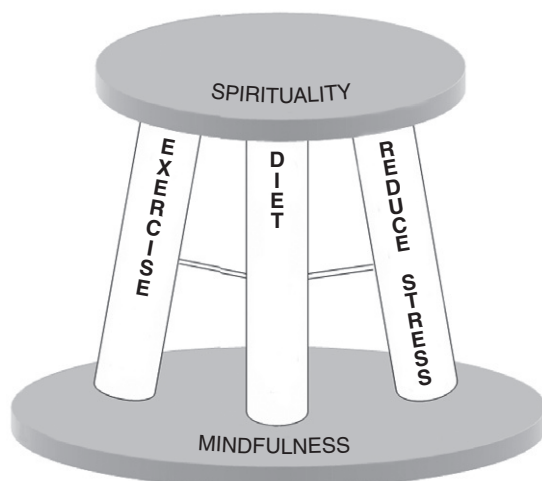
In my practice, I use the three-legged stool of health as an educational tool (**Fig. 78-2**). I also discuss the stages of change, advancing from pre-contemplation to contemplation to preparation, action, and then maintenance.<sup>17</sup> We discuss the fact that the practice of awareness is foundational to creation of sustainable change. It is more beneficial to apply different types of tools to different stages of change. Tools are generally divided into two categories. Transformational tools are defined by letting go of the old and seeing things with new eyes; they mainly involve a new way of being. Translational tools are characterized as interventions or practices that can be easily defined and have specific rules for implementation; they mainly include embracing new habits or ways of doing.<sup>18</sup> The foundational practice of

**FIGURE 78-1**

Proposed inflammatory mechanisms relating diet, lifestyle, and medication use to colorectal cancer. IGF-1, insulin-like growth factor 1. (From Chan AT, Giovannucci EL. Primary prevention of colorectal cancer. *Gastroenterology*. 2010;138:2029–2043.e10.)

**FIGURE 78-2**

Three-legged stool of health.



awareness is transformational and has its main functionality in pre-contemplation, contemplation, and maintenance stages of change, whereas discrete translational tools such as physical activity, improved diet, and stress reduction practices have their main impact on the preparation and action stages.

## Insulin Resistance and Metabolic Syndrome

Many mechanisms of action are proposed for the cancer preventive effect associated with healthy lifestyle and dietary changes; chief among them is optimal energy balance. Suboptimal energy balance can result in obesity, and this can result in the metabolic syndrome. Metabolic syndrome is characterized by excess abdominal obesity, atherogenic dyslipidemia, hypertension, insulin resistance, prothrombotic state, and proinflammatory state. All these factors have in vitro evidence of stimulation of carcinogenesis and cancer proliferation. There are well-documented in vitro effects on immune function, cell proliferation, cancer cell migration and invasion, loss of apoptosis, and increased angiogenesis (Fig. 78-3; see also Fig. 78-1).

## Supplements

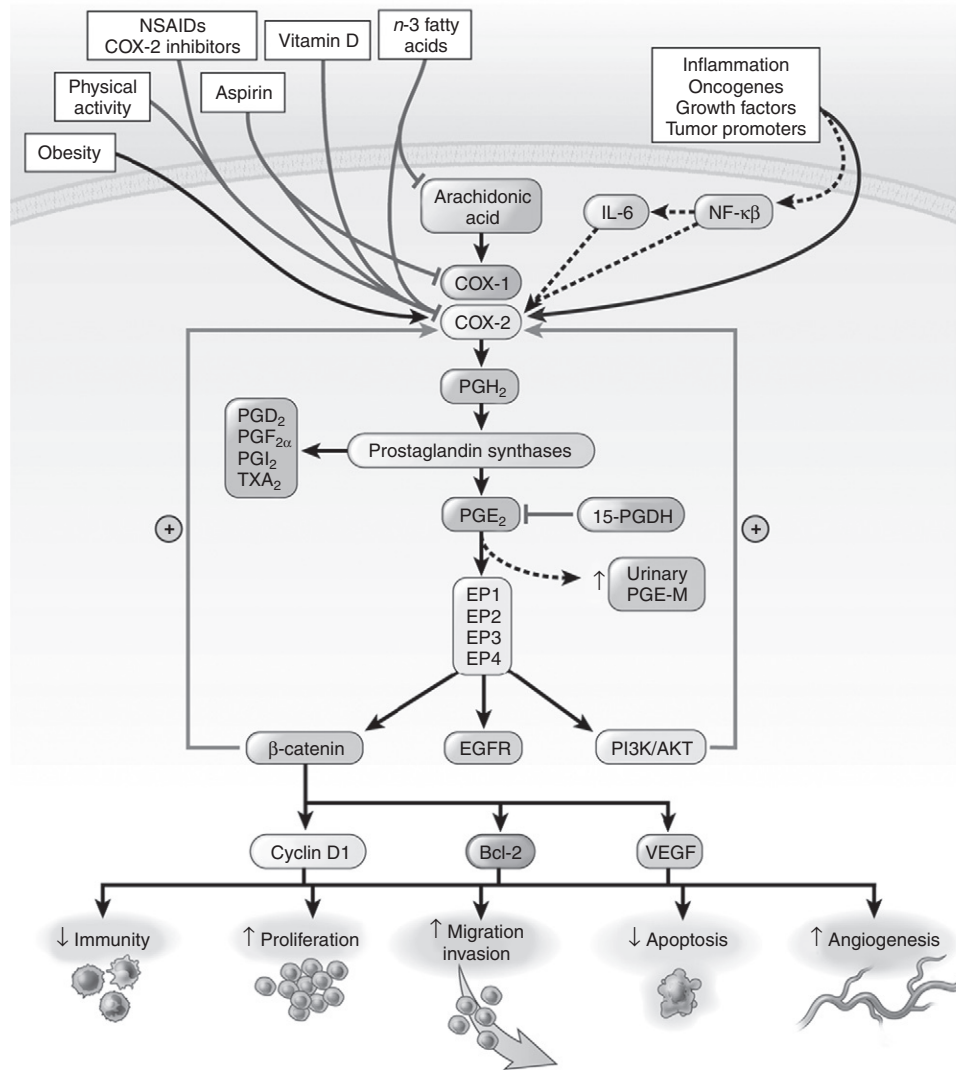
Significant research effort has gone into looking for a prescribed agent that can lower risk; this also is a potentially simple solution that would not require as much effort on the part of the patient. Daily aspirin intake, supplementation, and increasing dietary intake of foods containing folate, vitamin B<sub>6</sub>, vitamin D<sub>3</sub>, calcium, and omega-3 fats have been proposed to play a role in colorectal cancer risk reduction; however, supportive data are generally from small cohort studies, and meta-analyses generally show marginal or no clear effect on prevention.<sup>19–25</sup> A Cochrane meta-analysis found no convincing evidence that antioxidant supplements decrease colorectal adenoma formation.<sup>26</sup> A meta-analysis revealed that vitamin B<sub>6</sub> intake and blood levels of pyridoxal 5′-phosphate (PLP, the bioactive form of vitamin B<sub>6</sub>) were inversely associated with the risk of colorectal cancer.<sup>27</sup> This study showed that whereas the correlation with vitamin B<sub>6</sub> supplementation was moderate, it was dramatic with higher PLP levels, which decreased risk of colon cancer by nearly half. This points to the probable importance of obtaining this nutrient from food sources as opposed to supplements.

Food sources of vitamin B<sub>6</sub> include garlic, tuna, cauliflower, mustard greens, banana, celery, cabbage, crimini mushrooms, asparagus, broccoli, kale, collard greens, Brussels sprouts, cod, and chard.

Aspirin has been the most well studied and may be especially beneficial in patients with previous history of adenomas (secondary prevention).<sup>21</sup> A retrospective review of several randomized trials originally designed to prevent vascular events showed that daily aspirin intake was associated with significantly lower death rates from several cancer types, including colorectal cancer.<sup>28</sup> These data must be interpreted with caution because of their retrospective nature.

**FIGURE 78-3**

Proposed insulin-related mechanisms that relate diet, obesity, and physical activity to colorectal cancer. (From Chan AT, Giovannucci EL. Primary prevention of colorectal cancer. *Gastroenterology*. 2010;138:2029–2043.e10.)



The risks and benefits of supplementation with any of these compounds must be weighed carefully for every individual, especially in light of the fact that a whole-food plant-based diet should provide adequate amounts of each of the nutrients mentioned. The hypothesis that oral supplementation or preventive treatment (nonsteroidal antiinflammatory drugs) can overcome poor dietary and lifestyle practices has not been well tested in a prospective fashion.

Secondary prevention for high-risk individuals, such as those with familial adenomatous polyposis, may also include the use of selective cyclooxygenase-2 (COX-2) inhibitors, such as celecoxib, although some significant cardiac morbidity is possible with this agent at preventive doses used in clinical trials.<sup>29</sup> Natural agents that have anti-inflammatory mechanisms of action, including ginseng, curcumin, quercetin, omega-3 fatty acids, and green tea, also affect the COX-2 pathway and have been proposed as possible preventive agents. Further research is indicated.<sup>30,31</sup>

## Treatment

Conventional therapy has arguably progressed more for colorectal cancer than for any other malignant neoplasm. Diagnostic efforts usually include endoscopy and biopsy. Endoscopic ultrasonography for rectal cancer has dramatically improved clinical staging by helping to define the extent of the primary disease invasion through the bowel wall as well as by an improved ability to detect perirectal and regional lymph nodes. Improved clinical staging has led to the ability to better define the most appropriate initial intervention, either initial surgery or preoperative chemotherapy and radiation therapy.

## Surgery

Surgical intervention can now include laparoscopic approaches for colon cancers (supported by multiple systematic reviews<sup>32,33</sup>), and the ability to provide low coloanal

anastomosis has lowered colostomy rates in low-lying rectal cancer. Resection of oligometastatic disease can be performed through partial liver resection, taking advantage of the fact that liver regenerates after such procedures. Wedge excision of solitary metastatic disease to the lung may include video-assisted laparoscopic approaches, thus reducing the need for thoracotomy and associated postoperative morbidity.<sup>6</sup>

## Chemotherapy and Radiation Therapy

Preoperative chemotherapy and radiation therapy are the standard of care for tumor that has invaded through the muscle wall of the bowel; this approach results in lower colostomy rates compared with postoperative adjuvant therapy as well as improved survival. Radiation therapy has improved with the use of techniques that spare dose-limiting normal tissue structures, such as the small bowel. Radiation therapy can now be delivered with computed tomography–based treatment planning and improved setup and immobilization techniques.<sup>6</sup>

## Chemotherapy

Systemic therapy has added new agents, both cytotoxic and biologic, that have improved the long-term survival of most patients currently diagnosed with colorectal cancer. The biologic agents can be targeted for delivery only to patients who have certain genetic features indicating responsiveness. One example is the use of the epidermal growth factor receptor (EGFR) inhibitors cetuximab and panitumumab in patients with *KRAS* wild-type tumors (those without a mutation in the *KRAS* oncogene). The *K-ras* oncogene is part of the *ras* oncogene family and is the most common mutation in colorectal cancer; about 40% to 50% of colorectal cancers have mutated *KRAS* genes. *KRAS* wild-type tumors respond to EGFR inhibitors, whereas those tumors with a mutation in *KRAS* do not respond to these relatively well tolerated, targeted biologic agents. A clinical trial showed improvements in overall survival and quality of life for a population of colorectal cancer patients with wild-type *KRAS* treated with cetuximab (Erbix) alone versus best supportive care when all other therapies had failed.<sup>34,35</sup>

Systemic therapy by use of chemotherapy has significant potential toxicity, and there is a debate, especially in early-stage colon cancer, as to whether the risks outweigh the benefits. The entire field of oncology has shifted toward a more “personalized,” individualized, and targeted approach to therapy. The field of gene expression profiling is a potential solution by which only patients with high-risk disease that would benefit from therapy are treated. The Oncotype DX assay, a 12-gene expression profile for colon cancer, is currently undergoing validation in clinical trials. It is possible that this assay, which has shown successful implementation with a similar process in breast cancer patients, could help define which patients will benefit from chemotherapy and which will not.<sup>36</sup>

## Chronotherapy

Various investigators have also looked at the idea of chronotherapy, the administration of antineoplastic therapy based on circadian rhythms. Several trials and approaches to therapy have been reported, including a meta-analysis of the limited published trials that showed significant benefit in patients with advanced disease.<sup>37–40</sup> One such publication<sup>37</sup> described patients who adopted comprehensive diet

and lifestyle changes as well as various supplements, including individually tailored nutraceuticals and botanicals in oral and intravenous forms, along with chronomodulated chemotherapy. This study documented significant response in patients with otherwise refractory disease. This type of intervention deserves future research attention.

## Supplements for Treatment

Preliminary data support improved tolerance and efficacy of conventional therapies when multiple supplements, nutraceuticals, and botanicals are taken concurrently during chemotherapy or radiation therapy. These include omega-3 fats, astragalus, milk thistle (silymarin), green tea, melatonin, L-glutamine, alpha-lipoic acid, vitamins C and E, soy isoflavones, Siberian ginseng, and a variety of Chinese herbal combinations.<sup>41</sup> Data for these supplements are generally not conclusive, although further research should be conducted.

## Support and the Therapeutic Ratio

Despite improvements in conventional therapies, there is still significant need for supportive care throughout the process. Side effects from surgery, radiation therapy, and chemotherapy are common, and multiple complementary interventions can improve the side effect profile. With help to support patients through treatment, an improvement may occur in the therapeutic ratio, basically a ratio that defines the amount of harm versus the amount of benefit. By improvement of the therapeutic ratio, patients may have improved cure rates in addition to improved quality of life because of better treatment tolerance and compliance. See [Table 78-1](#) for symptoms and supportive care interventions.<sup>18,41</sup> Physical activity, nutrition, and stress reduction are recommended activities throughout the entire cancer continuum, with an excellent risk/benefit ratio.

Physical activity, nutrition, and stress reduction are recommended activities throughout the entire cancer continuum, with an excellent risk/benefit ratio.

**TABLE 78-1.** Symptoms Associated With Colorectal Cancer Treatment and Potential Complementary Therapies

Nausea	Acupuncture, ginger capsules, frequent small meals, astragalus, mind-body therapies
Anxiety and distress	Massage therapy, creative arts therapy, mindfulness-based stress reduction, physical activity
Fatigue	Increased physical activity, botanicals, supplements, mind-body therapies
Pain	Massage therapy, acupuncture, Reiki (energy medicine), mind-body therapies
Insomnia	Yoga, meditation, physical activity, selected botanicals (chamomile, valerian, melatonin)
Depression	Physical activity, dietary changes, yoga, Reiki, massage therapy, meditation, omega-3 fats

## Survivorship and Tertiary Prevention

As a result of the significant advances in early detection and treatment, the number of deaths due to colorectal cancer has been steadily decreasing. There are now more than 1 million survivors of colorectal cancer in the United States. Tertiary prevention should mainly focus on the modifiable risk factors discussed as a part of primary prevention. There are good data that adopting a whole-food plant-based diet and increasing physical activity can help reduce recurrence rates and preserve overall health and function.<sup>42-45</sup> An emphasis should be placed on compliance with follow-up screening procedures because a previous personal history for colorectal cancer places an individual in a high-risk category for development of new colorectal cancers.

## End-of-Life Care

Despite appropriate therapy, approximately 500,000 deaths due to colorectal cancer occur yearly. End-of-life care can be enhanced by a variety of complementary therapies, including massage therapy, acupuncture, spiritual interventions, a variety of mind-body therapies, appropriate nutrition and supplementation, and targeted physical activity.<sup>46-48</sup>

## Implementation of an Integrative Model

Integrative oncology must include an assessment of the intention of therapy—curative versus palliative—as well as of the outcome data for specific stages of disease and the performance status of patients. These factors will have a heavy impact on the decision to recommend interventions that have higher and lower levels of evidence.<sup>18</sup> For example, it might be reasonable to recommend an intervention that is rated B2 to a specific patient with a poor performance status being treated palliatively with therapy who has a low response rate to conventional therapy more than to a healthy patient being treated curatively in a situation in which the chance of cure is high.

Ideally, an integrative model will address all participants in the process at all levels of their being and experience. Many of the tools that have proven impact—modifiable lifestyle and diet risk factors—are simple to describe to patients but are not easy for patients to implement and to maintain. Physician self-care is vital for oncology care providers to prevent burnout.<sup>49</sup> Physicians who practice self-care are more effective at guiding patients to adopt healthy lifestyle and diet changes.<sup>50</sup>

Patient navigation is a new and expanding field that may provide a part of the solution to improving compliance of

patients with screening and comprehensive diet and lifestyle changes.<sup>51</sup> Patient navigation basically consists of an individual in the health care system whose sole responsibility is to act as a patient advocate, providing access to all available resources throughout the cancer care continuum.<sup>52</sup> Patient navigation has been shown to improve access to care; the data are especially strong for improvement of screening and early detection, and some trials have improved colorectal cancer screening in disparate populations.<sup>53</sup> Patient navigators can include trained lay volunteers of similar cultural background, social workers, community health workers, and nurses.<sup>54,55</sup> The National Cancer Institute is currently sponsoring several trials to document optimal methods of patient navigation throughout the cancer care continuum.<sup>56</sup>

## PREVENTION PRESCRIPTION

Screening and early detection should focus first on identification of high-risk populations, such as those with familial polyposis syndromes and family history of colorectal cancer. Screening studies are then matched to risk level and should follow ACS recommendations. Individuals with a normal risk should have screening colonoscopy at the age of 50 years.

Primary, secondary, and tertiary prevention of colorectal cancer should include the following foundation:

- Physical activity of at least 30 minutes of brisk walking daily or its equivalent
- Maintenance of a body mass index between 19 and 25
- A whole-food plant-based diet with avoidance of processed and sugary foods; avoidance or limitation of animal-based food products, especially charred red meat
- Avoidance of tobacco and alcohol consumption
- Appropriate, individualized supplementation with a low-potency multivitamin, omega-3 fat, vitamin D<sub>3</sub>, and calcium citrate; vitamin D<sub>3</sub> levels should be maintained between 30 and 50 ng/mL
- Practice of a stress management tool for a minimum of 10 to 15 minutes/day

This whole-system approach should be consistently reevaluated for adherence, patient satisfaction, and efficacy and to determine if new tools in each category are indicated.

### Secondary Prevention

- COX-2 inhibitors: either selective (such as celecoxib; most trials have used 400 mg twice daily; optimal dosing is still under investigation) or nonselective (aspirin; a single baby aspirin, 81 mg daily, appears to be sufficient, although optimal dosing is still not known).





## THERAPEUTIC REVIEW

### ■ Primary Prevention

- Risk reduction in at-risk population

### ■ Screening and Early Detection

- Identify high-risk populations for increased screening and early intervention.
- Follow ACS recommendations for screening in normal-risk populations with colonoscopy starting at the age of 50 years.

### ■ Exercise

- 30 minutes of physical activity daily, the equivalent of brisk walking (see Chapter 88, Writing an Exercise Prescription)

### ■ Nutrition

- Whole-food plant-based diet (see Chapter 86, The Antiinflammatory [Omega-3] Diet)

### ■ Mind-Body

- Mind-body stress reduction techniques (see Chapter 93, Relaxation Techniques)

### ■ Supplements

- Folate: 400 mcg daily. Evidence is mixed for benefit. Some studies with 1000 mcg daily show an increased risk with supplementation. It is best to obtain folate through eating of foliage, such as green leafy vegetables.
- Vitamin B<sub>6</sub>: Doses of these B vitamins in the range commonly found in a simple multivitamin are reasonable or 50 mg daily.
- Vitamin D<sub>3</sub>: Maintain blood level between 30 and 50 ng/mL with baseline supplementation of 1000 units/day of D<sub>3</sub> once normal range is achieved.
- Calcium: Dose used in positive trials was 1200 mg calcium citrate per day. Calcium should be taken with vitamin D.
- Omega-3 fatty acids: 1000 mg/day of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). No definitive evidence favors an optimal ratio of EPA to DHA.

### ■ Patient Outreach

- Implement a patient outreach program, such as lay navigation, to address disparities in access to care. This can result in improved adherence to screening guidelines and migration to a lower disease stage at presentation.

### ■ Treatment

Symptom control during chemotherapy and radiation therapy can be enhanced through the use of a variety of complementary tools.

- Acupressure and acupuncture relieve chemotherapy-associated nausea and vomiting.
- Ginger tablets (2000 mg/day), 2 days before, during, and after chemotherapy, relieve chemotherapy-related nausea.
- Physical activity during conventional therapy improves fatigue levels and treatment adherence.
- Mind-body stress reduction techniques—yoga, mindfulness-based stress reduction, meditation, and hypnosis—improve tolerance of therapy, adherence to therapy, and quality of life during therapy.
- Individualized nutritional programs can increase the patient's tolerance of and compliance with conventional therapy.


Some botanicals may improve the tolerance and efficacy of conventional therapy.


- Astragalus: Some data show improved tolerance and efficacy when it is given during platinum (cisplatin)-based chemotherapy. Doses and schedules are not clearly defined. Most data come from clinical trials in China.
- Milk thistle: Some preclinical data show improved tolerance and efficacy during platinum-based chemotherapy.

Some nutritional supplements may improve tolerance of, adherence to, and efficacy of conventional therapy.

- L-Glutamine (5000 mg/day) improves radiation therapy-associated mucositis and decreases chemotherapy-related neuropathy.
- Acetyl-L-carnitine improves chemotherapy-related neuropathy and increases efficacy. Doses used in randomized trials were in the range of 1000 mg two or three times daily.



- Mushroom extract (PSK, *Cordyceps*): Significant preclinical data show increased immunity, and some clinical randomized data in gastrointestinal tract cancers show improved efficacy and tolerance when it is given with chemotherapy. However, no definitive dose or schedule is available currently. 

- Alpha-lipoic acid improves neuropathy. Doses used for treatment of diabetic neuropathy are in the range of 200 to 400 mg/day. 

Individualized and highly rigorous, costly programs including “targeted” nutritional and intravenous supplements, physical activity, and mind-body stress reduction can have an antineoplastic effect.

## KEY WEB RESOURCES

<a href="http://www.cancer.net">www.cancer.net</a>	Official patient site of the American Society of Clinical Oncology; includes significant patient resource and educational materials
<a href="http://www.cancer.org">www.cancer.org</a>	American Cancer Society Web site with specific information on colon cancer, including early detection, genetic markers, treatment, and prevention
<a href="http://www.trialcheck.org">www.trialcheck.org</a>	Search for clinical trials for specific cancer types and stages
<a href="http://www.cdc.gov/cancer/colorectal/pdf/SFL_brochure.pdf">http://www.cdc.gov/cancer/colorectal/pdf/SFL_brochure.pdf</a>	Free brochure on colon cancer from the Centers for Disease Control and Prevention (CDC)
<a href="http://www.cancer.gov/colorectalcancerrisk/#">http://www.cancer.gov/colorectalcancerrisk/#</a>	Colorectal risk calculator from the National Cancer Institute

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Benson AB III. Epidemiology, disease progression, and economic burden of colorectal cancer. *J Manag Care Pharm*. 2007;13(suppl C):S5–S18.
- McCullough ML. Colorectal cancer: what do studies of diet patterns tell us? *Nat Rev Gastroenterol Hepatol*. 2009;6:567–568.
- Jemal A, Siegel R, Xu J, Ward E. Cancer statistics, 2010. *CA Cancer J Clin*. 2010;60:277–300.
- Edwards BK, Ward E, Kohler BA, et al. Annual report to the nation on the status of cancer, 1975–2006, featuring colorectal cancer trends and impact of interventions (risk factors, screening, and treatment) to reduce future rates. *Cancer*. 2010;116:544–573.
- Haggard FA, Boushey RP. Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. *Clin Colon Rectal Surg*. 2009;22:191–197.
- Cunningham D, Atkin W, Lenz HJ, et al. Colorectal cancer. *Lancet*. 2010;375:1030–1047.
- Cairns SR, Scholefield JH, Steele RJ, et al. Guidelines for colorectal cancer screening and surveillance in moderate and high risk groups (update from 2002). *Gut*. 2010;59:666–689.
- Levin B, Lieberman DA, McFarland B, et al. Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *Gastroenterology*. 2008;134:1570–1595.
- Smith RA, Cokkinides V, Brawley OW. Cancer screening in the United States, 2009: a review of current American Cancer Society guidelines and issues in cancer screening. *CA Cancer J Clin*. 2009;59:27–41.
- Lieberman D. Progress and challenges in colorectal cancer screening and surveillance. *Gastroenterology*. 2010;138:2115–2126.
- Campbell MK, Carr C, Devellis B, et al. A randomized trial of tailoring and motivational interviewing to promote fruit and vegetable consumption for cancer prevention and control. *Ann Behav Med*. 2009;38:71–85.
- Linden A, Butterworth SW, Prochaska JO. Motivational interviewing-based health coaching as a chronic care intervention. *J Eval Clin Pract*. 2010;16:166–174.
- Giovannucci E. Modifiable risk factors for colon cancer. *Gastroenterol Clin North Am*. 2002;31:925–943.
- Platz EA, Willett WC, Colditz GA, et al. Proportion of colon cancer risk that might be preventable in a cohort of middle-aged US men. *Cancer Causes Control*. 2000;11:579–588.
- Spence RR, Heesch KC, Brown WJ. A systematic review of the association between physical activity and colorectal cancer risk. *Scand J Med Sci Sports*. 2009;19:764–781.
- Chambers SK, Lynch BM, Aitken J, Baade P. Relationship over time between psychological distress and physical activity in colorectal cancer survivors. *J Clin Oncol*. 2009;27:1600–1606.
- Mochari-Greenberger H, Terry MB, Mosca L. Does stage of change modify the effectiveness of an educational intervention to improve diet among family members of hospitalized cardiovascular disease patients? *J Am Diet Assoc*. 2010;110:1027–1035.
- Mumber M. *Integrative Oncology: Principles and Practice*. London: Taylor and Francis; 2006.
- Carroll C, Cooper K, Papaioannou D, et al. Supplemental calcium in the chemoprevention of colorectal cancer: a systematic review and meta-analysis. *Clin Ther*. 2010;32:789–803.
- Carroll C, Cooper K, Papaioannou D, et al. Meta-analysis: folic acid in the chemoprevention of colorectal adenomas and colorectal cancer. *Aliment Pharmacol Ther*. 2010;31:708–718.
- Cooper K, Squires H, Carroll C, et al. Chemoprevention of colorectal cancer: systematic review and economic evaluation. *Health Technol Assess*. 2010;14:1–206.
- Ghadimi R, Kuriki K, Tsuge S, et al. Serum concentrations of fatty acids and colorectal adenoma risk: a case-control study in Japan. *Asian Pac J Cancer Prev*. 2008;9:111–118.
- Gorham ED, Garland CF, Garland FC, et al. Vitamin D and prevention of colorectal cancer. *J Steroid Biochem Mol Biol*. 2005;97:179–194.
- McCullough ML, Robertson AS, Rodriguez C, et al. Calcium, vitamin D, dairy products, and risk of colorectal cancer in the Cancer Prevention Study II Nutrition Cohort (United States). *Cancer Causes Control*. 2003;14:1–12.
- Yin L, Grandi N, Raum E, et al. Meta-analysis: longitudinal studies of serum vitamin D and colorectal cancer risk. *Aliment Pharmacol Ther*. 2009;30:113–125.
- Bjelakovic G, Nagorni A, Nikolova D, et al. Meta-analysis: antioxidant supplements for primary and secondary prevention of colorectal adenoma. *Aliment Pharmacol Ther*. 2006;24:281–291.
- Larsson SC, Orsini N, Wolk A. Vitamin B<sub>6</sub> and risk of colorectal cancer: a meta-analysis of prospective studies. *JAMA*. 2010;303:1077–1083.
- Rothwell PM, Wilson M, Elwin C-E, et al. Long-term effect of aspirin on colorectal cancer incidence and mortality: 20-year follow-up of five randomised trials. *Lancet*. 2010;376:1741–1750.
- Moreira L, Castells A. Cyclooxygenase as a target for colorectal cancer chemoprevention. *Curr Drug Targets*. 2010; [Epub ahead of print].
- Wallace JM. Nutritional and botanical modulation of the inflammatory cascade—eicosanoids, cyclooxygenases, and lipoxygenases—as an adjunct in cancer therapy. *Integr Cancer Ther*. 2002;1:7–37.
- Wargovich MJ. Colon cancer chemoprevention with ginseng and other botanicals. *J Korean Med Sci*. 2001;16(suppl):S81–S86.
- Kuhry E, Schwenk W, Gaupset R, et al. Long-term outcome of laparoscopic surgery for colorectal cancer: a Cochrane systematic review of randomised controlled trials. *Cancer Treat Rev*. 2008;34:498–504.
- Reza MM, Blasco JA, Andradas E, et al. Systematic review of laparoscopic versus open surgery for colorectal cancer. *Br J Surg*. 2006;93:921–928.
- Fakih MM. KRAS mutation screening in colorectal cancer: from paper to practice. *Clin Colorectal Cancer*. 2010;9:22–30.
- Roberts PJ, Stinchcombe TE, Der CJ, Socinski MA. Personalized medicine in non-small-cell lung cancer: is KRAS a useful marker in selecting patients for epidermal growth factor receptor-targeted therapy? *J Clin Oncol*. 2010;28:4769–4777.
- Ross JS, Torres-Mora J, Wagle N, et al. Biomarker-based prediction of response to therapy for colorectal cancer: current perspective. *Am J Clin Pathol*. 2010;134:478–490.
- Block KI, Block PB, Fox SR, et al. Making circadian cancer therapy practical. *Integr Cancer Ther*. 2009;8:371–386.
- Lévi F, Karaboué A, Gorden L, et al. Cetuximab and circadian chronomodulated chemotherapy as salvage treatment for metastatic colorectal cancer (mCRC): safety, efficacy and improved secondary surgical resectability. *Cancer Chemother Pharmacol*. 2011;67:339–348.
- Lévi F. Chronotherapeutics: the relevance of timing in cancer therapy. *Cancer Causes Control*. 2006;17:611–621.
- Liao C, Li J, Bin Q, et al. Chronomodulated chemotherapy versus conventional chemotherapy for advanced colorectal cancer: a meta-analysis of five randomized controlled trials. *Int J Colorectal Dis*. 2010;25:343–350.
- Block KI. *Life Over Cancer*. New York: Bantam Dell; 2009.
- Demark-Wahnefried W, Morey MC, Sloane R, et al. Promoting healthy lifestyles in older cancer survivors to improve health and preserve function. *J Am Geriatr Soc*. 2009;57(suppl 2):S262–S264.
- Meyerhardt JA, Giovannucci EL, Ogino S, et al. Physical activity and male colorectal cancer survival. *Arch Intern Med*. 2009;169:2102–2108.
- Mosher CE, Sloane R, Morey MC, et al. Associations between lifestyle factors and quality of life among older long-term breast, prostate, and colorectal cancer survivors. *Cancer*. 2009;115:4001–4009.
- Meyerhardt JA, Niedzwiecki D, Hollis D, et al. Association of dietary patterns with cancer recurrence and survival in patients with stage III colon cancer. *JAMA*. 2007;298:754–764.
- Lafferty WE, Downey L, McCarty RL, et al. Evaluating CAM treatment at the end of life: a review of clinical trials for massage and meditation. *Complement Ther Med*. 2006;14:100–112.
- Pan CX, Morrison RS, Ness J, et al. Complementary and alternative medicine in the management of pain, dyspnea, and nausea and vomiting near the end of life. A systematic review. *J Pain Symptom Manage*. 2000;20:374–387.
- Tilden VP, Drach LL, Tolle SW. Complementary and alternative therapy use at end-of-life in community settings. *J Altern Complement Med*. 2004;10:811–817.
- Miller NM, McGowen RK. The painful truth: physicians are not invincible. *South Med J*. 2000;93:966–973.
- Cvengros JA, Christensen AJ, Hillis SL, Rosenthal GE. Patient and physician attitudes in the health care context: attitudinal symmetry predicts patient satisfaction and adherence. *Ann Behav Med*. 2007;33:262–268.
- Carroll JK, Humiston SG, Meldrum SC, et al. Patients' experiences with navigation for cancer care. *Patient Educ Couns*. 2010;80:241–247.
- Hopkins J, Mumber MP. Patient navigation through the cancer care continuum: an overview. *J Oncol Pract*. 2009;5:150–152.
- Christie J, Itzkowitz S, Lihau-Nkanza I, et al. A randomized controlled trial using patient navigation to increase colonoscopy screening among low-income minorities. *J Natl Med Assoc*. 2008;100:278–284.

54. Hawkes AL, Pakenham KI, Courneya KS, et al. A randomised controlled trial of a tele-based lifestyle intervention for colorectal cancer survivors ("CanChange"): study protocol. *BMC Cancer*. 2009;9:286.
55. Pinto BM, Ciccolo JT. Physical activity motivation and cancer survivorship. *Recent Results Cancer Res*. 2011;186:367–387.
56. Hendren S, Griggs JJ, Epstein RM, et al. Study protocol: a randomized controlled trial of patient navigation-activation to reduce cancer health disparities. *BMC Cancer*. 2010;10:551.



# Skin Cancer

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Skin cancer, the most common of all cancer types, can be divided into two major groups, melanoma and non-melanoma skin cancer (NMSC). Melanoma is a tumor derived from melanocytes in the basal layer of the epidermis. Melanoma (Fig. 79-1) is the fifth leading cause of cancer in men (5%) and the sixth leading cause of cancer in women (4%).<sup>1</sup> Lifetime probability for development of invasive melanoma increases with age and is 1 in 37 for men and 1 in 56 for women. Whites have a higher (10-fold) incidence than that of nonwhites. NMSC encompasses different types of cancer, the two most common types being basal and squamous cell carcinomas. Basal cell carcinoma (BCC), the most common type of skin cancer (75%), arises from basal cells found in the outer layer of the epidermis and adnexal structures (hair follicles, sweat ducts; Fig. 79-2). Squamous cell carcinoma (SCC), the second most common type of skin cancer (20%), originates from scaly cells on the surface of the skin (Fig. 79-3). It is estimated that the incidence of NMSC is approximately equal to the combined incidence of all cancers.

## Pathophysiology

Skin cancer can occur in any individual. The main risk factor for BCC is the inability to tan, whereas the risk factors for SCC include light skin, outdoor occupations, sunburns, and exposure to sunlight during childhood. Evidence for a role of the immune system in the pathogenesis of skin cancer is also noted. The increased frequency of SCC, especially in transplant recipients, is probably due to long-term immunosuppressive therapy. Exposure to ultraviolet (UV) light and sunburn increases the incidence of all skin cancers. Approximately 90% of NMSCs can be attributed to UV exposure.<sup>2</sup> UVB radiation can induce both direct and indirect adverse biologic effects, including induction of oxidative stress, DNA damage and its repair, premature aging of the skin, and multiple effects on the immune system. UVA can also lead to development of melanoma and SCC, mainly by production of reactive oxygen species through interaction

with endogenous and exogenous photosensitizers. Several factors have been identified to increase the risk for melanoma (Box 79-1).

## Screening

Early detection remains the gold standard. The American Cancer Society screening guidelines recommend regular skin self-examination for all adults. A review of the literature on screening for skin cancer identified several limitations. The direct evidence to support the benefits of a screening examination by a physician or patient in reducing morbidity and mortality is limited.<sup>3</sup> Pamphlets for self-examination of the skin are available from the American Cancer Society, the American Academy of Dermatology, and the Skin Cancer Foundation.

Clinical examination of the skin should be performed annually, particularly for individuals at high risk for skin cancer. People considered at high risk are those with a family history of skin cancer or melanoma; those with a personal history of skin cancer or precancer; and those with a high number of melanocytic nevi, xeroderma pigmentosum, and basal cell nevus syndrome.

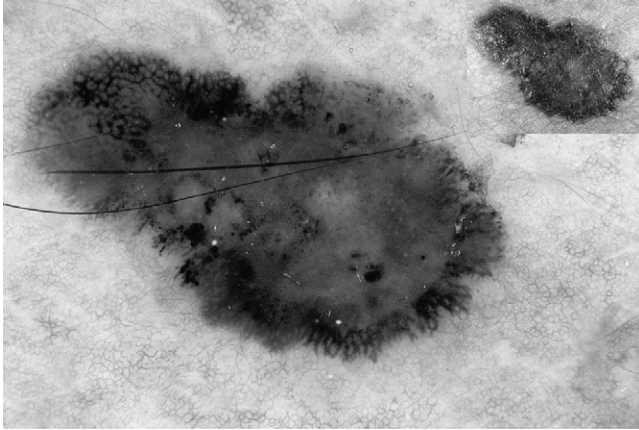
Recognize early melanoma by the ABCD screening guideline, as follows:

- Asymmetry
- Border irregularity
- Color variation
- Diameter more than 6 mm

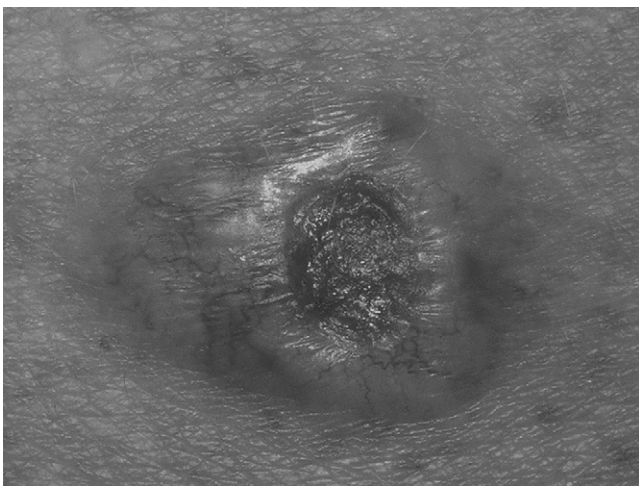
Imaging systems have been introduced to assist in detection of early lesions. Dermoscopy, with a hand-held lighted magnifier using cross-polarizing light filters, provides a 10-fold magnification of the skin. Several checklists can be used to assist in the decision.<sup>4</sup> A review of current studies reported a sensitivity of 82.6% to 85.7% and a specificity of 70% to 83.4%, dependent mainly on the experience of the examiner.<sup>5</sup> In multispectral digital dermoscopy, a sequence of images are obtained with use of particular bands of wavelengths; it offers the advantage of identifying characteristics

**FIGURE 79-1**

Melanoma. This melanoma has all of the melanoma-specific criteria from the algorithm and should be easy to diagnose. There are areas with an atypical pigment network, irregular streaks asymmetrically located in the lesion, irregular dots and globules, irregular blotches, and blue-white structures. Clinically, this lesion was in the gray zone of suspicion, but this dermoscopic picture leaves no doubt that this is a melanoma. (From Johr RH. *Dermoscopy*. St. Louis: Mosby; 2004.)

**FIGURE 79-2**

Basal cell carcinoma. (From Schuchter L, Ming M. Melanoma and nonmelanoma skin cancers. In: Goldman L. *Cecil Medicine*. 23rd ed. Philadelphia: Saunders; 2007.)



of the lesion not obvious to the naked eye. This automated version can enhance the sensitivity to 91.3% to 100% and the specificity to 70% to 85%.<sup>6,7</sup>

Confocal scanning laser microscopy uses a hand-held near-infrared laser of low power to provide real-time in vivo imaging of skin lesions at variable depths. It has a sensitivity of 97.3% and a specificity of 83%.<sup>8,9</sup>

Other technology (bioimpedance, ultrasonography) is available, but additional evaluation is required to define its role. Despite all the advances, clinical acumen remains the essential skill to identify skin lesions.<sup>10</sup>

**FIGURE 79-3**

Squamous cell carcinoma of the skin. (From Schuchter L, Ming M. Melanoma and nonmelanoma skin cancers. In: Goldman L. *Cecil Medicine*. 23rd ed. Philadelphia: Saunders; 2007.)



## Integrative Therapy

### Lifestyle

The depletion of the ozone layer has increased the exposure of people to UV light. To protect themselves, people should wear protective clothing, avoid acute exposure to sunlight (particularly at midday, between 11 AM and 3 PM), and apply a broad-spectrum, high-sun protection factor (SPF) sunscreen. These precautions are not limited to sunny days; the sun's rays can penetrate light clouds and mist, and they are reflected by snow (85%) and water (5%). Multiple-day exposure to sunlight significantly increases sensitivity of the skin to sun damage on the second day, particularly in susceptible individuals. When such exposure occurs, application of high-SPF (30+) sunscreen is recommended. A major portion of UV exposure is received during childhood and adolescence; therefore, application of sunscreen during this time considerably reduces the incidence of NMSC. It should be cautioned that application of sunscreen may cause subjects to feel protected; hence, they may spend a longer time exposed to the sun and develop a higher risk of skin cancer.<sup>11</sup> Sunscreen should be reapplied every 2 hours if subjects decide to prolong their sun exposure.

### BOX 79-1. Risk Factors Associated With Malignant Melanoma

Family history of malignant melanoma (first-degree relative)  
 Personal history of melanoma or any other skin cancer  
 Having red or blond hair  
 Marked freckles on upper back  
 Three or more blistering sunburns before 20 years of age  
 Three or more years of summer jobs during teenage years  
 Past use of tanning beds, especially before the age of 30 years  
 Actinic keratosis  
 Weakened immune system or immunosuppressive therapy  
 Higher socioeconomic group

#### Environmental Factors

Living near the equator  
 Outdoor recreational habit  
 Working outdoors  
 History of pesticide exposure

#### Phenotypic Factors

Blue or green eyes  
 Light complexion  
 Inability to tan  
 Blond or red hair  
 Freckles  
 Sun sensitivity

Data from Evans RD, Kopf AW, Lew RA, et al. Risk factors for the development of malignant melanoma: review of case-control studies. *J Dermatol Surg Oncol.* 1988;14:393–408; and MacKie RM, Hauschild A, Eggermont AM. Epidemiology of invasive cutaneous melanoma. *Ann Oncol.* 2009;20(suppl 6):vi1–7.

Almost any opaque substance can be used to reduce the amount of UV radiation reaching the skin. The more opaque the material, the better the protection it provides.

## Nutrition

### Dietary Fat

Preliminary studies in the early 1980s reported a possible association of fat intake with incidence of melanoma. Although this initial work was based mainly on a dietary questionnaire, a follow-up study indicated a higher content of polyunsaturated fat in the adipose tissue of subjects with melanoma compared with controls.<sup>12,13</sup> Studies of the effect of fat intake on nonmelanoma skin cancer reported a similar association between fat intake and the incidence of new cancer. Reduction of fat intake (but not total calories) led to a lower incidence of new actinic keratosis (pre-malignant lesions) in study subjects than that found in the control group.<sup>14,15</sup>

Case-control and epidemiologic studies identify a trend toward lower risk of melanoma and SCC with high dietary

intake of omega-3 polyunsaturated fatty acids and high omega-3/omega-6 polyunsaturated fatty acid ratio. In a review of Mediterranean diet and fatty acid intake,<sup>16,17</sup> observational studies show that adherence to a Mediterranean diet reduces the incidence of melanoma, even among populations that adopt the traditional diet.<sup>18,19</sup>

### Garlic and Onion

Garlic and onion oils were found to lower the number of skin tumors in an animal study. Diallyl sulfide, a component of garlic, applied topically 1 hour before or after exposure to carcinogens, delays the onset of tumors and confers significant protection from skin carcinogenesis.<sup>20</sup> Animal studies proposed several potential mechanisms for skin cancer prevention: suppression of development of tumors that harbor *ras* mutations by inhibiting the membrane association of oncogenic p21/ras protein<sup>21</sup>; antimutagenic properties on 7,12-dimethylbenz[*a*]anthracene (DMBA [a carcinogenic polycyclic aromatic hydrocarbon])—induced DNA strand breaks<sup>22</sup>; and up-regulation of p53wt and p21/Waf1, while p53mut expression was down-regulated.<sup>23</sup> Translation of these results into human prevention studies is lacking.

### Fish and Fish Oil

Fish intake was noted to have a protective effect in case-control studies, suggesting a possible role for fish oil in the prevention of melanoma.<sup>24</sup> Studies reported that linolenic acid (18:2 omega-6) and alpha-linolenic acid (18:3 omega-3), the precursors to omega-3 and omega-6 fatty acids, have shown promise as a safe adjunctive treatment of several skin conditions, including NMSC and melanoma.<sup>25</sup> Several mechanisms were proposed, including maintenance of the stratum corneum, inhibition of proinflammatory eicosanoids and cytokines, elevation of sunburn threshold, and promotion of apoptosis in malignant cells. However, case-control studies found no appreciable association of lower melanoma risk with fish, meat, vegetables, fruit, dairy products, whole-meal bread, alcohol, or coffee and tea drinking.<sup>26</sup> A systematic review confirmed these conclusions; the review did not find evidence to suggest a significant association between omega-3 fatty acids and cancer incidence.<sup>27</sup> In fact, subanalysis of skin cancer found an increased risk (RR, 1.13; 95% CI, 1.01–1.27). However, a closer look at the study identifies several limitations that render the conclusions uncertain. Additional studies are still needed to evaluate the role of omega-3 fatty acids in cancer prevention.

## Botanicals

### Green Tea

Green tea contains powerful polyphenol antioxidants (epigallocatechin gallate). Their protective effect is thought to be due to inhibition of free radicals, inhibition of lipid peroxidation, inhibition of UV light-induced and chemical-induced tumor growth, reduction of the inflammation associated with UV exposure, DNA repair, and inhibition of oncogenic expression.<sup>28,29</sup> Several animal and human studies investigating the oral and topical application of green tea to prevent skin cancer have suggested that green tea may reduce the risk of skin cancer induction in humans

by UV radiation.<sup>30,31</sup> Reports suggest that green tea polyphenols have the potential, in conjunction with the use of traditional sunscreens, to further protect the skin against the damaging effects of UV radiation.<sup>32</sup> In addition, animal study suggests that the antitumor activity of green tea on melanoma can be enhanced when it is combined with vitamin A.<sup>33</sup>

### **Panax Ginseng**

Animal and laboratory<sup>34</sup> studies suggest a dose-dependent inhibitory effect of Panax ginseng on skin cancer, prolonging the latency period and reducing the tumor numbers. Laboratory studies of ginsenoside Rp1 (G-Rp1), a novel ginseng saponin, strongly inhibited the metastatic lung transfer of melanoma cells, suggesting that G-Rp1 may act as an anti-cancer agent by strongly inhibiting cell viability and metastatic processes.<sup>35</sup>

### **Thuja Standishii**

Labdane diterpenoid, derived from the stem bark of *Thuja standishii* (Japanese name: kurobe) and from marine sources, has been found to demonstrate different levels of bioactivity, such as antiinflammatory, antibacterial, antifungal, antileishmanial, cardiotoxic, and cytotoxic activities. A two-stage mouse skin carcinogenesis study reported an inhibitory effect on tumor promotion induced by TPA (12-O-tetradecanoylphorbol-13-acetate).<sup>36,37</sup> A potential role in the prevention or treatment of human skin cancer is yet to be established.

### **Turmeric (Curcumin)**

In a study on three different melanoma cell lines at M.D. Anderson Cancer Center, the yellow Indian spice turmeric (curcumin) inhibited growth of all three. Curcumin also stimulated cell apoptosis (programmed cell death) by suppressing a protein called nuclear factor kappaB that normally protects these cancer cells from death. The effects were dose dependent; the higher the dose, the more cancer cell death.<sup>38</sup> More recently, attention has been directed at curcumin in the attempt to repair photodamaged skin as a means of preventing degeneration into solar-induced skin cancers. Curcumin has been shown to protect from injury by attenuating oxidative stress and suppressing inflammation.<sup>39</sup>

The combined treatment at lower doses of curcumin with tamoxifen provides a nontoxic option for chemotherapy with great potential for future use.<sup>40</sup> The combination was noted to produce significant induction of autophagy along with apoptosis of cancerous cells; noncancerous cells are unaffected by this combination. In addition, once they are exposed to low doses of this cotreatment, melanoma cells still retained signals to commit suicide even after removal of the drugs.

Curcumin shows promise as it has been found to reduce inflammation in the skin, to provide protection against damage, and to enhance the benefits of treatment for melanoma.

## **Supplements**

### **Selenium**

Selenium is a trace element that plays an important part in antioxidant enzymes (selenoproteins). The content of selenium in plant food depends on the soil content of the mineral. Some nuts and particularly Brazil nuts contain a high amount of selenium (each nut contains about 80 to 120 mcg). Selenium can also be found in some meats (beef, turkey, chicken breast) and seafood (cod, tuna). Despite early indications of a possible role of selenium in the prevention of skin cancers, randomized studies on the use of selenium for the prevention of melanoma and NMSC do not show a protective effect; in fact, later evidence found it to raise the risk of recurrence among high-risk individuals.<sup>41,42</sup>

### **Probiotics**

Probiotics are defined as living microorganisms that confer a health benefit to the host when they are consumed in adequate amounts. Several trials suggested a beneficial role of probiotics in the management of atopic dermatitis. A small randomized trial reported that *Lactobacillus johnsonii* NCC 533 could modulate the cutaneous immune homeostasis altered by UV exposure.<sup>43</sup> Clinical data suggest that certain probiotic strains may confer a benefit at the skin level, leading to the preservation of skin homeostasis. However, additional studies are needed to better define a potential role for probiotics in skin cancer prevention.

### **Beta-Carotene**

Beta-carotene is a member of the carotenoids, a group of red, orange, and yellow pigments. Beta-carotene can be found in green plants, carrots, sweet potatoes, green peppers, fruits, apricots, and whole grains. Alpha-, beta-, and gamma-carotenes are considered provitamins because they can be converted to vitamin A. UV radiation disrupts skin homeostasis, in part by causing a loss of retinoid receptors. Retinoid receptors participate in epidermal growth and differentiation. Animal studies point to an inhibitory role of beta-carotene in UV-induced skin cancer. In addition, an inverse relationship between the level of serum beta-carotene and the incidence of skin cancer was noted.<sup>44</sup> In a large clinical trial, the protective effect of beta-carotene (50 mg/day) against NMSC during 5 years was not supported.<sup>45,46</sup> These findings were confirmed by a large Australian study using 30 mg/day for 4.5 years.<sup>47</sup> High levels of retinol and carotenoids have been found to have a weak or no protective effect against melanoma.<sup>24,48</sup>

### **Vitamin D**

Vitamin D is a fat-soluble vitamin made in the body when the skin is exposed to the sun. Food sources are fatty fish (salmon, tuna, or mackerel), beef liver, cheese, and egg yolks. Several foods (e.g., cereals, milk) are fortified with vitamin D. Several studies suggest a potential influence of vitamin D on site-specific aggressiveness of melanomas. A meta-analysis of 10 studies (N = 6805) found an overall protective association with melanoma and NMSC for 2 vitamin D polymorphisms (FokI and BsmI).<sup>49</sup> However, additional studies



are needed to define the role of vitamin D in skin cancer primary or secondary prevention.

### Vitamin E

Vitamin E can be found in nuts, whole grains, spinach, egg yolk, vegetable oils, and asparagus, among others. Animal studies show a possible protective effect of vitamin E. The effect was noted to be greater in vivo than in vitro. Vitamin E has been found to protect against lipid peroxidation and DNA miscoding, and it had a strong inhibitory effect on tumor promotion in a two-stage protocol after application of dimethylbenzanthracene (DMBA).<sup>50</sup> Vitamin E has also been found to have a synergistic effect with the other carotenoids by protecting them from photo-oxidation and hence enhancing their tumor suppression effect.<sup>51</sup> Additional studies are needed to evaluate the exact role of vitamin E in skin cancer prevention. Earlier human studies did not show a protective effect for vitamin E supplementation against melanoma or NMSC; however, a consistently higher risk was noted in subjects with low vitamin E intake. A 2005 review found that topical vitamin E reduced erythema, sunburn cells, chronic UVB-induced skin damage, and photocarcinogenesis, whereas only high doses of oral vitamin E may affect the response to UVB in humans.<sup>52</sup>

### Vitamin C

Vitamin C can be found in most plants, such as broccoli, bell peppers, kale, tomatoes, strawberries, blueberries, citrus, kiwi, pineapples, and cantaloupes. Studies report that vitamin C lowers the incidence of skin cancer in UV light-treated mice and has a photoprotective effect in human epithelial cells.<sup>53</sup> A small study using 10% topical vitamin C 5 days before UVB irradiation showed a reduced erythematous response. Lower concentrations did not confer any protection. Oral use of vitamin C has not been demonstrated to confer photoprotection.

## Pharmaceuticals

### Sunscreen

No randomized controlled trials have assessed the effect of sunscreens on the incidence of or mortality from malignant melanoma. One randomized controlled trial found that sunscreens reduced the incidence of solar keratosis. A review of existing studies demonstrated a major role of UVA in the induction of skin photodamage and emphasized the need for a broad protection covering the entire solar UV spectrum.<sup>54</sup> It is increasingly accepted that sunscreens should protect against UV radiation-induced immunosuppression, with an index of protection that can be compared with the SPF. The SPF number indicates protection against UVB rays only. The American Academy of Dermatology recommends products with SPF of 30 or higher. Despite the lack of prospective studies, use of broad-spectrum sunscreens for the prevention of melanoma and NMSC seems sensible and is highly recommended. For best results, recommend application of a thick layer of sunscreen to exposed areas. Recommend reapplication of sunscreens at least every 2 hours and even more often with swimming or sweating. Sunscreens labeled waterproof can provide

protection for 80 minutes even when subjects become wet; products labeled water resistant may protect for only 40 minutes.

Studies have shown that a class of natural agents known as oligosaccharins, complex carbohydrates found in plants, protects the cutaneous immune system from UVB- and UVA-induced immunomodulation.<sup>55,56</sup> This immune protective effect occurs independently from erythema and DNA damage protection, and these agents, particularly tamarind xyloglucan, may become important adjunctive ingredients to sunscreens.

Concerns were raised by the Environmental Working Group report, which stated: "Recently available data from an FDA study indicate that a form of vitamin A, retinyl palmitate, when applied to the skin in the presence of sunlight, may speed the development of skin tumors and lesions (NTP 2009). This evidence is troubling because the sunscreen industry adds vitamin A to 41 percent of all sunscreens." However, on closer review, there is no convincing evidence to support this conclusion.<sup>57</sup>

### Vaccine Therapy

A number of trials are evaluating vaccine therapies in melanoma patients. Recent trials reported that high-dose interferon improves relapse-free survival in melanoma patients at high risk for recurrence. Promising trials are under way to evaluate the efficacy of vaccines (CD34<sup>+</sup> derived and an oncolytic special strain of herpes simplex type 1 virus reprogrammed to infect only cancer cells) for treatment of patients with high-risk or completely resected metastatic melanoma. Additional trials are evaluating the efficacy of different regimens of melanoma vaccine: mutated gp100 melanoma vaccine in HLA-A\*0201 patients; peptides or tumor lysates using dendritic cells for antigen delivery; and anti-gastrin-releasing peptide DNA.

## PREVENTION PRESCRIPTION

- Avoid sunburn, midday sunlight, artificial ultraviolet sources (tanning booths, sunlamps), and prolonged sun exposure starting in childhood.
- Wear protective clothing and a wide-brimmed hat when exposed to sunlight.
- Apply a generous layer of broad-spectrum high-SPF sunscreen of 30 or greater. Reapply every 2 hours and as needed if the skin gets wet. Use of sunscreen does not mean that one can prolong exposure time.
- Perform yearly skin examinations and educate patients to do self-examination using the ABCD warning signs.
- A low-fat diet may have a beneficial effect in the prevention of melanoma and nonmelanoma skin cancers.



## THERAPEUTIC REVIEW

### ■ Avoid Sunburn

- Avoid prolonged sun exposure, particularly between 11 AM and 3 PM. A 1
- Use a broad-spectrum sunblock with an SPF of 30 or higher to provide 1 to 2 hours of protection. An important and efficient barrier is clothing. A hat can protect the face and scalp. A 1

### ■ Nutrition

- Consider a reduction in total fat intake and encourage foods rich in fish oil. B 1

### ■ Botanicals

- Consider green tea; drinking of three cups a day or using it in topical form may provide some protection from UV radiation. B 1
- Consider adding curcumin to the diet. At a dosage of 500 to 1000 mg three times a day, it has an antiinflammatory effect. B 1

### ■ Supplements

- A combination of antioxidants (beta-carotene with vitamin C; vitamin A with green tea) may have a better protective effect against UV radiation than either alone. B 1

## KEY WEB RESOURCES

American Cancer Society: <http://www.cancer.org>

1-800-ACS-2345 (1-800-227-2345)

Melanoma Research Foundation: <http://www.melanoma.org/>

Information, database, chat room, and a patient network with case profiles are provided for people interested in melanoma. Information is also provided about ongoing trials and results from relevant trials.

Melanoma Education Foundation: <http://www.skincheck.com>

This Web site of the Melanoma Education Foundation (1-978-535-3080) is a good resource for patients and health care workers, with pictures and useful link sites.

### Guide to Internet Resources for Cancer

The Skin Cancer Resources Directory: <http://www.cancerindex.org/clinks2s.htm>

A wealth of information, resources, links, and database about skin cancer are provided for both professionals and patients.

American Academy of Dermatology: [www.aad.org](http://www.aad.org)

1-888-462-DERM (1-888-462-3376)

Skin Cancer Foundation: [www.skincancer.org](http://www.skincancer.org)

1-800-SKIN-490 (1-800-754-6490)

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Jemal A, Siegel R, Xu J, Ward E. Cancer statistics, 2010. *CA Cancer J Clin.* 2010;60:277–300.
- Evans RD, Kopf AW, Lew RA, et al. Risk factors for the development of malignant melanoma: review of case-control studies. *J Dermatol Surg Oncol.* 1988;14:393–408.
- Wolff T, Tai E, Miller T. Screening for skin cancer: an update of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med.* 2009;150:194–198.
- Dolianitis C, Kelly J, Wolfe R, Simpson P. Comparative performance of 4 dermoscopic algorithms by nonexperts for the diagnosis of melanocytic lesions. *Arch Dermatol.* 2005;141:1008–1014.
- Argenziano G, Soyer HP, Chimenti S, et al. Dermoscopy of pigmented skin lesions: results of a consensus meeting via the Internet. *J Am Acad Dermatol.* 2003;48:679–693.
- Gutkowicz-Krusin D, Elbaum M, Jacobs A, et al. Precision of automatic measurements of pigmented skin lesion parameters with a MelaFind multispectral digital dermoscope. *Melanoma Res.* 2000;10:563–570.
- Fikrle T, Pizinger K. Digital computer analysis of dermatoscopic images of 260 melanocytic skin lesions; perimeter/area ratio for the differentiation between malignant melanomas and melanocytic nevi. *J Eur Acad Dermatol Venereol.* 2007;21:48–55.
- Langley RG, Walsh N, Sutherland AE, et al. The diagnostic accuracy of in vivo confocal scanning laser microscopy compared to dermoscopy of benign and malignant melanocytic lesions: a prospective study. *Dermatology.* 2007;215:365–372.
- Gerger A, Hofmann-Wellenhof R, Samonigg H, Smolle J. In vivo confocal laser scanning microscopy in the diagnosis of melanocytic skin tumours. *Br J Dermatol.* 2009;160:475–481.
- Rigel DS, Russak J, Friedman R. The evolution of melanoma diagnosis: 25 years beyond the ABCDs. *CA Cancer J Clin.* 2010;60:301–316.
- Autier P, Dore J-F, Negrier S, et al. Sunscreen use and duration of sun exposure: a double-blind, randomized trial. *J Natl Cancer Inst.* 1999;91:1304–1309.
- Mackie BS, Mackie LE, Curtin LD, Bourne DJ. Melanoma and dietary lipids. *Nutr Cancer.* 1987;9:219–226.
- Bain C, Green A, Siskind V, et al. Diet and melanoma. An exploratory case-control study. *Ann Epidemiol.* 1993;3:235–238.
- Black HS, Thornby JJ, Wolf JE, et al. Evidence that a low-fat diet reduces the occurrence of non-melanoma skin cancer. *Int J Cancer.* 1995;62:964–969.
- Black HS. Can diet prevent nonmelanoma skin cancer progression? *Expert Rev Anticancer Ther.* 2005;5:801–808.
- Hakim IA, Harris RB, Ritenbaugh C. Fat intake and risk of squamous cell carcinoma of the skin. *Nutr Cancer.* 2000;36:155–162.
- Ibibebe TI, van der Pols JC, Hughes MC, et al. Dietary fat intake and risk of skin cancer: a prospective study in Australian adults. *Int J Cancer.* 2009;125:1678–1684.
- Fortes C, Mastroeni S, Melchi F, et al. A protective effect of the Mediterranean diet for cutaneous melanoma. *Int J Epidemiol.* 2008;37:1018–1029.
- Shapira N. Nutritional approach to sun protection: a suggested complement to external strategies. *Nutr Rev.* 2010;68:75–86.
- Singh A, Shukla Y. Antitumour activity of diallyl sulfide on polycyclic aromatic hydrocarbon-induced mouse skin carcinogenesis. *Cancer Lett.* 1998;131:209–214.
- Arora A, Kalra N, Shukla Y. Regulation of p21/ras protein expression by diallyl sulfide in DMBA induced neoplastic changes in mouse skin. *Cancer Lett.* 2006;242:28–36.
- Nigam N, Shukla Y. Preventive effects of diallyl sulfide on 7,12-dimethylbenz[a]anthracene induced DNA alkylation damage in mouse skin. *Mol Nutr Food Res.* 2007;51:1324–1328.
- Khan A, Shukla Y, Kalra N, et al. Potential of diallyl sulfide bearing pH-sensitive liposomes in chemoprevention against DMBA-induced skin papilloma. *Mol Med.* 2007;13:443–451.
- Bain C, Green A, Siskind V, et al. Diet and melanoma. *Ann Epidemiol.* 1993;3:235–238.
- McCusker MM, Grant-Kels JM. Healing fats of the skin: the structural and immunologic roles of the omega-6 and omega-3 fatty acids. *Clin Dermatol.* 2010;28:440–451.
- Naldi L, Gallus S, Tavani A, et al. Risk of melanoma and vitamin A, coffee and alcohol: a case-control study from Italy. *Eur J Cancer Prev.* 2004;13:503–508.
- MacLean CH, Newberry SJ, Mojica WA, et al. Effects of omega-3 fatty acids on cancer risk: a systematic review [erratum in *JAMA.* 2006;295:1900]. *JAMA.* 2006;295:403–415.
- Meeran SM, Akhtar S, Katiyar SK. Inhibition of UVB-induced skin tumor development by drinking green tea polyphenols is mediated through DNA repair and subsequent inhibition of inflammation. *J Invest Dermatol.* 2009;129:1258–1270.
- Nichols JA, Katiyar SK. Skin photoprotection by natural polyphenols: anti-inflammatory, antioxidant and DNA repair mechanisms. *Arch Dermatol Res.* 2010;302:71–83.
- Mukhtar H, Katiyar SK, Agarwal R. Green tea and skin-anticarcinogenic effects. *J Invest Dermatol.* 1994;102:3–7.
- Agarwal R, Mukhtar H. Cancer chemoprevention by polyphenols in green tea and artichoke. *Adv Exp Med Biol.* 1996;401:35–50.
- Yusuf N, Irby C, Katiyar SK, Elmets CA. Photoprotective effects of green tea polyphenols. *Photodermatol Photoimmunol Photomed.* 2007;23:48–56.
- Lee JH, Kishikawa M, Kumazoe M, et al. Vitamin A enhances anti-tumor effect of a green tea polyphenol on melanoma by upregulating the polyphenol sensing molecule 67-kDa laminin receptor. *PLoS One.* 2010;5:e11051.
- Lei J, Li X, Gong XJ, Zheng YN. Isolation, synthesis and structures of cytotoxic ginsenoside derivatives. *Molecules.* 2007;12:2140–2150.
- Park TY, Park MH, Shin WC, et al. Anti-metastatic potential of ginsenoside Rp1, a novel ginsenoside derivative. *Biol Pharm Bull.* 2008;31:1802–1805.
- Tanaka R, Ohtsu H, Iwamoto M, et al. Cancer chemopreventive agents, labdane diterpenoids from the stem bark of *Thuja standishii* (Gord.) Carr. *Cancer Lett.* 2000;161:165–170.
- Iwamoto M, Ohtsu H, Tokuda H, et al. Anti-tumor promoting diterpenes from the stem bark of *Thuja standishii* (Cupressaceae). *Bioorg Med Chem.* 2001;9:1911–1921.
- Siwak DR, Skishodia S, Aggarwal BB, Kurzroch R. Curcumin-induced anti-proliferative and proapoptotic effects in melanoma cells are associated with suppression of IκappaB kinase and nuclear factor IκappaB activity and are independent of the B-raf/mitogen-activated/extracellular signal-regulated protein kinase pathway and the Akt pathway. *Cancer.* 2005;104:879–890.
- Heng MC. Curcumin targeted signaling pathways: basis for anti-photoaging and anti-carcinogenic therapy. *Int J Dermatol.* 2010;49:608–622.
- Chatterjee SJ, Pandey S. Chemo-resistant melanoma sensitized by tamoxifen to low dose curcumin treatment through induction of apoptosis and autophagy. *Cancer Biol Ther.* 2011;11:216–228.
- Clark LC, Combs GF, Turnbull BW, et al. Effects of selenium supplementation for cancer prevention in patients with carcinoma of the skin: a randomized controlled trial. Nutritional Prevention of Cancer Study Group. *JAMA.* 1996;276:1957–1963.
- Duffield-Lillico AJ, Slate EH, Reid ME, et al. Selenium supplementation and secondary prevention of nonmelanoma skin cancer in a randomized trial. *J Natl Cancer Inst.* 2003;95:1477–1481.
- Guéniche A, Philippe D, Bastien P, et al. Probiotics for photoprotection. *Dermatoendocrinology.* 2009;1:275–279.
- Wang Z, Boudjelal M, Kang S, et al. Ultraviolet irradiation of human skin causes functional vitamin A deficiency, preventable by all-trans retinoic acid pre-treatment. *Nat Med.* 1999;5:418–422.
- Kune GA, Bannerman S, Field B, et al. Diet, alcohol, smoking, serum beta-carotene, and vitamin A in male nonmelanocytic skin cancer patients and controls. *Nutr Cancer.* 1992;18:237–244.
- Greenberg ER, Baron JA, Stukel TA, et al. A clinical trial of beta carotene to prevent basal-cell and squamous-cell cancers of the skin. The Skin Cancer Prevention Study Group [erratum in *N Engl J Med.* 1991;325:1324]. *N Engl J Med.* 1990;323:789–795.
- Green A, Williams G, Neale R, et al. Daily sunscreen application and betacarotene supplementation in prevention of basal-cell and squamous-cell carcinomas of the skin: a randomised controlled trial [erratum in *Lancet.* 1999;354:1038]. *Lancet.* 1999;354:723–729.
- Greenberg ER, Baron JA, Stukel TA, et al. A clinical trial of beta carotene to prevent basal-cell and squamous-cell cancers of the skin. The Skin Cancer Prevention Study Group. *N Engl J Med.* 1990;323:789–795.
- Gandini S, Raimondi S, Gnagnarella P, et al. Vitamin D and skin cancer: a meta-analysis. *Eur J Cancer.* 2009;45:634–641.
- Stryker WS, Stampfer MJ, Stein EA, et al. Diet, plasma levels of beta-carotene and alpha-tocopherol, and risk of malignant melanoma. *Am J Epidemiol.* 1990;131:597–611.

51. Offord EA, Gautier JC, Avanti O, et al. Photoprotective potential of lycopene, beta-carotene, vitamin E, vitamin C and carnosic acid in UVA-irradiated human skin fibroblasts. *Free Radic Biol Med.* 2002;32:1293–1303.
52. Eberlein-König B, Ring J. Relevance of vitamins C and E in cutaneous photoprotection. *J Cosmet Dermatol.* 2005;4:4–9.
53. Miyai E, Yanagida M, Akiyama J, Yamamoto I. Ascorbic acid 2-O-alpha-glucoside, as table form of ascorbic acid, rescues human keratinocyte cell line, SCC, from cytotoxicity of ultraviolet light B. *Biol Pharm Bull.* 1996;19:984–987.
54. Fourtanier A, Moyal D, Seité S. Sunscreens containing the broad-spectrum UVA absorber, Mexoryl SX, prevent the cutaneous detrimental effects of UV exposure: a review of clinical study results. *Photodermatol Photoimmunol Photomed.* 2008;24:164–174.
55. Strickland FM, Kuchel JM, Halliday GM. Natural products as aids for protecting the skin's immune system against UV damage. *Cutis.* 2004;74(suppl):24–28.
56. Filip A, Clichici S, Daicoviciu D, et al. Photochemoprevention of cutaneous neoplasia through natural products. *Exp Oncol.* 2009;31:9–15.
57. Wang SQ, Dusza SW, Lim HW. Safety of retinyl palmitate in sunscreens: a critical analysis. *J Am Acad Dermatol.* 2010;63:903–906.



# End-of-Life Care

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Integrative end-of-life care, integrative palliative care delivered at the end of a person's life, is usually referred to as hospice care (Fig. 80-1). It encompasses whole-person, relationship-centered care using conventional and alternative approaches with an emphasis on health and healing.<sup>1</sup> Goals of care for the dying person include optimization of well-being and quality of life, relief of distressing symptoms, empowered decision-making, support of caregivers, and effective life closure for peaceful and meaningful dying and death. Bereavement services for family and friends of the person dying are an essential element of care. Grief and loss begin with the diagnosis of disease. Hospice care incorporates the use of a multidisciplinary team of health professionals working together to best meet the needs of the patient and family. The team includes the patient's physician, the hospice physician, nurses, certified nurses' aides, chaplains, bereavement counselors, social workers, housekeepers, dietitians, volunteers, occupational and physical therapists, and other integrative practitioners who work in the hospice, are affiliated with the hospice, or have been sought out by the patient and family for care and support.<sup>2</sup> Integrative palliative care calls on us to be creative and innovative in the care of dying patients, expanding options to enhance healing, to maintain hope, and to improve well-being in a unique way for each person.

In a survey of complementary therapy services provided by hospices, 60% of responding organizations offered such therapies. The most common services were massage therapy (83%), music therapy (50%), therapeutic touch (49%), pet therapy (48%), guided imagery (45%), Reiki (36%), aromatherapy (30%), harp music (23%), reflexology (20%), art therapy (20%), hypnotherapy (4%), yoga (3%), acupuncture (1%), and humor therapy (1%). Constraints to providing complementary services were lack of funding, lack of staff time, lack of qualified complementary therapists, inadequate knowledge about these services, and patient and staff resistance to complementary therapies. Even in hospices that offered these services, less than 25% of the patients received them.<sup>3</sup> In a 2008 survey of 27 Nevada and Montana hospices

using the survey instrument of Demmer, 70.4% of hospices offered complementary and alternative medicine (CAM) services, but less than 25% of hospice patients received them. The most used CAM therapies included massage and music therapy; 61.1% of hospices had a salaried CAM provider, and 88.3% had CAM volunteers. None of the hospices had an assessment tool to determine which patients might benefit from CAM services. Barriers to use were the same as those cited for constraints to providing complementary services.<sup>4</sup> Preliminary research outcome data on the program have been favorable.<sup>5</sup> Demmer and Sauer<sup>6</sup> found that patients who received complementary therapies were more satisfied with their hospice services. Sirios<sup>7</sup> compared consumers seeking consultation with CAM practitioners in 1997 and 2005. Consumer motivation changed in that period from use of CAM due to negative attitudes toward conventional medicine to use of CAM modalities for their positive effects and a whole-person, empowered approach to health care.

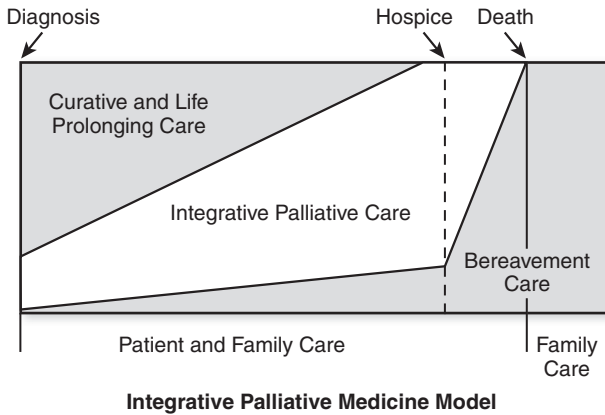
For patients dying with uncontrolled symptoms, such as pain, the symptoms are often more frightening than death itself. Patients desire pain and symptom control; the ability to prepare for their dying and to have their choices honored; life completion; mental clarity; being touched; being at peace with their god; having clinicians one can trust, who listen, and are comfortable talking about dying; and being in the presence of loved ones without being a burden.<sup>8</sup> Ira Byock<sup>9</sup> describes the essential elements of meaningful living as the expression of forgiveness, appreciation, and love. The phrases "Please forgive me," "I forgive you," "Thank you," and "I love you" embody these elements; they can improve relationships at any time in life but particularly at life's closure.<sup>9</sup>

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## Pathophysiology

General criteria in patients with advanced chronic illness who are dying are as follows: unintentional weight loss of more than 10% body weight, serum albumin value lower than

**FIGURE 80-1**  
Model of integrative palliative medicine.



2.5 g/dL, spending more than 50% of time in bed (Karnofsky score), inability to perform most activities of daily living, progression of disease, and uncontrolled symptoms despite aggressive treatment of the underlying illness.<sup>10</sup> Physicians tend to be overly optimistic about prognosis, an error that leads to delayed hospice referrals, less time for patient and family to prepare for death, delay or absence of end-of-life care discussions with informed decision making, lack of preparatory bereavement services, and inappropriate life-prolonging interventions. An important question for clinicians to ask themselves is, Would I be surprised if this patient died in the next year or in the next 6 months? If the answer is no, the patient has reached the end of life; communication about treatment preferences becomes more important and referral to hospice appropriate.<sup>11</sup>

Communication lies at the heart of integrative end-of-life care. “Hoping for the best” needs to be balanced with “preparing for the worst.”<sup>12</sup> Conversations must be sensitive in eliciting how much the patient wants to know.<sup>13</sup> Goals of care are explored in a patient-centered way and then serve as guides for further decision-making. Armed with knowledge about patient preferences for care, clinicians can avoid unwarranted treatment. Hope is then in keeping with what the patient wants to accomplish in his or her remaining life. Goals and hope will change as the process unfolds. Hope can be viewed as an inner power that moves a person forward in life. Questions that can be helpful in palliative medicine conversations with patients in uncovering what will move them forward and inspire hope include the following: How can I be most helpful to you? What worries you most now and for the future? What is important or meaningful to you right now? When the clinician listens to the answers intently without interruption, empowerment and a sense of hopefulness can arise in the patient. It allows the patient to heal and to live well in the face of dying. Hope becomes a fluid process of living fully rather than fixed dependence on a particular outcome.<sup>14</sup>

Communicating “bad” or challenging news constitutes an essential skill that is well described by Buckman.<sup>15</sup> It requires deep listening, empathy, presence, and emotional awareness on the part of the clinician (see Chapter 3, The Healing Encounter).

Hope does not lie in a way out, but in a way through.

*Robert Frost*

## Common Issues in End-of-life Care

Common symptoms managed in end-of-life care are pain; nausea, vomiting, and constipation; dyspnea; depression and anxiety; and delirium. Unrelieved physical, emotional, or spiritual discomfort must be treated as a palliative care emergency, and careful assessment and intensive palliative resources must be applied to prevent unnecessary suffering.<sup>16</sup> Uncontrolled symptoms can lead to the patient's desire for a hastened death.<sup>17</sup> On occasion, physical and psychological symptoms cannot be controlled with conventional and alternative therapies, and palliative sedation must be used to control symptoms such as intractable and intense pain, seizures, and existential psychological suffering. The intention of this therapy is to treat intractable suffering, not to hasten death. Careful guidelines have been developed for its use.<sup>18–22</sup>

It is beyond the scope of this chapter to discuss conventional symptom management in detail. There are many valuable palliative care resources for this information.<sup>2,23–27</sup>

## Pain Management

Opioids are the foundation of end-of-life pain management. Pain, however, is a complex phenomenon involving physical, emotional, social, and spiritual aspects that must be addressed for total pain management, as described by Cicely Saunders,<sup>28,29</sup> the founder of the modern hospice movement. The World Health Organization (WHO) ladder of pain management recommends various levels of pain treatment, depending on pain severity.<sup>23</sup> Physical pain is often a combination of nociceptive and neuropathic pain, and opioids alone are usually not effective in treating the neuropathic component of pain without adjunctive medications, such as antidepressants and anticonvulsant medication.<sup>29</sup>

Methadone is a unique opioid that can effectively treat both components but must be dosed carefully, given that it has a large volume of distribution and its kinetics differ from those of other opioids. The switch from another opioid to methadone must be made carefully and may require consultation with a pain or palliative medicine consultant.<sup>30–32</sup> There is no ceiling dose for opioids, and careful but aggressive and rapid titration of the dose to relieve pain is recommended (see box). Pain that is unrelieved by opioids can be treated with agents such as ketamine, paravertebral lidocaine, nerve blocks, and, in some cases, palliative sedation.<sup>29,33–36</sup>

Depression, anxiety, and spiritual distress can all increase the perception of pain intensity, and addressing these components of pain can reduce the need for pain medication.<sup>37,38</sup> A multicenter WHO study in primary

care revealed that persistent pain is associated with greater psychological illness.<sup>39</sup> Lin et al,<sup>40</sup> in a large randomized controlled trial, found that amelioration of depressive symptoms decreased pain and improved both functional status and quality of life.<sup>40</sup> Because most antidepressants, including St. John's wort, take 2 to 6 weeks to have effect, treatment at end of life depends on length of life expected. Psychostimulants such as methylphenidate have immediate effects in alleviating depression.<sup>41</sup> Other modalities, such as psychotherapy, energetic medicine, and mind-body modalities, can also have a beneficial effect.

Many integrative modalities for the pain management of chronic conditions are covered in other chapters in this volume and can be applied at end-of-life care. Relatively few studies have focused solely on alternative and complementary treatments of pain at end of life.

Never order opioids without also scheduling a stool softener and/or laxative such as senna to prevent constipation that can lead to bowel obstruction. A common one is docusate sodium, 100 mg at bedtime. A laxative is usually needed in conjunction with a stool softener to have a bowel movement at least every other day as a usual goal.

## Supplements for Pain

### Glucosamine Sulfate

Glucosamine is used for arthritis pain. Arthritis pain can be worsened with decreased mobility at the end of life. Glucosamine has fewer side effects than nonsteroidal antiinflammatory analgesics do, but it can be as efficacious for arthritis pain.

## PAIN MANAGEMENT FOR HOSPICE PATIENTS

### Remember!

- There is no maximum dose of morphine if the patient remains in pain.
- Dose the medicines around the clock to prevent pain; "prn" dosing for cancer pain is poor pain control.

### What You Will Need

- Morphine extended-release (MS Contin) 30 mg #60 to start (also comes as 15, 60, 100, and 200 mg)
- You can use suppositories for immediate-release dosing every 2 to 4 hours if the patient is unable to swallow (available as 5, 10, 20, and 30 mg).
- Paper and pencil, or calculator and pencil if math is "not your thing."

### Dosing for the First 48 Hours

Dosages for maintenance and long-acting pain medications may be calculated as follows:

Start with an immediate-release morphine sulfate liquid formulation that will be given every 4 hours.	Example: Roxanol 20 mg/mL concentrate
Give a loading dose of the liquid. This is done in part to demonstrate to the patient that the pain can be controlled, and it should relieve pain within 30 minutes.	Roxanol 30 mg (1½ mL)
Follow that with a maintenance dose, which is then given around-the-clock.	Roxanol 10-20 mg every 4 hours
To control breakthrough pain, the patient is allowed to take half the maintenance dose every hour as needed for pain.	Roxanol 5-10 mg every hour as needed
The patient is given a dose of long-acting morphine sulfate at bedtime to allow him or her to sleep through the night.	Morphine extended-release (MS Contin) 30 mg at bedtime

### Subsequent Dosing of Long-Acting Morphine Sulfate for Maintenance and Immediate-Release Liquid for Breakthrough Pain

Subsequent dosages of pain medications for maintenance and breakthrough pain are calculated as follows:

To figure the maintenance dose, add up the total amount of long-acting morphine sulfate given in a 24-hour period (immediate-release liquid plus long-acting pills used each day). Divide the total by 2; the result is the maintenance dose. The dosage can be rounded up or down to make things easier.	The total 24-hour dose is 120 mg. $120/2 = 60$ . The maintenance dose for long-acting morphine sulfate is started at 60 mg every 12 hours: MS Contin 30 mg, 2 tablets twice daily
To calculate the amount of immediate-release liquid to use for breakthrough pain, divide the total 24-hour dose by 6.	$120/6 = 20$ The patient may have 20 mg (1 mL) of Roxanol every 2 to 4 hours as needed for breakthrough pain.

**If More Pain Control Is Needed Over Time**

Recalculate dosages for more pain control as follows:

Have the family keep track of how much morphine sulfate is needed for breakthrough pain in a day.	The patient needs three doses of 20 mg of the immediate-release liquid (Roxanol) in a day; the total requirement is 60 mg.
Recalculate the amount of long-acting morphine sulfate that is given for maintenance as follows: Add the total daily breakthrough dose to the 24-hour maintenance dose to obtain the new maintenance dose.	Total daily breakthrough dose = 60 mg. 24-hour maintenance dose = 120 mg. New maintenance dose is 180 mg.
Divide this total by 2 to obtain the new twice-daily dose for the long-acting morphine sulfate.	$180/2 = 90$ Extended-release morphine (MS Contin) 90 mg twice daily
The same new maintenance dose number is then divided by 6 to obtain the new breakthrough dose for the immediate-release morphine sulfate that can be given every 2 to 4 hours as needed.	$180/6 = 30$ Roxanol 30 mg (1½ mL) every 2 to 4 hours as needed

Modified method of Michael Frederich, MD, Regional Medical Director, TrinityCare Hospice, Torrance, California; used with permission.

**■ Dosage**

Start with 3000 mg/day; once pain is relieved, decrease to 1500 mg daily. Tablets can be crushed. It can be taken for 1 to 3 months to achieve pain relief.

**■ Side Effects**

The side effects of glucosamine are minimal, but it can cause gastrointestinal distress.<sup>42</sup>

**Botanicals for Pain*****Cannabis***

Cannabis can help alleviate neuropathic pain. Dronabinol (Marinol) is the oral synthetic form of cannabis. Cannabinoid receptors are located in the central and peripheral nervous system (CB1) and the immune system (CB2). Investigation of these receptors is becoming more prominent.<sup>43</sup> One small randomized controlled trial found that cannabinoid CT-3 is significantly more effective than placebo in controlling neuropathic pain 3 hours after dosing, with less response after 8 hours. In a study of patients with human immunodeficiency virus (HIV) infection, cannabis improved muscle pain and nerve pain significantly.<sup>44-46</sup>

**■ Dosage**

The dose of dronabinol is 10 mg, four times a day.

**■ Side Effects**

Side effects include dry mouth, tiredness, and poor memory.

**Other Modalities for Treatment of Pain:  
Acupuncture, Massage, and Music**

A Cochrane review of 16 trials of acupuncture for osteoarthritis pain of the knee or hip showed statistically significant short-term improvements in pain.<sup>47</sup> A Cochrane review of massage and low back pain in 13 trials demonstrated short- and long-term significant relief of low back pain,

outperforming acupuncture, relaxation techniques, and other CAM modalities.<sup>48</sup> Music therapy was also found to relieve pain and to help decrease opioid dose needed.<sup>49</sup>

**Nausea, Vomiting, and Constipation**

Whenever nausea, vomiting, and constipation symptoms occur, it is important to establish the cause for an antiemetic targeted at the responsible mechanism to be used. Common causes are dysmotility, obstruction, side effects of medication such as opioids, metastases in the brain, and vestibular apparatus irritation (sometimes caused by dehydration). Constipation is a common cause of nausea and vomiting. Corticosteroids (such as prednisone and dexamethasone) can reduce the nausea and vomiting caused by the cerebral edema that occurs from brain metastases. Laxatives, stool softeners, and enemas can prevent and relieve constipation and bowel obstruction from severe constipation. The goal is to achieve a bowel movement at least every other day<sup>50,51</sup> (see Chapter 45, Constipation). Bulking agents should be avoided in patients who are not taking in sufficient fluids. Metoclopramide (Reglan) can relieve nausea from dysmotility but can have extrapyramidal side effects, especially in older persons. For dysmotility, promethazine (Phenergan) is a potent anticholinergic drug that should not be used for nausea in this situation because it will cause further slowing of gut motility.<sup>52</sup>

Antiemetics represent a variety of drugs with antihistamine, antidopaminergic, antiserotonergic (5-HT<sub>3</sub> receptor antagonists), and anticholinergic effects. They are not interchangeable. Promethazine is an antihistamine with potent anticholinergic effects and very weak antidopaminergic effects, making it a poor choice for treatment of the nausea of opioids as well. Prochlorperazine (Compazine) is the drug of choice for opioid-induced nausea, together with stool softeners to prevent constipation, metoclopramide to improve motility, and long-acting opioids to prevent drug level peaks that can cause nausea. 5-Hydroxytryptamine type 3 (5-HT<sub>3</sub>) antagonists such as ondansetron (Zofran)



are expensive second-line agents that are preferred for treatment of the nausea from chemotherapy or when other agents have failed or are contraindicated, such as in Parkinson's disease.<sup>52</sup> There is evidence that acupuncture as well as other mind-body and energetic therapies can also help relieve nausea.

## Botanicals for Nausea

### Ginger (*Zingiber officinale*)

Ginger can help alleviate nausea. It has been found efficacious for nausea of pregnancy, motion sickness, and nausea associated with chemotherapy but not for postoperative nausea.<sup>53</sup> Its mechanism of action is unknown, but ginger appears to have a prokinetic effect.

#### ■ Dosage

Take 500 to 1000 mg of ginger root extract every 4 to 6 hours as needed, or eat 1 tsp or 5 g of crystallized ginger every 2 to 3 hours as needed.

#### ■ Precautions

Side effects are rare. Excessive doses can cause heartburn.

### Cannabis

Cannabis can help alleviate nausea and improve appetite. In a study of HIV-positive patients, cannabis improved nausea and appetite significantly.<sup>45</sup>

#### ■ Dosage

Dronabinol, 10 mg, is given four times a day.

#### ■ Side Effects

Side effects include dry mouth, tiredness, and poor memory.

## Dyspnea

Opioids and oxygen are important palliative treatments of dyspnea. Opioids relieve the sensation of breathlessness and can improve the patient's functional capacity. Diuretics can help relieve dyspnea from fluid overload. Optimal treatment of the underlying condition is essential, but some interventions may no longer reverse the condition in end-stage disease. Nonpharmacologic strategies to help relieve dyspnea include the use of fans for a well-ventilated environment and cool ambient temperature. Complementary therapies include mind-body and energetic modalities.

Scopolamine, glycopyrrolate, and hyoscyamine dry oral secretions and decrease the "death rattle."<sup>54,55</sup> Dying is marked usually by progressive dehydration that keeps the patient comfortable by eliminating excessive secretions. Thirst is relieved with small sips of fluids and by keeping the mouth moist with frequent swabbing. Artificial feeding through a gastric tube and artificial intravenous fluids can cause respiratory congestion, pain, nausea, and vomiting. Families and health care professionals who equate caring with feeding can be encouraged to provide caring by other means, such as touch, life review, listening, and expressing love and appreciation to the dying person.<sup>56,57</sup>

Dyspnea is often accompanied by anxiety and is effectively treated with anxiolytics. If carefully titrated, opioids and

anxiolytics do not hasten death or cause respiratory depression but make the patient comfortable. Care must be taken in the opioid naive patient, and initial dosing is low.<sup>54,56</sup>

In a Cochrane review of nonpharmacologic interventions most effective in relieving malignant and nonmalignant dyspnea, there existed strong evidence for the positive role of neuroelectrical muscle stimulation and chest wall vibration and moderate evidence for breathing training and walking aids. There was weak evidence for the role of acupuncture and no evidence for benefit of music therapy. There was insufficient evidence for other modalities, such as relaxation breathing and psychological interventions. Most studies reviewed were of patients with chronic obstructive pulmonary disease.<sup>58</sup>

## Anxiety and Depression



Information on this topic can be found online at [expertconsult.com](http://expertconsult.com)

## Delirium

The patient's inability to focus, fluctuating level of consciousness, poor memory, agitation, hallucinations, hyperactivity and restlessness or hypoactivity and somnolence, tangential thinking, insomnia, anxiety, and significant distress characterize delirium. Careful assessment of the delirious patient is essential, and the condition should not be reflexively treated with anxiolytics, which can potentially make delirium worse.<sup>60</sup> Benzodiazepines, however, are first-line treatment of the delirium associated with alcohol withdrawal or seizures.<sup>64</sup> Medications commonly cause delirium, especially those with anticholinergic side effects, such as tricyclic antidepressants and antihistamines. Opioids can also cause delirium, and decreasing the dose or substituting another opioid with no active metabolites, such as hydromorphone (Dilaudid), can help. Steroids can cause delirium as well as hepatic encephalopathy, hypoxia, and hypoglycemia. Haloperidol (Haldol) continues to be the most effective medication for acute delirium. The treatment goal, however, is to treat the underlying cause.<sup>65-67</sup>

Near-death awareness encompasses a dying person's experience and possibly control over the dying process. When a patient experiences the presence of a deceased relative, clinicians can interpret this event as delirium with hallucinations and can inappropriately medicate the person with an antipsychotic or anxiolytic agent. The patient, however, may not demonstrate other criteria for delirium. Patients can feel annoyed, frustrated, and isolated in their profound end-of-life experiences. This is a time for clinicians to listen. Patients will attempt to describe these experiences or request something to ensure a peaceful death. They may know when they will die. They may use symbolic language to describe their experiences, which can be difficult to interpret. By being curious and appreciative of the experience, clinicians can validate and support the patient, help family members understand the experience, and perhaps learn themselves about the dying process.<sup>68-70</sup>

Anxiety is common in the end-of-life experience. Anxiolytics provide relief of short-term anxiety, whereas selective serotonin reuptake inhibitors (SSRIs) can effectively treat long-term anxiety as well as depression. Because SSRIs can take 2 to 6 weeks for effect, the patient's life expectancy must be considered. Depression can be treated with psychostimulants such as methylphenidate (Ritalin), dextroamphetamine (Dexedrine), or pemoline (Cylert) when immediate antidepressant effect is needed. Psychostimulants can also increase energy and appetite in dying patients and also counter the sedating effects of opioids.<sup>41</sup>

Anxiety and depression can be caused by uncomfortable physical symptoms but also by underlying psychological illness, spiritual concerns, or emotional needs.<sup>41</sup> The patient can be evaluated for these causes with current assessment tools. Anxiety must also be differentiated from the agitation and restlessness of delirium and the agitation from progressive dementia, which are not optimally treated with anxiolytics.<sup>59</sup> Weissman<sup>60</sup> advises careful assessment of the patient to prevent “automatic” treatment of any physical, emotional, psychological, or spiritual distress with anxiolytics. Depression must also be differentiated from grief, but the two often occur simultaneously in the dying patient. A number of mind-body and energetic therapies can ease anxiety and depression.

## Botanicals for Anxiety and Depression

### *St. John's Wort* (*Hypericum perforatum*)

*St. John's wort* can be used for treatment of depression. Effects can take 2 to 6 weeks to appear. A meta-analysis of 23 randomized controlled trials of *St. John's wort* demonstrated efficacy comparable to that of standard antidepressants and significant superiority to placebo for treatment of

mild to moderate depression.<sup>61</sup> Two large randomized controlled trials to test this effect, however, did not demonstrate efficacy of this botanical for major depression.<sup>62,63</sup>

#### ■ Dosage

*St. John's wort*, 300 mg, is given three times a day, followed by maintenance treatment at twice-daily dosing. Use standardized products containing 2% to 5% hyperforin or 0.3% hypericin.

#### ■ Side Effects

Side effects include gastrointestinal distress, dry mouth, constipation, and fatigue.

#### ■ Precautions

*St. John's Wort* interacts with many medicines that are also metabolized by the cytochrome P-450 system, including warfarin. It should not be taken with another SSRI. Because supplements and their quality control are not regulated by the Food and Drug Administration, the amount received by the patient may vary. Pharmaceutical SSRIs may provide more consistent dosing.

### *Cannabis*

*Cannabis* can help alleviate depression and anxiety. In a study of HIV-positive patients, *cannabis* improved depression and anxiety significantly.<sup>45</sup>

#### ■ Dosage

Dronabinol, 10 mg, is given four times a day.

#### ■ Side Effects

Side effects include dry mouth, tiredness, and poor memory.

Do not treat agitation reflexively with anxiolytics. Careful assessment is needed to determine the cause of agitation, especially in patients with decreased cognitive function such as dementia. Causes can include delirium, near-death awareness, spiritual distress, depression and anxiety, unrelieved pain, and other uncontrolled physical symptoms.

## Spiritual Care

End of life brings questions about life's meaning and purpose. Spiritual and religious concerns often affect end-of-life decision making.<sup>71</sup> In one study questioning ambulatory outpatients, 66% of respondents said they would want their physician to ask about their spirituality and beliefs if they became gravely ill, and 16% said they would not.<sup>72</sup> Careful spiritual assessment can help the patient who desires supportive spiritual resources to obtain them to aid in life closure. Expressive therapies such as music, art, collage, movement, and writing can facilitate the exploration of spiritual issues.<sup>73</sup> Life review or reminiscence therapy can encourage the discovery of meaning. Chibnall and associates<sup>74</sup> reported that higher levels of death distress in patients correlated with higher levels of physical and psychological symptoms, living alone, lower spiritual well-being, and less physician communication as perceived by the patient. In a study of patients with cancer, Meraviglia<sup>75</sup> found that higher levels of finding meaning in life and greater use of prayer correlated with higher psychological well-being and less physical distress. Use of a spiritual assessment tool can facilitate communication about life's meaning, life closure, and treatment goals and help assess a patient's strengths. It can also be used as a therapeutic tool to increase self-efficacy and well-being.<sup>76-80</sup> Puchalski's model for spiritual assessment with the acronym of FICA includes questions related to faith and belief, importance of that faith and beliefs, spiritual or social community, and how to address these beliefs in end-of-life care (Table 80-1).<sup>77</sup> The clinician can learn how the patient copes with illness, what support systems are in place, and what beliefs the patient may have that could affect decision making.<sup>81</sup> Supporting the dignity of the patient and his or her "person-ness" is essential in effective spiritual care. Miller et al<sup>82</sup> demonstrated better spiritual and psychological well-being in patients with life-threatening illness who were given supportive-affective group experiences with a spiritual inquiry tool.

The clinician should pray only with the explicit permission of the patient. Requests from the patient for prayer with the clinician should not compromise the clinician's religious beliefs. A clinician may choose to be with the patient in silence as the patient prays.<sup>79,83</sup> Often, the patient can identify a spiritual mentor, such as a priest, minister, or rabbi, who can guide him or her through the spiritual territory of the dying process. If not, involving the hospice chaplain, after obtaining the patient's permission, can provide the needed spiritual support. Spiritual support, however, can come from the entire end-of-life health care team, family, and friends<sup>84</sup> (see Chapter 110, Integrating Spiritual Assessment and Care.)

**TABLE 80-1. FICA: Taking a Spiritual History\***

Faith and belief	Do you consider yourself spiritual or religious? or Do you have spiritual beliefs that help you cope with stress? If the patient responds no, the physician might ask: What gives your life meaning? Sometimes patients respond with answers such as family, career, or nature.
Importance	What importance does your faith or belief have in your life? Have your beliefs influenced how you take care of yourself in this illness? What role do your beliefs play in regaining your health?
Community	Are you part of a spiritual or religious community? Is this of support to you? How? Is there a group of people you really love or who are important to you? Communities such as churches, temples, mosques, or a group of like-minded friends can serve as strong support systems for some patients.
Address in care	How would you like me, your health care provider, to address these issues in your health care?

© Christina M. Puchalski, MD, 1996. Modified with permission from Puchalski CM, Romer AL. Taking a spiritual history allows clinicians to understand patients more fully. *J Palliat Med.* 2003;3:129-137.

\*The acronym FICA can help structure questions for health care professionals taking a spiritual history.

## Bereavement

The loss of the healthy self begins at the time of diagnosis of illness. Delivery of "bad" or "important" news requires skill in managing the grief of the patient and family for this loss.<sup>15</sup> Grief is the experience of the loss, and bereavement is the process of journeying through grief. Mourning is the public expression of grieving. Grief work or bereavement targets the restoration of wholeness and a new identity as the desired outcome. Each person journeys through the grief process uniquely, but certain tasks of grieving are universal; they are to accept the reality of the loss, to experience the pain of the loss, to adjust to a new reality where the deceased is not, and to reinvest energy into new relationships.<sup>85</sup> The grief that the dying patient experiences is called preparatory grief.<sup>86</sup>

In hospice care, bereavement services are offered to the patient and family before death (anticipatory grief occurs for the family before the death) and to the family up to 13 months after the patient's death. Supportive interventions for preparatory grief of the patient and for the anticipatory grief of the family help prevent depression in the patient and complicated grief in family and significant others left behind by the death. Periyakoil and Hallenbeck<sup>87</sup> suggest psychosocial-spiritual interventions with the acronym RELIEVER: reflect with the patient on emotions, empathize, lead with questions to facilitate grieving, improvise interventions to

the unique individual, educate about the grief process and what to expect, validate the experience, and recall the life story and accomplishments of the patient. All health care professionals and bereavement counselors can facilitate this process. As in spiritual exploration, the use of the humanities such as art, music, writing, and collage can help individuals express their grief and work through it one-on-one or in bereavement groups.

Encouragement of healthy grieving can prevent complicated grief, such as delayed grief, absent grief, distorted grief, and chronic grief. When complicated grief occurs, refer to a bereavement counselor, psychiatric consultant, or spiritual counselor. Grief can also be complicated by major depression, anxiety disorder, posttraumatic stress disorder, and, in children, adjustment disorder. Those at risk for complicated grief include mothers after the death of a child, widowers, family members who feel guilt or anger or “unfinished business” with the deceased, survivors of a sudden violent death of a loved one, children and teenagers who have lost a parent, persons with a history of psychiatric illness or substance abuse, and refugees. Patients presenting with somatic or psychiatric symptoms may be experiencing complicated grief, and this should be explored. In the patient interview, the clinician starts the therapeutic intervention by acknowledging the loss and then supports the patient in the grief process.<sup>88</sup> In one study, those who had strong spiritual beliefs were more resilient in the face of grief and had lower incidence of complicated grief.<sup>89</sup>

Depression must be differentiated from preparatory grief in the dying patient because depression requires different interventions for successful treatment. Depression is characterized by flat affect, anhedonia, hopelessness, worthlessness, guilt, and social withdrawal. One must remember that pain can also cause a flat affect, anhedonia, and withdrawal. In grief, sadness fluctuates and responds to social support, some activities can be enjoyed, and sadness improves with time. Symptoms such as insomnia and loss of appetite cannot be used to differentiate depression and grief in the dying process. Patients can at times sense whether they are depressed or grieving, and asking patients if they are feeling depressed can simply differentiate between the two states.<sup>90</sup>

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## Integrative Therapies

### Nutrition

Appetite naturally decreases at end of life, and progressive dehydration is the rule. Food and fluids optimally are flavorful and of an appropriate consistency to facilitate swallowing. Food is often equated with caring, but forcing the patient to eat and drink is to be avoided. Offering small quantities of food and foods desired by the patient is optimal. Avoid dietary restrictions unless certain foods cause uncomfortable symptoms. In conditions such as congestive heart failure and pneumonia, fluid overload is to be avoided. Cool foods are often better tolerated than warm or hot foods, unless the patient prefers the latter. Fruit-flavored juices, ices, or smoothies can relieve dry mouth and are usually well tolerated. Cancer in particular can change taste sensation, and foods that taste good to the patient should be maximized.<sup>91,92</sup>

### Supplements

Polypharmacy with nutritional supplements is to be avoided, just as polypharmacy with medications at end of life can increase burden on the patient without significant benefit. Only those nutritional supplements essential to the patient's well-being should be continued. In most cases of patients imminently dying, almost all nutritional supplements can be discontinued except for those giving specific symptom relief. Patients and families must be a part of this decision-making process because they may hold strong beliefs about what supplements are essential for their well-being. These supplements can be continued unless the patient is having difficulty swallowing them, they are contributing to distressing symptoms, or they are contraindicated (e.g., fish oil in a patient with the potential for bleeding or actively bleeding).

### Mind-Body Therapies

Mind-body therapies are efficacious for chronic pain, anxiety, depression, and insomnia. In a telephone survey of 2055 Americans, 18.9% had used one mind-body therapy in the past year.<sup>93</sup>

#### *Mindfulness-Based Stress Reduction*

In a meta-analytic review of mindfulness-based stress reduction (MBSR), an 8-week program of teaching moment-to-moment awareness of mind-body interactions was significantly correlated with reductions in the anxiety, chronic pain, stress, and depression often found in patients at end of life.<sup>94,95</sup> Practices that can be used in end-of-life care include walking, sitting, or lying meditation, depending on the condition of the patient; body scan meditation; gentle Hatha yoga; and breath awareness.<sup>96</sup> MBSR has also been combined with art therapy in cancer patients, achieving higher quality-of-life measures than in controls as well as diminished psychological distress.<sup>97</sup>

#### *Life Review and Reminiscence Therapy*

Life review and reminiscence therapy are techniques used in end-of-life care as therapeutic interventions. Reminiscing is often done in a group setting, focuses on happy memories, is superficial in nature, and aims to improve socialization and communication skills.<sup>98</sup> It is especially effective with patients who have dementia.<sup>99</sup> Life review, in contrast, is performed individually by a health professional who guides the patient in specific recollections in an effort to reframe, reexplore, and redefine life events and explore them for meaning. Using Milton Erickson's life stage approach,<sup>100</sup> life review is a critical developmental task enabling older persons and the dying to achieve ego integrity rather than despair. With the achievement of ego integrity, a person finds meaning in his or her life and dying experience and, it is hoped, fears death less.<sup>101</sup> Chochinov<sup>80</sup> has developed a life review tool to guide patients in looking over their lives for meaning and purpose and to help them maintain their person-ness and dignity in the dying process. The dignity-conserving perspectives fostered by this style of life review include continuity of self, role preservation, maintenance of pride, hopefulness, autonomy and control, generativity and legacy, acceptance, resilience, and fighting spirit. Three personal approaches that enhance dignity are living in the moment, maintaining normalcy, and finding spiritual comfort.<sup>80</sup> More research is needed to

document the effects of life review, although many working in end-of-life care acknowledged that this tool has significant effects in relieving the existential suffering of dying patients.<sup>101-103</sup>

### *Hypnosis and Guided Imagery*

In small trials, hypnosis and guided imagery have been shown to reduce anxiety, pain, and stress and to promote relaxation. Hypnosis creates a state of “focused awareness and attention,” which can facilitate improvements in coping, well-being, and acceptance of death.<sup>98</sup> Guided imagery can be facilitated with music to evoke deeper connection.<sup>96,104,105</sup> Hypnosis was found to be efficacious in attenuating the nausea and vomiting associated with cancer chemotherapy as well as pain.<sup>106</sup> Hypnosis and guided imagery may be helpful in decreasing pain and increasing relaxation in patients at end of life, although more research is needed in this area.<sup>107,108</sup> Guided imagery can also be used before death to imagine a person's optimal dying process: who would be with the person, what environment he or she would be in, what he or she would like to hear or say, and so on. Once this process is defined through imagery, family can do their best to re-create it (see Chapter 92, Self-Hypnosis Techniques, and Chapter 95, Guided Imagery and Interactive Guided Imagery).

### *Music Therapy*

Simple music that is relaxing can be provided by anyone, but only a certified music therapist provides music therapy. In active approaches to music therapy, the patient creates music with voice or instruments as a way of relating or expressing deep feelings. In receptive music therapy, the patient is receptively engaged but listening to music rather than creating it. Some forms of receptive music therapy involve the playing of music while the patient reminisces, paints, relaxes, meditates, or moves gently. Goals of therapy include relief of pain or other discomfort, relaxation, increased energy, better sleep, and relief of depressive symptoms. Music therapy has a clear theoretical framework for its effects. Although a number of studies have examined the use of music therapy for depression, the variety of modalities of music therapy makes it difficult to create a systematic review with strong recommendations.<sup>109</sup>

Music can raise endorphin levels in the brain and lower adrenaline levels.<sup>110,111</sup> The noise level in an intensive care unit (ICU) can exceed 60 dB, engendering anxiety and pain in the patients being treated there. Music can help modulate this noisy environment when it is played through earphones, but music therapy should not be continuous, and optimal treatment periods are 25 to 90 minutes.<sup>112-114</sup> Studies by Chlan<sup>111</sup> and Wong et al<sup>115</sup> have shown that 30 minutes of music therapy for relaxation is more effective than uninterrupted rest of ICU patients undergoing mechanical ventilation, and Zimbaro and Gerrig<sup>116</sup> found that 30 minutes of classical music therapy in an ICU setting equaled the relaxation effects of 10 mg of diazepam. In a 2010 Cochrane review, because of high risk of bias and limited number of studies, insufficient evidence was found for beneficial effects of music in end-of-life care to improve quality of life.<sup>117</sup> Music therapy can improve mood in depression.<sup>118</sup> This modality reduced the intensity of pain by up to 70% in one study and can decrease opioid requirements.<sup>49</sup>

Music thanatology combines music therapy as medicine and spirituality. Its goals are to relieve suffering and pain and to promote a peaceful and conscious death. The therapy depends on the assessment of the musician and the needs of the patient and is therefore described as prescriptive music. A bedside vigil lasts 45 to 60 minutes, and caregivers are encouraged to be present. A portable harp produces polyphonic sound that is described by Therese Schroeder-Sheker,<sup>119</sup> founder of the Chalice of Repose Project in End of Life Care in Oregon and North Carolina, as dissolving, which is well suited to the various environments in which the vigils are held. The tempo of the music is synchronized to the heart and respiratory rate of the patient to produce entrainment to a more relaxed or sleep state.<sup>120</sup> In one study of harp therapy, 77% of patients and families found the therapy of great benefit, and 23% found it to be of some benefit. Anxiety was relieved in 84% of patients, fear in 70%, dyspnea in 71%, nausea in 92%, and pain in 63%.<sup>5</sup>

### *Massage*

Massage encompasses many different styles, but in dying patients, gentler forms such as Swedish massage may be better tolerated. Massage is beneficial in the treatment of depression and pain, and it can help alleviate anxiety and promote more restful sleep.<sup>121-130</sup> In one study of 1290 patients with cancer, massage reduced moderate to severe symptoms of pain, fatigue, anxiety, and nausea by about 50%.<sup>131</sup> A Cochrane review found evidence that massage, especially paired with stress reduction techniques, improved quality of life in HIV/AIDS patients.<sup>132</sup> Hand massage may be helpful for patients with dementia who are agitated. This modality can promote relaxation.<sup>133</sup> This modality is also combined with aromatherapy at times for a synergistic effect.

### *Aromatherapy*

Aromatherapy is often used together with massage. One randomized controlled trial showed that massage therapy with or without lavender oil helped promote sleep; massage therapy appeared to be the essential intervention.<sup>134</sup> Lavender oil aromatherapy alone was found to relieve anxiety in two small studies.<sup>135,136</sup> Use of rosemary oil increased alertness and decreased anxiety.<sup>135</sup> In a small study of 20 terminally ill patients with cancer, a regimen of lavender oil aromatherapy, followed by a foot soak with oil and warm water, followed by application of reflexology significantly relieved fatigue.<sup>137</sup> In another small experimental study of 17 hospice patients, inhaled lavender aromatherapy helped relieve anxiety and pain.<sup>138</sup> In a systematic review, aromatherapy massage showed benefit for psychological well-being and anxiety. Limited evidence exists for benefits in nausea, pain, and depression.<sup>139</sup> The species of plant used for the oil and the quality of the essential oil can have an impact on therapeutic effect.<sup>140</sup> Many essential oil blends exist for specific indications, and the reader is encouraged to read a definitive text on this modality or to seek out the services of a certified aromatherapist.

### *Energy Medicine*

Subtle energies involved in some complementary therapies work on a level of physics that is new to a purely mechanical, materialistic, and chemical view of life, and new discoveries have been slowly accepted in the understanding of biologic

systems. DNA has been found to have electronic as well as acoustical resonances, in which quantum fluctuations switch DNA expression on and off. Music thanatology, described previously, may very well affect acoustical resonances on a DNA level as well as on a universal healing plane.<sup>141</sup> The emerging understanding that exists today makes the randomized clinical trial perhaps too primitive a research tool with which to study these energetic modalities, especially at end of life, when a person's vibrational energies merge with the energies beyond the human form (see Chapter 112, Human Energetic Therapies).

### Healing or Therapeutic Touch and Reiki Therapy

In small, nonrandomized, not controlled trials, therapeutic touch has been found to reduce anxiety and pain and to improve relaxation. Therapeutic touch is the focused intention to heal on the part of the practitioner; it involves the transfer of energy from the environment through the practitioner to the patient.<sup>142</sup> In one large descriptive study, a hospital evaluated its inpatient therapeutic touch program. The investigators found that it decreased anxiety and pain and increased relaxation.<sup>143</sup> It is challenging to research therapeutic touch with randomized controlled trials because it is difficult to have a control group, and the effects cannot be differentiated from a placebo response.<sup>144</sup> Four trials of therapeutic touch for wound healing were variable in effect.<sup>145</sup> A Cochrane review on touch therapies found modest effects on decreasing pain, and positive results seemed to be in part related to the experience of the practitioner.<sup>146</sup>

Reiki therapy balances the bioenergy fields on a deep vibrational level. Its therapeutic goals are to restore balance and resiliency and to promote nonspecific healing. Light touch is used on specific areas of the head and torso. If the patient has lesions, the practitioner's hands can hover a few inches above the patient. Reiki therapy may reduce anxiety and pain.<sup>147</sup> Miles and True<sup>148</sup> reviewed randomized controlled trials of the use of Reiki therapy and found inconclusive results.

### Acupuncture and Traditional Chinese Medicine

Traditional Chinese medicine has been practiced for thousands of years as a system of healing modalities, including herbs, acupuncture, and qi gong, designed to balance the life energy called *qi*. Acupuncture is an effective modality

for breathlessness, nausea and vomiting, and pain.<sup>149–151</sup> One randomized controlled trial showed a significant decrease in neuropathic pain with acupuncture compared with sham acupuncture.<sup>152</sup> Acupuncture is effective for pain in a number of musculoskeletal pain syndromes, such as headache, chronic neck and back pain, and osteoarthritis. Adverse reactions are rare.<sup>153–157</sup>

### Therapies to Consider

Art therapy is useful in bereavement groups, especially with children and teens, as a means of expressing feelings, communications about the death, and their resulting grief. Pet therapy is also increasingly more popular in end-of-life care. Anyone dying who has a pet should be allowed to have the pet present at end of life if at all possible. The comfort provided can reduce anxiety.<sup>158</sup> Other modalities to consider in end-of-life care are homeopathy, chiropractic care, osteopathic manipulation, and humor therapy. See [Key Web Resources](#) for a list of resources for patients and clinicians.

## PREVENTION PRESCRIPTION

- Prevention is focused on maximizing comfort, well-being, healing, and life closure rather than on prevention of death.
- Carefully apply and titrate therapeutic interventions to minimize side effects and to maximize well-being.
- Avoid skin breakdown with frequent turning and gentle massage.
- Prevent anxiety and spiritual discomfort with supportive and trusting therapeutic relationships, effective symptom management, empowered decision making by the patient, and bereavement and spiritual care.
- Prevent complicated grief with effective bereavement services during terminal illness and after death.
- Advocate the use of advance directives, educate the patient and family on options in end-of-life care, elicit and honor patient treatment preferences, and deliver palliative care on the basis of the patient's treatment goals. Doing so will reduce unnecessary and unwanted interventions at the end of life.



## THERAPEUTIC REVIEW

A number of therapeutic interventions can be used synergistically to maximize therapeutic effect, in some cases reducing the dose of medication needed for effect and minimizing side effects. In addition to controlling symptoms, many integrative modalities can improve well-being by enhancing psychological and spiritual health as well as by providing physical comfort. In end-of-life care, unnecessary therapies are discontinued,

and less invasive modalities can be increased in keeping with the needs and goals of the patient, the resources available, and the patient's response to them. Attentive listening and keen observation are essential in guiding therapeutic choices.

### ■ Pain Management

#### ■ Pharmaceuticals





- Treat pain as an emergency. Addiction at end of life is a nonissue. Believe the patient's report of pain. Treat pain aggressively. Use a lower starting dose in patients

- who are opioid naive and in older persons, but increase dosage rapidly and carefully for an adequate response. There is no ceiling dose for opioids.<sup>29</sup>
- For unrelieved severe pain, increase the immediate-acting opioid dose by 50% to 100% every 24 hours; for moderate pain, increase the dose by 25% to 50%. The dose of short-acting opioids for breakthrough pain should be 5% to 10% of the total 24-hour dose of sustained-release medication and should be given every 1 to 2 hours. Consider increasing bedtime dose by 50% to avoid administration during the night. Opioid-induced sedation caused by initiation of or increase in the dose of an opioid analgesic usually clears within a few days.<sup>29,159,160</sup>
  - Use scheduled dosing of a long-acting pain medication for chronic pain to prevent oversedation and troughs of pain relief. Adjust dose every 2 to 4 days after a steady state is achieved. Increase the dose of immediate-acting opioids for uncontrolled pain. Administer by mouth whenever possible. Avoid intramuscular injections.<sup>29</sup>
  - The lowest dose of the fentanyl transdermal patch is 12 mcg/hr and replaced generally every 3 days. The 25-mcg/hr patch is equivalent to approximately 50 mg of oral morphine daily. The patch should be avoided in opioid-naïve patients, for whom the starting dose may be too strong. Most patients can take oral medication, which also costs less. The transdermal patch takes 8 to 24 hours to achieve analgesic effect and therefore should not be used alone to treat acute pain. Also, once the patch is removed, the analgesic effect continues for 17 to 24 hours. Dosage may be usually titrated every 6 days. Absorption increases with fever. Subcutaneous fat is needed as a reservoir for the drug.<sup>29,159</sup>
  - Decrease dose and intervals of analgesics in patients with reduced hepatic and renal clearance and in patients who are dehydrated and oliguric.<sup>29</sup>
  - Extended-release tablets cannot be crushed or chewed. Extended-release granules can, however, be mixed with food or fluids or given by gastric tube.<sup>29</sup>
  - Avoid use of meperidine (Demerol) because of its problematic metabolites when it is used for chronic pain.<sup>159</sup>
  - For severe chronic pain, start with extended-release morphine, 15-mg tablet twice daily, with immediate-acting morphine, 10 mg every 4 hours, as needed. Kadian, a long-acting morphine preparation, consists of a capsule containing sprinkles that can be given by gastric tube or mixed with food; the starting dose is 20 mg every 24 hours.<sup>29</sup>
  - Hydromorphone does not have toxic metabolites and is preferred in patients with severe renal insufficiency. Morphine and oxycodone are excreted renally and should be used carefully or avoided in patients with severe renal insufficiency.<sup>29</sup>
  - In patients with liver impairment, morphine is preferred. Avoid acetaminophen and tricyclic antidepressants in patients with liver impairment.<sup>29</sup>
  - Methadone is useful in the treatment of nociceptive and neuropathic pain; it is inexpensive and can control pain that is not responsive to other opioids.<sup>30</sup> Initiation and titration of methadone therapy is unique, and appropriate resources must be carefully used; alternatively, the clinician can consult with a palliative medicine or pain consultant.<sup>30,32</sup> Conversion to methadone from another opioid is also unique, and guidelines for optimal, safe conversions are available.<sup>29–33</sup>
  - Always use a stool softener when treating a patient with opioids, for example, docusate (Colace), 100 mg twice daily. Use laxatives liberally; senna (Senokot), at a starting dose of 2 tablets at bedtime as needed, works well. The goal is for the patient to have a bowel movement every other day. A stool softener alone is often not effective, and use with a laxative is needed.
  - Neuropathic pain often requires the addition of adjuvant medications, such as anticonvulsants (e.g., gabapentin [Neurontin] starting at 100 mg three times a day) or antidepressants (e.g., the tricyclic antidepressant nortriptyline [Pamelor] starting at 10 mg/day or amitriptyline starting at 25 mg at bedtime), for adequate relief. Opioids alone, except methadone, are usually not adequate to treat neuropathic pain.<sup>29</sup> Use caution with renal or hepatic impairment.
- ### ■ Botanicals and Supplements
- For arthritis pain, glucosamine sulfate: start with 3000 mg/day; once pain is relieved, decrease to 1500 mg/day. Tablets can be crushed. The patient needs to use it for at least a few months to assess the effect.
  - For pain, especially neuropathic pain, cannabis (oral synthetic cannabinoid): dronabinol, 10 mg four times a day. Medical marijuana is only available legally in specific states in the United States and countries worldwide. Check local laws and clinical resources.
- ### ■ Other Modalities
- Consider acupuncture for neuropathic and nociceptive pain, often in conjunction with medication.
  - Massage can help relieve pain.
- ### ■ Nausea and Vomiting
- #### ■ Lifestyle
- Target the mechanism of cause and either discontinue the offending medication or treat the underlying cause.
- #### ■ Pharmaceuticals
- Stimulation of chemoreceptor trigger zone (CTZ) in the fourth ventricle of the brain by medications including opioids, hypercalcemia, or uremia commonly causes nausea and vomiting. The CTZ has dopamine



and serotonin (5-HT<sub>3</sub>) receptors. Antidopaminergics such as prochlorperazine and haloperidol and 5-HT<sub>3</sub> antagonists such as ondansetron most effectively treat this cause of nausea and vomiting.<sup>52</sup>

Prochlorperazine: start at 5 mg every 6 hours as needed orally or 25 mg twice daily as needed by the rectal route

Haloperidol: start at 1.5 mg orally three times daily as needed; may also be given subcutaneously


- Nausea caused by constipation is relieved with laxatives.<sup>52</sup> 
- Nausea caused by infection and inflammation responds well to anticholinergic and antihistamine antiemetics, such as promethazine, starting at 25 mg orally or rectally every 4 to 6 hours as needed; this agent can also be given intramuscularly or intravenously starting at 50 mg every 4 to 6 hours as needed.<sup>52</sup> 
- Nausea caused by dysmotility of the gut, such as in the use of opioids, is relieved best with prokinetic agents such as metoclopramide, starting at 5 mg orally, intramuscularly, or intravenously every 6 to 8 hours as needed. Anticholinergic drugs make this kind of nausea worse. Avoid this drug in patients with Parkinson's disease and renal failure.<sup>52</sup> 
- Vestibular causes of nausea respond best to antihistamine, anticholinergic drugs such as promethazine, and scopolamine, one patch every 72 hours as needed.<sup>52</sup> 

#### ■ Botanicals



- Ginger: 500 to 1000 mg of ginger root extract as needed (boiled to make a tea), or eat 1 tsp or 5 g of crystallized ginger as needed for nausea. 
- Cannabinoid: dronabinol CT-3, 10 mg four times a day for nausea and to improve appetite. 

#### ■ Dyspnea

##### ■ Pharmaceuticals

- Oxygen therapy can help relieve dyspnea caused by low oxygen saturation.
- Morphine and other opioids can help relieve the sensation of breathlessness.<sup>54</sup> Start with a low dose of sustained-release morphine (e.g., 15 mg twice daily). A 10-mg dose of immediate-release morphine is sometimes given to the patient to assess the response, especially in a patient who has never taken morphine. Also, in elderly and opioid naive patients, consider initially using very low doses of morphine solution in doses of 2 to 4 mg every 3 hours either scheduled or as needed. Immediate-release morphine can also be given if the patient must exert himself or herself above baseline activities, if a more strenuous activity causes more dyspnea. 

The dose is given 30 minutes before the more strenuous activity.

- In patients already receiving opioids for pain, the dose of opioid to control breathlessness may need to be 1.5 to 2.5 times the analgesic dose.<sup>29</sup>
- Drying secretions with a scopolamine patch every 72 hours can help with the sensation of dyspnea. Avoidance of overhydration is also important. 
- Anxiolytics such as lorazepam (Ativan), 0.5 to 2 mg every 6 to 8 hours as needed, can help with the anxiety associated with breathlessness. 



#### ■ Energy Medicine

- Acupuncture can help relieve dyspnea. 



#### ■ Delirium

- Assess for delirium carefully because the patient can be in a hyperactive/agitated or hypoactive/somnolent delirium state. Do not treat states of agitation reflexively with anxiolytics, which have a high potential to make delirium worse. Medications (especially with anticholinergic side effects), steroids, benzodiazepines, and opioids are often the culprit, and offending medications must be discontinued or changed, the dose decreased, or the route of administration changed. Treatment is aimed at the underlying cause.<sup>60,65,66</sup>
- Delirium must be differentiated from near-death awareness.<sup>70</sup>

#### ■ Pharmaceuticals


- Haloperidol is the drug of choice for treatment of acute delirium; dosing starts at 0.5 to 2 mg orally two or three times a day or 0.5 to 2 mg intravenously or intramuscularly every 1 to 4 hours as needed. The dose can be titrated down by 25% daily. It is less sedating and has fewer side effects than other neuroleptics. Side effects are extrapyramidal, consisting of restlessness, tremor, and so on.<sup>60,65</sup> Use caution if the QTc interval is prolonged. 
- Benzodiazepines are indicated for delirium caused by seizures and alcohol or sedative withdrawal and in cases not responding to haloperidol.<sup>64,65</sup> 

#### ■ Spiritual Care


- Indigenous cultural and spiritual practices are important in facilitating healing as well as peaceful, meaningful dying and death. Ritual and ceremony are important in supporting the patient and relieving emotional and spiritual distress, which can have an ameliorating effect on physical symptoms. 
- Spiritual inquiry using a spiritual assessment tool, meditation, and prayer can improve spiritual and psychological well-being in the dying process and also relieve physical symptoms. 




### ■ Bereavement


- Preparatory grief work for the patient can help relieve existential distress, and anticipatory grief work for family, friends, and health care staff can diminish complicated grief after the death. 


### ■ Nutrition


- Reducing food and fluid intake is normal in the dying process, and patient discomfort can occur if food or fluids are forced. Substitute the nurturing aspects of feeding with touch and other ways to show love and caring to the patient. Offer foods in small quantities that the patient enjoys and finds palatable. Swab the mouth frequently to prevent feeling of thirst. 

### ■ Mind-Body Therapies

- Mindfulness-based stress reduction can decrease anxiety, chronic pain, stress, and depression. 
- Music therapy encompasses many modalities. Harp therapy can decrease pain, existential and physical suffering, anxiety, and nausea and can improve sleep.


- Massage therapy also includes many different styles of treatment; it can ameliorate pain, fatigue, anxiety, depression, and nausea as well as promote better sleep. 


- Reminiscence therapy can improve cognition in patients with dementia. 


- Life review therapy improves depression and spiritual distress, improves quality of life, and alleviates pain. 

- Hypnosis and guided imagery can reduce anxiety, pain, and stress and promote relaxation. 

### ■ Energy Therapies

- Aromatherapy massage has been shown to be of benefit for psychological well-being and anxiety. Limited evidence exists for its benefits in nausea, pain, and depression. 

- Therapeutic touch may reduce anxiety and pain and promote relaxation. Other benefits are also possible, but this modality is challenging to research. 

- Acupuncture is an effective modality for nausea and vomiting and pain. 

## KEY WEB RESOURCES

### Advance Care Planning

- Aging with Dignity Five Wishes: [www.agingwithdignity.org](http://www.agingwithdignity.org)
- Respecting Choices: <http://respectingchoices.org/>
- Partnership for Caring: America's Voices for the Dying: [www.partnershipforcaring.org](http://www.partnershipforcaring.org)
- Complementary and alternative medicine integrative pain management: [www.stoppain.org](http://www.stoppain.org)
- Integrative pain assessment and treatment: [www.HealingChronicPain.org](http://www.HealingChronicPain.org)

### Palliative Medicine and Hospice

- Education in Palliative and End-of-Life Care (EPEC): [www.epec.net](http://www.epec.net)
- End-of-Life Nursing Education Consortium (ELNEC): [www.aacn.nche.edu/el nec](http://www.aacn.nche.edu/el nec)
- Dying Well: [www.dyingwell.org](http://www.dyingwell.org)

- National Hospice and Palliative Care Organization: [www.nhpc.org](http://www.nhpc.org)
- Last Acts: [www.lastacts.org](http://www.lastacts.org)
- End of Life/Palliative Educational Resource Center—Fast Facts: [www.eperc.mcw.edu](http://www.eperc.mcw.edu)
- Americans for Better Care of the Dying (ABCD): [www.abcd-caring.com](http://www.abcd-caring.com)
- Death, dying, and grief resources: [www.katsden.com/webster/index.html](http://www.katsden.com/webster/index.html)
- American Academy of Hospice and Palliative Medicine: [www.AAHPM.org](http://www.AAHPM.org)
- Society for Integrative Oncology: [www.integrativeonc.org](http://www.integrativeonc.org)
- Module on grief with patient resources including handouts on coping with grief and tools to help with the grief experience: <http://www.fammed.wisc.edu/integrative/modules/grief>

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Maizes V, Koffler K, Fleishman S. Revisiting the health history: an integrative approach. *Adv Mind Body Med*. 2002;18:31–34.
- Policzer JS. How to work with an interdisciplinary team. In: Kinzbruner BM, Weinreb NJ, Policzer JS, eds. *20 Common Problems in End-of-Life Care*. New York: McGraw-Hill; 2002.
- Demmer C. A survey of complementary therapy services provided by hospices. *J Palliat Med*. 2004;7:510–516.
- Running A, Shreffler-Grant J, Andrews W. A survey of hospices' use of complementary therapies. *J Hosp Palliat Nurs*. 2008;10:304–312.
- Lewis CR, de Vedia A, Reuer B, et al. Integrating complementary and alternative medicine (CAM) into standard hospice and palliative care. *Am J Hosp Palliat Care*. 2003;20:221–228.
- Demmer C, Sauer J. Assessing complementary therapy services in a hospice program. *Am J Hosp Palliat Care*. 2002;19:306–314.
- Sirios FM. Motivations for consulting complementary and alternative medicine practitioners: a comparison of consumers from 1997–8 and 2005. *BMC Complement Altern Med*. 2008;8:1–10.
- Steinhausner KE, Christakis NA, Clipp EC, et al. Factors considered important at the end of life by patients, family, physicians, and other care providers. *JAMA*. 2000;284:2476–2482.
- Byock I. *The Four Things That Matter Most: A Book about Living*. New York: Free Press; 2004.
- Lynn J. Serving patients who may die soon and their families: the role of hospice and other services. *JAMA*. 2001;285:925–932.
- Christakis NA, Lamont EB. Extent and determinants of error in doctor's prognoses in terminally ill patients: prospective cohort study. *BMJ*. 2000;320:469–473.
- Back AL, Arnold RM, Quill TE. Hope for the best, and prepare for the worst. *Ann Intern Med*. 2003;138:439–443.
- Candib LM. Truth telling and advance planning at the end of life: problems with autonomy in a multicultural world. *Families Systems Health*. 2002;20:213–228.
- Marchand L. The healing power of hope. *AAHPM Bull*. Summer 2010;13.
- Buckman R. *How to Break Bad News: A Guide for Health Care Professionals*. Baltimore: Johns Hopkins University Press; 1992.
- Quill TE. You promised me I wouldn't die like this! A bad death as a medical emergency. *Arch Intern Med*. 1995;155:1250–1254.
- Reibart W, Rosenfeld B, Pessin H, et al. Depression, hopelessness, and desire for hastened death in terminally ill patients with cancer. *JAMA*. 2000;284:2907–2911.
- Salacz ME, Weissman DE. Controlled sedation for refractory suffering. *J Palliat Med*. 2005;8:136–138.
- Kohara H, Ueoka H, Takeyama H, et al. Sedation for terminally ill patients with cancer with uncontrollable physical distress. *J Palliat Med*. 2005;8:20–25.
- Rousseau P. Palliative sedation in the control of refractory symptoms. *J Palliat Med*. 2005;8:10–12.
- Taylor BR, McCann RM. Controlled sedation for physical and existential suffering? *J Palliat Med*. 2005;8:144–147.
- Braun TC, Hagen NA, Clark T. Development of a clinical practice guideline for palliative sedation. *J Palliat Med*. 2003;6:345–350.
- EPEC (Education for Physicians on End-of-Life Care) Handbook*. Chicago: AMA; 2000.
- Fast Facts and Concepts Series*. EPERC (End of Life/Palliative Education Resource Center). [www.eperc.mcw.edu/](http://www.eperc.mcw.edu/); Accessed 23.12.11.
- Storey P, Knight CF. *UNIPAC: Hospice/Palliative Care Training for Physicians: A Self Study Program*. Larchmont, NY: Mary Ann Liebert; 2003.
- Doyle D, Hanke GW, MacDonald N, eds. *Oxford Textbook of Palliative Medicine*. New York: Oxford University Press; 1999.
- Storey P. *Primer of Palliative Care*. Glenview, IL: American Academy of Hospice and Palliative Medicine; 1996.
- Pain: Current Understanding of Assessment, Management, and Treatments*. Reston, VA: National Pharmaceutical Council, Inc, and Joint Commission on Accreditation of Healthcare Organizations; 2001.
- Weinreb NJ, Kinzbruner B, Clark M. Pain management. In: Kinzbruner BM, Weinreb NJ, Policzer JS, eds. *20 Common Problems in End-of-Life Care*. New York: McGraw-Hill; 2002.
- Morley JS, Makin MK. The use of methadone in cancer pain poorly responsive to other opioids. *Pain Rev*. 1998;5:51–58.
- Gazelle G, Fine PG. Methadone for the treatment of pain. *Fast Facts and Concepts #75*. EPERC (End of Life/Palliative Education Resource Center); 2002. [www.eperc.mcw.edu/](http://www.eperc.mcw.edu/) Accessed 23.12.11.
- Cleary JF, Foley D. Methadone: the ideal long-acting opioid? *AAHPM Bull*. 2002;2:6–7.
- Whitcare PS, Maxwell TL, Douglass AB. Principles of palliative care medicine. Part 2: pain and symptom management. *Adv Stud Med*. 2004;4:88–100.
- Fine PG. Ketamine: from anesthesia to palliative care. *AAHPM Bull*. 2003;3:1, 6.
- Ferrini R. Infusional lidocaine for severe and/or neuropathic pain. *AAHPM Bull*. 2001;1:10–12.
- Reisfield GM, Wilson GR. *Intrathecal drug therapy for pain. Fast Facts and Concepts Series*. EPERC (End of Life/Palliative Education Resource Center); 2004. [www.eperc.mcw.edu/](http://www.eperc.mcw.edu/); Accessed 23.12.11.
- Vastag B. Scientists find connections in the brain between physical and emotional pain. *JAMA*. 2003;290:2389–2390.
- Koenig HG. *Chronic Pain: Biomedical and Spiritual Approaches*. Binghamton, NY: Haworth Pastoral Press; 2003.
- Gureje OG, Von Korff M, Simon GE, et al. Persistent pain and well-being: a World Health Organization study in primary care. *JAMA*. 1998;280:147–151.
- Lin EHB, Katon W, Von Korff M, et al. Effect of improving depression care on pain and functional outcomes among older adults with arthritis. *JAMA*. 2003;290:2428–2434.
- Wright JB. Depression and other common symptoms. In: Kinzbruner BM, Weinreb NJ, Policzer JS, eds. *20 Common Problems in End-of-Life Care*. New York: McGraw-Hill; 2002.
- McAlindon TE, LaValley MP, Gulin JP, et al. Glucosamine and chondroitin for treatment of osteoarthritis. *JAMA*. 2000;283:1469–1475.
- Walsh D, Nelson KA, Mahmoud FA. Established and potential therapeutic applications of cannabinoids in oncology. *Support Care Cancer*. 2003;11:137–143.
- Karst M, Salim K, Burstein S. Analgesic effect of the synthetic cannabinoid CT-3 on chronic neuropathic pain: a randomized controlled trial. *JAMA*. 2003;290:1757–1762.
- Woolridge E, Barton S, Samuel J, et al. Cannabis use in HIV for pain and other medical symptoms. *J Pain Symptom Manage*. 2005;29:358–367.
- Mbvundula EC, Rainsford KD, Bunning RA. Cannabinoids in pain and inflammation. *Inflammopharmacology*. 2004;12:99–114.
- Manheimer E, Cheng K, Linde K, et al. Acupuncture for peripheral joint osteoarthritis. *Cochrane Database Syst Rev*. 2010;1: CD001977. doi:10.1002/14651858.CD001977.pub2.
- Furlan AD, Imamura M, Dryden T, et al. Massage for low-back pain. *Cochrane Database Syst Rev*. 2008;4: CD001929. doi:10.1002/14651858.CD001929.pub2.
- Cepeda MS, Carr DB, Lau J, et al. Music for pain relief. *Cochrane Database Syst Rev*. 2006;(2) CD004843. doi:10.1002/14651858.CD004843.pub2.
- Mannix KA. *Palliation of Nausea and Vomiting*. 2nd ed. New York: Oxford University Press; 1998.
- Storey P, Knight CF. Management of selected non-pain symptoms in the terminally ill. In: *UNIPAC Four: Hospice/Palliative Care Training for Physicians: A Self Study Program*. Larchmont, NY: Mary Ann Liebert; 2003:36–45.
- Hallenbeck J. *Treatment of nausea and vomiting. Fast Facts and Concepts #5*. EPERC (End of Life/Palliative Education Resource Center); 2000. [www.eperc.mcw.edu/](http://www.eperc.mcw.edu/); Accessed 23.12.11.
- Pittler EE. Efficacy of ginger for nausea and vomiting: a systematic review of randomized clinical trials. *Br J Anaesth*. 2000;84:367–371.
- McKinnis EA. Dyspnea and other respiratory symptoms. In: Kinzbruner BM, Weinreb NJ, Policzer JS, eds. *20 Common Problems in End-of-Life Care*. New York: McGraw-Hill; 2002:147–162.
- Bicanovsky L. Comfort care: symptom control in the dying. In: Walsh D, et al, eds. *Palliative Medicine*. Philadelphia: Saunders; 2009:997–1000.
- Slomka J. What do apple pie and motherhood have to do with feeding tubes and caring for patients? *Arch Intern Med*. 1995;155:1258–1263.
- McClement SE, Degner LF, Harlos MS. Family beliefs regarding the nutritional care of a terminally ill relative: a qualitative study. *J Palliat Med*. 2003;6:737–748.
- Bausewein C, Booth S, Gysels M, et al. Non-pharmacological interventions for breathlessness in advanced stages of malignant and non-malignant diseases. *Cochrane Database Syst Rev*. 2008;(2) CD005623. doi:10.1002/14651858.CD005623.pub2.
- Periyakoil VS, Skultety K, Sheikh J. Panic, anxiety, and chronic dyspnea. *J Palliat Med*. 2005;8:453–459.

60. Weissman DE. *Treating terminal delirium. Fast Facts and Concepts #1*. EPERC (End of Life/Palliative Education Resource Center); 2000. [www.eperc.mcw.edu/](http://www.eperc.mcw.edu/). Accessed 23.12.11.
61. Linde K, Mulrow CD. St John's wort for depression. *Cochrane Database Syst Rev*. 2000;(2) CD000448.
62. Shelton RC, Keller MB, Gelenberg A, et al. Effectiveness of St. John's wort in major depression: a randomized controlled trial. *JAMA*. 2001;285:1978–1986.
63. Hypericum Depression Trial Study Group. Effect of *Hypericum perforatum* (St. John's wort) in major depressive disorder. *JAMA*. 2002;287:1807–1814.
64. Roche V. Managing terminal delirium. *AAHPM Bull*. 2003;3:7–10.
65. Meagher DJ. Delirium: optimising management. *BMJ*. 2001;322:144–149.
66. Greenberg DB. Preventing delirium at the end of life: lessons from recent research. *J Clin Psychiatry*. 2003;5:62–67.
67. Gagnon PR, Ouellette M. Delirium and psychosis. In: Walsh D, et al, eds. *Palliative Medicine*. Philadelphia: Saunders; 2009:860–865.
68. Callahan M, Kelley P. *Final Gifts: Understanding the Special Awareness, Needs and Communications of the Dying*. New York: Bantam Books; 1992.
69. Moody R. *Life After Life*. New York: Bantam Books; 1975.
70. Marchand L. Near death awareness. *Fast Facts and Concepts #118*. EPERC (End of Life/Palliative Education Resource Center); 2004. [www.eperc.mcw.edu/](http://www.eperc.mcw.edu/); Accessed 23.12.11.
71. Lo B, Ruston D, Kates LW. Discussing religious and spiritual issues at the end of life. *JAMA*. 2002;287:749–754.
72. Ehman JW, Ott B, Short TH, et al. Do patients want physicians to inquire about their spirituality or religious beliefs if they become gravely ill? *Arch Intern Med*. 1999;159:1803–1806.
73. Mazanec P, Tyler MK. Cultural considerations in end-of-life care: how ethnicity, age, and spirituality affect decisions when death is imminent. *Am J Nurs*. 2003;103:50–58.
74. Chibnall JT, Videen SD, Duckro PN, et al. Psychosocial-spiritual correlates of death distress in patients with life-threatening medical conditions. *Palliat Med*. 2002;16:331–338.
75. Meraviglia MG. The effects of spirituality on well-being of people with lung cancer. *Oncol Nurs Forum*. 2004;31:89–94.
76. Anandarajah G, Hight E. Spirituality and medical practice: using the HOPE questions as a practical tool for spiritual assessment. *Am Fam Physician*. 2001;63:81–89.
77. Puchalski CM, Romer AL. Taking a spiritual history allows clinicians to understand patients more fully. *J Palliat Med*. 2000;3:129–137.
78. Maugans TA. The SPIRITUAL history. *Arch Fam Med*. 1996;5:11–16.
79. Okon TZ. Spiritual, religious, and existential aspects of palliative care. *J Palliat Med*. 2005;8:392–414.
80. Chochinov HM. Dignity-conserving care—a new model for palliative care: helping the patient feel valued. *JAMA*. 2002;287:2253–2260.
81. Koenig HG. Taking a spiritual history. *JAMA*. 2004;291:2881–2883.
82. Miller DK, Chibnall JT, Videen SD, et al. Supportive-affective group experience for persons with life-threatening illness: reducing spiritual, psychological, and death-related distress in dying patients. *J Palliat Med*. 2005;8:333–343.
83. Lo B, Kates LW, Ruston D, et al. Responding to requests regarding prayer and religious ceremonies by patients near the end of life and their families. *J Palliat Med*. 2003;6:409–415.
84. Winslow GR, Winslow BW. Examining the ethics of praying with patients. *Holist Nurs Pract*. 2003;17:170–177.
85. Worden JW. Bereavement. *Semin Oncol*. 1985;12:472–475.
86. Kubler-Ross E. *On Death and Dying: What the Dying Have to Teach Doctors, Nurses, Clergy, and Their Families*. New York: Simon & Schuster; 1997.
87. Periyakoil VS, Hallenbeck J. Identifying and managing preparatory grief and depression at the end of life. *Am Fam Physician*. 2002;65:883–890, 897–898.
88. Steen KF. A comprehensive approach to bereavement. *Nurse Pract*. 1998;23:54–68.
89. Walsh K, King M, Jones L, et al. Spiritual beliefs may affect outcome of bereavement: prospective study. *BMJ*. 2002;324:1551.
90. Periyakoil VS, Hallenbeck J. Identifying and managing preparatory grief and depression at the end of life. *Am Fam Physician*. 2002;65:883–890, 897–898.
91. Summerbell CD. Nutritional advice and support for individuals with incurable diseases. *Br J Biomed Sci*. 1994;51:271–277.
92. Cross KL. If he would just eat, I know he would get stronger: eating and drinking at the end of life. *AAHPM Bull*. 2001;2:1, 12–13.
93. Wolsko PM, Eisenberg DM, Davis RB, et al. Use of mind-body medical therapies: results of a national survey. *J Gen Intern Med*. 2004;19:43–50.
94. Grosman P, Niemann L, Schmidt S, et al. Mindfulness-based stress reduction and health benefits: a meta-analysis. *J Psychosom Res*. 2004;57:35–43.
95. Kabat-Zinn J, Lipworth L, Burney R. The clinical use of mindfulness meditation for the self-regulation of chronic pain. *J Behav Med*. 1985;8:163–190.
96. Monti DA, Yang J. Complementary medicine in chronic cancer care. *Semin Oncol*. 2005;32:225–231.
97. Monti DA, Peterson C. Mindfulness based art therapy: results from a two-year study. *Psychiatr Times*. 2004;2221:6663–6666.
98. Trueman I. Life review: an educational perspective. In: Foyle L, Hostad J, eds. *Delivering Cancer and Palliative Care Education*. Abingdon Oxford, England: Radcliffe; 2004.
99. Woods B, Spector A, Jones C, et al. Reminiscence therapy for dementia. *Cochrane Database Syst Rev*. 2005;(2) CD001120.
100. Erickson EM. *The Life Cycle Completed*. extended ed. New York: W.W. Norton; 1997.
101. DeRamon PB. The final task: life review for the dying patient. *Nursing*. 1983;13:46–49.
102. Haight BK. The therapeutic role of a structured life review process in homebound elderly subjects. *J Gerontol*. 1988;43:40–44.
103. McDougall GJ, Blixen CE, Suen L. The process and outcome of life review with depressed homebound older adults. *Nurs Res*. 1997;46:277–283.
104. Gruzelier JH. A review of the impact of hypnosis, relaxation, guided imagery and differences on aspects of immunity and health. *Stress*. 2002;5:147–163.
105. Stephens R. Imagery: a strategic intervention to empower clients. *Clin Nurse Spec*. 1993;7:170–174.
106. Genuis ML. The use of hypnosis in helping cancer patients control anxiety, pain and emesis: a review of empirical studies. *Am J Clin Hypn*. 1995;37:316–325.
107. Marcus J, Elkins G, Mott F. A model of hypnotic intervention for palliative care. *Adv Mind Body Med*. 2003;19:24–27.
108. O'Connell S. Hypnosis in terminal care: discussion paper. *J R Soc Med*. 1985;78:122–125.
109. Maratos A, Gold C. Music therapy for depression. *Cochrane Database Syst Rev*. 2003;(4): CD004517.
110. Fontaine DK. Non-pharmacological management of patient distress during mechanical ventilation. *Crit Care Nurs*. 1994;10:695–708.
111. Chlan L. Effectiveness of music therapy intervention on relaxation and anxiety for patients receiving ventilatory assistance. *Heart Lung*. 1998;27:169–176.
112. Cardozo M. Harmonic sounds: complementary medicine for the critically ill. *Br J Nurs*. 2004;13:1321–1324.
113. Guzzetta CE. Effects of relaxation and music therapy on patients in a coronary care unit with presumptive acute myocardial infarction. *Heart Lung*. 1989;18:609–616.
114. Henry L. Music therapy: a nursing intervention for the control of pain and anxiety in the ICU. *Dimens Crit Care Nurs*. 1995;14:295–304.
115. Wong HL, Lopez -Nahas V, Molassiotis A. Effects of music therapy on anxiety in ventilator patients. *Heart Lung*. 2001;30:376–387.
116. Zimbardo P, Gerrig R. *Psychology and Life*. New York: Harper Collins; 1996.
117. Bradt J, Dileo C. Music therapy for end-of-life care. *Cochrane Database Syst Rev*. 2010;(1) CD007169. doi:10.1002/14651858.CD007169.pub2.
118. Maratos A, Gold C, Wang X, et al. Music therapy for depression. *Cochrane Database Syst Rev*. 2008;(1) CD004517. doi:10.1002/14651858.CD004517.pub2.
119. Schroeder-Sheker T. *Transitus: A Blessed Death in the Modern World*. St. Dunstan's Press; 2001. [www.chaliceofrepose.org/](http://www.chaliceofrepose.org/); Accessed 23.12.11.
120. Horrihan B, Schroeder-Sheker T. Music thanatology and spiritual care for the dying. *Altern Ther*. 2001;7:68–77.
121. Field T. Massage therapy effects. *Am Psychol*. 1998;53:1270–1281.
122. Field T. Massage therapy. *Med Clin North Am*. 2002;86:163–171.
123. Hurley D. Massage is better than acupuncture (and in the short term better than self care) in reducing pain and disability in patients with chronic lower back pain. *Aust J Physiother*. 2001;47:229.
124. Cherkin DC, Eisenberg D, Sherman KJ, et al. Randomized trial comparing traditional Chinese medical acupuncture, therapeutic massage, and self-care education for chronic low back pain. *Arch Intern Med*. 2001;161:1081–1088.

125. Ernst E. Massage therapy for low back pain: a systematic review. *J Pain Symptom Manage*. 1999;17:65–69.
126. Wright A, Sluka KA. Nonpharmacological treatments for musculoskeletal pain. *Clin J Pain*. 2001;17:33–46.
127. Wilke DJ, Kampbell J, Cutshall S, et al. Effects of massage on pain intensity, analgesics and quality of life in patients with cancer pain: a pilot study of a randomized clinical trial conducted within hospice care delivery. *Hospice J*. 2000;15:31–53.
128. Hernandez-Reif M, Ironson G, Field T, et al. Breast cancer patients have improved immune and neuroendocrine functions following massage therapy. *J Psychosom Res*. 2004;57:45–52.
129. Post-White J, Kinney ME, Savik K, et al. Therapeutic massage and healing touch improve symptoms in cancer. *Integr Cancer Ther*. 2003;2:332–334.
130. Smith MC, Kemp J, Hemphill L, et al. Outcomes of therapeutic massage for hospitalized cancer patients. *J Nurs Scholarsh*. 2002;34:257–262.
131. Cassileth BR, Vickers AJ. Massage therapy for symptom control: outcome study at a major cancer center. *J Pain Symptom Manage*. 2004;28:244.
132. Hillier SL, Louw Q, Morris L, et al. Massage therapy for people with HIV/AIDS. *Cochrane Database Syst Rev*. 2010;(1): CD007502. doi:10.1002/14651858.CD007502.pub2.
133. Hansen NV, Jørgensen T, Ørtenblad L. Massage and touch for dementia. *Cochrane Database Syst Rev*. 2006;(4): CD004989. doi:10.1002/14651858.CD004989.pub2.
134. Soden K, Vincent K, Craske S, et al. A randomized controlled trial of aromatherapy massage in a hospital setting. *Palliat Med*. 2004;18:87–92.
135. Diego MA, Jones NA, Field T, et al. Aromatherapy positively affects mood, EEG patterns of alertness and math computations. *Int J Neurosci*. 1998;96:217–224.
136. Dunn C, Sleep J, Collett D. Sensing an improvement: an experimental study to evaluate the use of aromatherapy, massage, and periods of rest in an intensive care unit. *J Adv Nurs*. 1995;21:34–40.
137. Kohara H, Miyauchi T, Suehiro Y, et al. Combined modality treatment of aromatherapy, footsoak, and reflexology relieves fatigue in patients with cancer. *J Palliat Med*. 2004;7:791–796.
138. Louis M, Kowalski SD. Use of aromatherapy with hospice patients to decrease pain, anxiety, and depression and to promote an increased sense of well-being. *Am J Hosp Palliat Care*. 2002;19:381–386.
139. Fellows D, Barnes K, Wilkinson S. Aromatherapy and massage for symptom relief in patients with cancer. *Cochrane Database Syst Rev*. 2004;(3): CD002287.
140. Buckle J. Aromatherapy. *Nurs Times*. 1993;89:32–35.
141. Hankey A. Are we close to a theory of energy medicine? *J Altern Complement Med*. 2004;10:83–86.
142. Olson M, Sneed N. Anxiety and therapeutic touch. *Issues Ment Health Nurs*. 1995;16:97–108.
143. Newshan G, Schuller-Civitella D. Large clinical study shows value of therapeutic touch program. *Holist Nurs Pract*. 2003;17:189–192.
144. Baumrucker SJ. Complementary medicine and the scientific method: mainstreaming proven “alternative” therapies. *Am J Hosp Palliat Care*. 2002;19:369–371.
145. O’Mathuna DP, Ashford RL. Therapeutic touch of healing acute wounds. *Cochrane Database Syst Rev*. 2003;(4): CD002766.
146. So PS, Jiang Y, Qin Y. Touch therapies for pain relief in adults. *Cochrane Database Syst Rev*. 2008;(4): CD006535. doi:10.1002/14651858.CD006535.pub2.
147. Wardell DW, Weymouth KF. Review of studies of healing touch. *J Nurs Scholarsh*. 2004;36:147–154.
148. Miles P, True G. Reiki—review of a biofield therapy history, theory, practice, and research. *Altern Ther*. 2003;9:62–72.
149. Pan C, Morrison S, Neww J, et al. Complementary and alternative medicine in the management of pain, dyspnea, and nausea and vomiting near end of life: a systematic review. *J Pain Symptom Manage*. 2000;20:374–387.
150. Jobst K, McPherson K, Brown V, et al. Controlled trial of acupuncture for disabling breathlessness. *Lancet*. 1996;20:1416–1419.
151. Filshie J, Penn K, Ashley S, et al. Acupuncture for the relief of cancer-related breathlessness. *Palliat Med*. 1996;10:145–150.
152. Alimi D, Rubino C, Pichard-Leandri E, et al. Analgesic effect of auricular acupuncture for cancer pain: a randomized, blinded, controlled trial. *J Clin Oncol*. 2003;21:4120–4126.
153. Melchart D, Linde K, Fischer P, et al. Acupuncture for idiopathic headache. *Cochrane Database Syst Rev*. 2001;(2): CD001218.
154. Irnich D, Behrens N, Molzen H, et al. Randomised trial of acupuncture compared with conventional massage and “sham” laser acupuncture for treatment of chronic neck pain. *BMJ*. 2001;322:1574–1578.
155. Kerr DP, Walsh DM, Baxter G. A study of the use of acupuncture in physiotherapy. *Complement Ther Med*. 2001;9:21–27.
156. Carlsson CP, Sjolund BH. Acupuncture for low back pain: a randomized placebo-controlled study with long-term follow-up. *Clin J Pain*. 2001;17:296–305.
157. Ernst E, White AR. Prospective studies of the safety of acupuncture: a systematic review. *Am J Med*. 2001;119:481–485.
158. Ockleford E, Berryman J. Do companion animals have therapeutic value? *Eur J Palliat Care*. 2001;8:75–78.
159. Hammack JE, Loprinzi CL. Use of administered opioids for cancer-related pain. *Mayo Clin Proc*. 1994;69:384–390.
160. Miller KE, Miller MM, Zylstra R. Providing quality care at end of life. *Family Pract Certification*. 2000;22:25–38.



# 81

## Alcoholism and Substance Abuse

Donald Warne, MD, MPH

Alcoholism, or alcohol dependence, is a disease characterized by four key components<sup>1</sup>:

- Craving: a strong urge to drink alcohol
- Loss of control: being unable to stop drinking once one has started
- Physical dependence: symptoms such as sweating, shaking, and anxiety after one stops drinking
- Tolerance: the need for greater quantities of alcohol to feel intoxicated

In addition to alcohol, there are numerous drugs of abuse, including opiates, marijuana, cocaine, methamphetamines, and tobacco.<sup>2</sup> See [Box 81-1](#) for a simple three-question screening tool for alcohol disorders (AUDIT-C).

Alcoholism and substance abuse have a negative impact on other chronic diseases managed in the primary care setting by the direct effects of the substances abused and issues related to compliance and self-care. Acute injury and illness resulting from alcohol and substance abuse are analogous to exacerbations of chronic conditions and therefore constitute issues of extreme importance in the arena of primary care. Unfortunately, many physicians do not routinely address these issues, and few conventional allopathic interventions are easily accessible and efficacious. This chapter examines the treatment options available to the primary care physician and also provides a source of information for appropriate referrals. A multitude of both illicit and prescribed substances are abused; the focus of this chapter is primarily on alcohol, tobacco, opiates, cocaine, and marijuana.

Addiction to drugs and alcohol should be treated as a chronic illness not unlike diabetes mellitus or hypertension.<sup>3</sup> Like these disorders, addiction has behavioral components as well as underlying biochemical mechanisms. Within chronic addiction and recovery, there are also exacerbations

of abuse as well as chronic multiorgan system complications. Successful treatment of all chronic diseases requires good rapport between patients and providers and the use of a non-judgmental approach. [Box 81-2](#) provides simple guidelines to assess the severity of alcohol risk.

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### Pathophysiology

Alcoholism and substance abuse have many dimensions, each with unique implications and standards of treatment. The processes of alcoholism and substance abuse may be divided into broad categories or stages: craving, active abuse, intoxication, withdrawal, detoxification, recovery, and relapse prevention.

A proposed mechanism of addiction for all substances of abuse involves the sudden release of dopamine in the “reward pathway” connecting the midbrain to the prefrontal cortex. This rush of dopamine is believed to cause a sense of euphoria and pleasure that is at the root of drug abuse. With extended drug use, there is a profound alteration in brain chemistry. This neurophysiologic change in the central nervous system eventually causes a “switch” in the affected person from a state of drug abuse to one of addiction with uncontrollable cravings and dependence. The exact mechanisms of this process are as yet unknown.<sup>4</sup>

The process of addiction is, of course, not limited to brain chemistry. The effect of environmental, social, cultural, genetic, and behavioral factors is significant in the development of alcoholism and substance abuse. These factors assume varying levels of importance in the development of addiction for each person. Addiction is therefore most accurately viewed as a complex illness with varying degrees of environmental and biochemical features.<sup>5</sup>

**BOX 81-1. AUDIT-C Screening for Alcohol Use Disorders**

Instructions: For each question, please check the answer that is correct for you.

1. How often do you have a drink containing alcohol?
  - Never (0)
  - Monthly or less (1)
  - Two to four times a month (2)
  - Two to three times per week (3)
  - Four or more times a week (4)
2. How many drinks containing alcohol do you have on a typical day when you are drinking?
  - 1 or 2 (0)
  - 3 or 4 (1)
  - 5 or 6 (2)
  - 7 to 9 (3)
  - 10 or more (4)
3. How often do you have six or more drinks on one occasion?
  - Never (0)
  - Less than monthly (1)
  - Monthly (2)
  - Two or three times a week (3)
  - Four or more times a week (4)

Add the numerical value of each answer selected to get your total score.

TOTAL SCORE: \_\_\_\_\_  
 The maximum score is 12. A score of  $\geq 4$  identifies 86% of men who report drinking above recommended levels or who meet criteria for alcohol use disorders.

A score of  $>2$  identifies 84% of women who report hazardous drinking or alcohol use disorders.

From National Council for Community Behavioural Healthcare. [http://www.thenationalcouncil.org/galleries/business-practice%20files/tool\\_auditc.pdf](http://www.thenationalcouncil.org/galleries/business-practice%20files/tool_auditc.pdf); Accessed 7.5.11.

**Integrative Therapy**

**Pharmaceuticals**

Until recently, few effective pharmacologic options have been available to the primary care physician to treat alcoholism and substance abuse. Some of the most effective pharmaceutical agents are available only through licensed intensive outpatient and inpatient programs specializing in the treatment of addictions. However, with the U.S. Food and Drug Administration (FDA) approval of acamprosate (Campral) and buprenorphine (Subutex), primary care physicians have the opportunity to take a more active role in the treatment of addiction to alcohol and opiates. For physicians interested in using these medications for their patients with addictions, it is important to remember that these agents are most effective when they are used as part of a comprehensive management program that involves psychosocial support such as counseling and support groups. Table 81-1 provides an overview of

**BOX 81-2. Alcohol Risk Terms: Abstinence, Moderate, and Risky or Hazardous**

**Abstinence**

No alcohol use

**Moderate**

Men: no more than 2 standard drinks per drinking day  
 Women and older persons (older than 65 years): no more than 1 standard drink per drinking day

**Risky or Hazardous**

Men  
 More than 4 standard drinks per drinking day  
 More than 14 standard drinks per week  
 Women and older persons (older than 65 years)  
 More than 3 standard drinks per drinking day  
 More than 7 standard drinks per drinking week

**TABLE 81-1. Pharmaceutical Agents Used for Treatment of Alcoholism and Substance Abuse**

SUBSTANCE OF ABUSE	AGENTS USED FOR DETOXIFICATION/WITHDRAWAL	AGENTS USED FOR CRAVING/RELAPSE PREVENTION	AGENTS USED FOR OTHER PURPOSES
Alcohol	Benzodiazepines Phenobarbital	Naltrexone Acamprosate Topiramate	Disulfiram
Tobacco	Nicotine Bupropion	Nicotine Varenicline	Bupropion
Opiates	Methadone Clonidine Buprenorphine	Methadone L-Alpha-acetylmethadol	Naloxone
Cocaine	Selective serotonin reuptake inhibitors Monoamine oxidase inhibitors Amantadine	Tricyclic antidepressants	
Marijuana	N/A	N/A	

N/A, not applicable.

pharmaceutical treatments of alcohol and substance abuse. As noted, these treatments may be divided into the broad categories of detoxification/withdrawal and craving/relapse prevention.

### Management of Alcohol Withdrawal and Recovery

The most common treatment of acute alcohol withdrawal is administration of diazepam or another benzodiazepine. The benefit of benzodiazepine treatment is relief of the anxiety and sleep disturbances experienced during the withdrawal phase. A disadvantage of benzodiazepine therapy is the potential for dependence if the drug is not prescribed appropriately. Benzodiazepine for detoxification should be prescribed only for a short time in a supervised setting. Phenobarbital or carbamazepine (Tegretol) is occasionally used in managing withdrawal seizures. There is evidence that opioid receptors play a role in the physiologic response to alcohol. Naltrexone (ReVia), an opioid antagonist, has been shown to be effective in preventing alcoholic relapse. Disulfiram (Antabuse) inhibits aldehyde dehydrogenase and produces unpleasant effects, such as nausea, vomiting, and dizziness, when alcohol is consumed.

Acamprosate, an amino acid derivative that modulates activity of gamma-aminobutyric acid (GABA) neurotransmission in the brain, appears to be effective in reducing alcohol cravings. As opposed to limiting the “high” sensation of alcohol (as naltrexone does) or producing unpleasant side effects (as disulfiram does), acamprosate can assist in preventing alcohol relapse by reducing the anxiety and sleep disturbances associated with alcohol craving, although its exact mechanism of action is unknown.<sup>6</sup> Pharmacologic treatments of alcohol withdrawal generally work well and can potentially be used for outpatient withdrawal management if the primary physician is able to monitor the patient closely. Treatments for relapse prevention generally are not efficacious in the absence of comprehensive follow-up care.<sup>7</sup>

For patients who have not abstained from alcohol, topiramate (Topamax) has been found to reduce heavy drinking and days of any drinking over a 12-week period. It is also cleared through the kidney and thus does not exacerbate toxicity to the liver. It is generally used for 6 to 12 months as part of a comprehensive treatment program.<sup>8</sup> Research also suggests that topiramate at a mean dose of 200 mg daily may work better to maintain abstinence with reduced cravings than naltrexone at a mean dose of 50 mg/day.<sup>9</sup>

#### ■ Dosage

Naltrexone, 50 mg/day orally, reduces the high sensation associated with alcohol.

For the reduction of the craving of alcohol, acamprosate, 333 to 666 mg three times a day, or topiramate, titrated from 25 to 300 mg weekly over 8 weeks (Table 81-2), is prescribed.

Disulfiram, 250 to 500 mg/day, creates unpleasant side effects when it is used with alcohol.

For help with tapering and withdrawal from alcohol, the dosage of benzodiazepine is titrated to achieve a calming effect. High doses may be needed initially. An example is clonazepam (Klonopin), 1 mg three times a day, with a gradual taper over 10 to 14 days.

**TABLE 81-2.** Titration of Topiramate for Treatment of Alcohol Dependence

WEEK	MORNING DOSE (mg)	AFTERNOON DOSE (mg)	TOTAL DAILY DOSE (mg)
1	0	25	25
2	0	50	50
3	25	50	75
4	50	50	100
5	50	100	150
6	100	100	200
7	100	150	250
8	150	150	300

### Management of Nicotine Withdrawal: Smoking Cessation

Effective outpatient treatment regimens are available for smoking cessation. Tapered nicotine replacement therapy is effective in the management of nicotine withdrawal and cravings. Bupropion (Zyban) has been shown to be effective in managing symptoms of anxiety associated with nicotine withdrawal and craving. Varenicline (Chantix), a partial nicotine receptor agonist, has been found to help increase smoking cessation more than placebo and as well as bupropion.<sup>10</sup> These medications can be used successfully in the outpatient primary care setting.<sup>11</sup>

#### ■ Dosage

Bupropion, 150 mg, is administered twice daily for 6 weeks, with a target quit date of 2 weeks after the start of therapy. Varenicline is started 1 week before smoking cessation: 0.5 mg orally for 3 days, 0.5 mg twice daily for 4 days, and then 1 mg twice daily for 11 weeks; the general course of therapy is 12 weeks.

#### ■ Precautions

Varenicline has a black box warning for neuropsychiatric side effects including behavior change, hostility, agitation, depression, and suicidality. This can be exacerbated when it is used with nicotine long term.

### Management of Opiate Withdrawal and Recovery

Acute opiate withdrawal is treated commonly with methadone, an opioid receptor agonist that can block withdrawal symptoms without producing the euphoria caused by heroin and other opiates. Owing to this effect, methadone is also commonly used in long-term maintenance programs to reduce cravings and relapse. Clonidine has been shown to be effective in lessening opiate withdrawal symptoms and does not foster physiologic dependence. L-Alpha-acetylmethadol (LAAM) is derived from methadone and acts in a fashion similar to that noted for methadone. The advantage of LAAM in maintenance therapy is that its effect lasts 72 hours, allowing dosing every other day or three times per week. Naloxone is an opiate antagonist used for treatment of acute opiate overdose.<sup>12</sup>

Perhaps the most significant pharmaceutical development in the management of opioid addiction is the approval of the use of buprenorphine in the United States. An opiate receptor partial agonist, buprenorphine has shown benefit in managing opioid addiction and preventing relapse. Opioid partial agonists bind to the opioid receptor but only partially activate the receptor and generate significantly less euphoric sensation than opiate agonists like heroin do.<sup>13</sup> Potential for abuse of buprenorphine is much lower than that of other opiates, and buprenorphine has been shown to be as effective as methadone in weaning clients off this class of drugs.<sup>14</sup>

Buprenorphine requires specific training for prescribing, and referral to the appropriate qualified physician is required. More information is available at the U.S. Department of Health and Human Services Substance Abuse and Mental Health Services Administration (SAMHSA) Web site (<http://buprenorphine.samhsa.gov>).

### Management of Cocaine Dependence

Cocaine withdrawal is associated with minimal symptoms. Several classes of pharmaceutical agents have been studied for their efficacy in treating cocaine dependence and relapse prevention, although none of these is approved by the FDA for this purpose. Extensive abuse of cocaine can cause depression by depletion of baseline levels of dopamine. Several antidepressants have been studied for their role in treating cocaine addiction, including tricyclic antidepressants, selective serotonin reuptake inhibitors, and monoamine oxidase inhibitors; however, results are mixed and inconclusive. Amantadine, a dopamine agonist, has been studied for its role in cocaine dependence. In theory, dopamine agonist therapy should cause dopamine restoration and reduce the need for cocaine, but findings of studies have not been convincing.<sup>15</sup> In addition, the results of studies examining the role of buprenorphine in the management of cocaine addiction have been mixed.<sup>16</sup>

### Botanicals

Various herbs and combinations of herbs are reported to be effective in reducing cravings, but in general, no studies have been conducted to prove their effectiveness.

#### Kudzu

Kudzu, a traditional Chinese herb, has been used as an “anti-inebriation” treatment for hundreds of years, although its mechanism of action is not yet known.<sup>17,18</sup>

A small study showed that in heavy drinkers of alcohol, kudzu did result in a reduction of the number of beers consumed after 7 days of treatment.<sup>19</sup> It has not been found to enhance sobriety in chronic alcoholics.<sup>20</sup>

#### ■ Dosage

The recommended dose is 1.2 g twice daily.

#### ■ Precautions

Kudzu is considered safe with few side effects other than the potential for an allergic reaction to the plant.

### Herbal Antidepressants and Anxiolytics

Because people who struggle with alcoholism and substance abuse commonly have coexisting depression and anxiety,<sup>21,22</sup> it is possible that herbal remedies used for these conditions

may have a role in recovery and abstinence. Poorly managed anxiety may lead to higher alcohol intake.<sup>23</sup> Herbs that are effective in treating anxiety and insomnia, such as valerian and kava kava, might be helpful in managing anxiety associated with detoxification and cravings. These herbs have been shown to enhance the levels and action of GABA and therefore might also have a role in control of alcohol cravings and prevention of relapse. Caution should be taken with the use of kava in alcoholic patients because it has been associated with liver toxicity. These are potential uses that warrant further investigation. St. John's wort has a mechanism of action similar to that of the selective serotonin reuptake inhibitors and has been shown to be effective in treating depression.<sup>24</sup> Its role in managing depression associated with alcoholism and substance abuse is yet to be determined.

### Other Herbal Remedies

Lobelia is described as a respiratory stimulant and has been used in homeopathic preparations as an aid to stop smoking.<sup>25</sup> Milk thistle, which has been studied for its hepatoprotective effects, appears to be a promising treatment of alcoholic cirrhosis.<sup>26</sup>

### Acupuncture

Acupuncture is perhaps the most extensively studied and most promising integrative treatment of addictions. The practice of acupuncture is documented in Chinese literature as early as the Han dynasty in the second century BC in the *Huang Di Nei Jing (Yellow Emperor's Classic of Medicine)*. In acupuncture terms, the body is seen as having several energy channels, or meridians, that allow the free flow of *qi* (pronounced “chee”), or energy. In a healthy or balanced state, *qi* flows smoothly throughout the body and provides for homeostasis. With disease, injury, or a state of imbalance, the normal movement of *qi* is obstructed or impaired. Acupuncture treatments are designed to unblock obstructions of meridians and to promote the healthy flow of energy.<sup>27</sup>

In 1973, Wen and Cheung<sup>28</sup> reported that opiate-addicted patients who were using electroacupuncture for treatment of postoperative pain described relief from symptoms of withdrawal. Omura brought the treatment protocol to Lincoln Hospital in New York in 1974, and Smith and Kahn<sup>29</sup> developed a five-point auricular acupuncture treatment protocol for addictions that is currently being taught and advocated by the National Acupuncture Detoxification Association (NADA).

In acupuncture terms, substance abuse can be seen as an attempt by the patient to self-treat an imbalance in the flow of *qi*. The “drug of choice” provides a temporary relief from energy imbalance, but unfortunately, it also commonly causes further underlying imbalance. As a result, the baseline imbalance slowly worsens, and the need for more drugs slowly increases. The acupuncture treatment therefore provides energy balancing without the need for alcohol or drugs as well as relaxation and relief from cravings.<sup>30</sup>

Acupuncture treatments influence the flow of *qi* to achieve energy balancing, relaxation, and reduced cravings for alcohol, tobacco, and illicit drugs.



Another proposed mechanism of action is that the acupuncture needles stimulate peripheral nerves to cause release of endorphins in the brain, thereby resulting in relaxation and a sense of well-being; acupuncture thus can provide direct biochemical treatment of opiate and ethanol craving and withdrawal.<sup>31</sup> The NADA treatment protocol and certification course emphasize the multifaceted nature of this modality and describe treatment benefits in the biochemical, psychological, and social realms as well as in the traditional Chinese paradigm.

The specific points used in the NADA protocol are shen men (spirit gate), sympathetic, kidney, liver, and lung (Fig. 81-1). These points have roles in balancing energy and calming as well as in regulating sympathetic nervous system function and specific organ function from the modern and traditional Chinese perspectives of physiology. The kidney, liver, and lung each have specific roles in the generation, regulation, and flow of *qi*. These organ-specific functions are described in acupuncture texts<sup>32</sup> and are beyond the scope of this chapter.

Auricular acupuncture has been studied in the treatment of addiction to various drugs, including alcohol, cocaine, opiates, and marijuana. In 1989, Bullock et al<sup>33</sup> reported that auricular acupuncture is effective in the treatment of relapsing alcoholics. In this study, 80 relapsing alcoholics who were enrolled in a treatment facility were randomly assigned to receive either the appropriate acupuncture treatment protocol (treatment group) or sham acupuncture points at sites close to the appropriate points (control group). The outcomes measured included completion of the treatment program and self-reported abstinence at 1, 3, and 6 months after the end of the program. Of the 40 subjects in the treatment group, 21 finished the program, whereas only 1 of 40 in the control group completed treatment ( $P < .001$ ). Information about self-reported drinking episodes was collected from

all available subjects, including those who did not complete treatment. Fewer treatment group subjects than control group subjects reported drinking episodes at 1-, 3-, and 6-month follow-up evaluations.<sup>33</sup>

In 1998, Shwartz et al<sup>34</sup> compared residential detoxification programs that used acupuncture with programs that did not. In this retrospective study, 6907 patients completed non-acupuncture programs, and 1104 patients completed programs that used acupuncture as an adjunctive therapy. The study subjects were dependent on alcohol, cocaine, crack, heroin, marijuana, or a combination of these drugs. The primary outcome measured was readmission to a detoxification program in the 6 months after discharge. After control for baseline differences of patients in the study, those who completed programs offering acupuncture were readmitted to detoxification less frequently than were those from conventional programs ( $P < .02$ ).<sup>34</sup> A randomized controlled trial of auricular acupuncture for cocaine dependence published in 2000 studied 82 patients who were randomly allocated to receive appropriate acupuncture treatment, sham acupuncture, or relaxation therapy. Thrice-weekly urine screening for cocaine was conducted during an 8-week period. The patients who received the appropriate acupuncture protocol were less likely to test positive for cocaine on urine screening than were the patients in the sham acupuncture control group ( $P = .05$ ) or the relaxation control group ( $P = .01$ ).<sup>35</sup>

Auricular acupuncture has been shown by these studies to be a useful adjunct in treating alcoholism and substance abuse. Other investigations have found mixed results or little benefit from acupuncture in treating addiction.<sup>36,37</sup> Further investigation in this area is warranted.

## Mind-Body Therapies

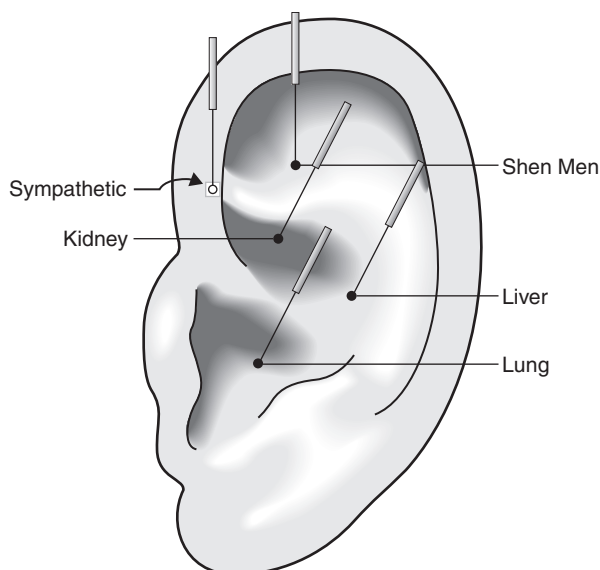
As more is learned about the connection between thoughts and physiology, the field of mind-body medicine continues to grow and to gain acceptance. Commonly used therapies classified as mind-body interventions are meditation, biofeedback, hypnosis, guided imagery, yoga, and prayer. Research in this field appears promising for mind-body medicine as an adjunctive intervention for alcoholism and substance abuse.

### Meditation

Meditation can be divided into three broad categories: concentrative, mindfulness, and transcendental. Concentrative meditation focuses attention on breathing, imagery, or sounds; mindfulness meditation involves focused awareness on the passage of thoughts and images as they spontaneously appear. Transcendental meditation (TM) is a technique brought to the United States by Maharishi Mahesh Yogi in the 1960s. TM was developed from the ancient East Indian Vedic belief system and helps practitioners of this technique balance the physical, mental, emotional, and spiritual components of health.<sup>38</sup> Within this belief system, prolonged or excessive stress leads to holistic imbalance, which causes illness, including alcoholism and substance abuse. The sense of balancing offered by TM allows optimal function and decreases the need for drugs and alcohol.<sup>39</sup> Several studies and review articles have shown TM to be effective in the treatment of alcoholism and substance abuse; however, most of these studies had flaws in design and methods without randomization, blinding, and appropriate control groups.<sup>40</sup>

**FIGURE 81-1**

Acupuncture points for the National Acupuncture Detoxification Association (NADA) treatment protocol. (Reprinted with permission from Joseph Helms, MD, and Medical Acupuncture Publishers, Berkeley, CA)



A randomized controlled trial indicated improvement in number of days of alcohol abstinence with the use of TM or biofeedback compared with electronic neurotherapy and the Alcoholics Anonymous program or counseling.<sup>41</sup> TM has been shown to significantly raise serotonin levels and to decrease cortisol levels in as little as 4 months of practice.<sup>42</sup> This is a possible mechanism for improving sense of balance and well-being and for reducing the effects of stress. In a group of polysubstance abusers, when goal management training was combined with mindfulness-based meditation, there was significant improvement with emotional risks associated with substance use<sup>43</sup> (see Chapter 98, Recommending Meditation).

Mind-body therapies, including meditation, biofeedback, hypnosis, guided imagery, yoga, and prayer, use the power of the mind to influence the body. Relaxation and reduced physiologic responses to stress are helpful in the recovery process.

### Biofeedback

Biofeedback is a technique that uses electronic monitors, including electroencephalography, electromyography, and electrocardiography, as well as cutaneous thermometers and pulse oximeters to teach the patient how to consciously control physiologic functions such as respiratory rate, heart rate, skin temperature, and blood pressure. Conscious regulation of these functions is achieved through concentration, meditation, and the use of relaxation techniques. Biofeedback has been shown to be useful in managing stress-related disorders such as hypertension, irritable bowel syndrome, pain, and substance abuse. Electromyographic biofeedback, which focuses on relieving muscle tension, has been shown to be an effective tool in treating alcoholism.<sup>44</sup> Unfortunately, there are only limited studies on the use of this intervention in treating addictions. The mechanism of action and efficacy of biofeedback in managing alcoholism and substance abuse have not yet been determined.

### Hypnosis

The German physician Franz Anton Mesmer introduced modern hypnotherapy in the eighteenth century as mesmerism. The American Medical Association recognized hypnosis as a legitimate medical therapy in 1958, and it has been applied by various health care practitioners in the treatment of numerous disorders, including alcoholism and substance abuse. Hypnotherapy involves concentration, mental focusing exercises, relaxation techniques, guided imagery, and suggestion. Studies have shown that hypnosis improves memory and cognitive function<sup>45</sup> and can affect physiologic function by reducing sympathetic nervous system activity, heart rate, blood pressure, and oxygen consumption.<sup>46</sup> Many techniques are used in hypnotherapy, making standardization difficult for research purposes; however, there are case reports of positive results of its use in substance abuse treatment and relapse prevention.<sup>47</sup> Controlled trials have not shown long-term benefits in the management of addictions. Some techniques used in hypnosis may be useful as adjunctive modalities in comprehensive recovery programs. One study used self-hypnosis tapes in a residential treatment

program for drug and alcohol abuse. Those who listened to the tapes three to five times a week showed the highest levels of self-esteem and serenity and the least amount of anger or impulsivity compared with less frequent users<sup>48</sup> (see Chapter 92, Self-Hypnosis Techniques).

### Guided Imagery

Guided imagery uses the power of the mind to directly affect physiologic function. Practitioners of this technique report improved insight into emotional and physical health. Imagery can modulate heart rate, blood pressure, oxygen consumption, and various other physiologic measures. Deeper insight into emotions, behaviors, and thoughts can help patients deal with the anxiety and depression associated with the recovery process<sup>49</sup> (see Chapter 95, Guided Imagery and Interactive Guided Imagery).

### Yoga

A traditional East Indian healing system, yoga combines specific postures, breathing control, and meditation to reduce stress and to promote balance and a sense of well-being. Yoga, meaning “union,” attempts to help its practitioners address and equilibrate the physical, mental, and spiritual forces that coalesce in the process of disease or disharmony. Yoga has been shown to have a beneficial effect on stress-related conditions, including chronic pain, hypertension, and recovery from addiction.<sup>50</sup> There are, however, no randomized controlled trials specifically assessing the efficacy of yoga for management of addictions. The use of this technique has been shown to be beneficial as part of a comprehensive treatment program<sup>51</sup> (see Chapter 90, Prescribing Movement Therapies).

### Spirituality

The role of spirituality in medicine and recovery has been steadily gaining acceptance from mainstream health care practitioners. Numerous studies on the role of spirituality in the recovery from addiction have been conducted. Defining spirituality and religion and identifying interventions that exist within these realms are difficult. Spirituality is a subjective concept that can be considered to represent a person's connection with and relationship to a transcendent or higher power.<sup>52</sup> Religion can be defined in terms of a structured value and belief system with its own hierarchy, rituals, and practices.<sup>53</sup>

Commonly described practices in spirituality are prayer and meditation. The field of mind-body medicine often includes prayer with meditation as a synergistic tool to promote wellness and healing. Spirituality is addressed separately here because it transcends mind-body interventions and is not easily defined by objective markers. The role of spirituality—and, to some extent, religion—in the recovery process cannot be ignored. The regular practice of prayer and meditation is strongly correlated with recovery and abstinence from drugs of abuse.<sup>54</sup> Active participation in spiritual practices such as prayer appears to be more important in the recovery process than being prayed for by others.<sup>55</sup>

“Negative spirituality” may be at the root of addictions, and a “spiritual awakening” may be required before an individual can genuinely recover from addiction.<sup>56</sup> Regular church attendance has been associated with negative perceptions of addiction and lower rates of alcoholism, substance abuse,<sup>57</sup> and tobacco use.<sup>58</sup> The extent of family religious practice

also has an effect on youth perspectives on substance abuse.<sup>59</sup> Obviously, spirituality cannot be prescribed in the primary care setting, but it is important for the clinician to be aware of the client's spiritual beliefs and value systems when identifying appropriate recovery programs for referral (see Chapter 110, Integrating Spiritual Assessment and Care).

## Twelve-Step Programs

Alcoholics Anonymous (AA) has helped millions of people in their approach to recovery from alcoholism worldwide since it began in 1935. The AA program of recovery is spiritually based, with frequent meetings, mentoring, and social support. The basic spiritual framework is described in the Twelve Steps of AA, presented in [Box 81-3](#).

AA is rooted in spirituality, not religion. The AA preamble, commonly recited at the start of meetings, states that "AA is not allied with any sect, denomination, politics, organization or institution." The belief in a "higher power" is seen as a point of connection for all AA members, no matter what each calls this higher power. This generalized belief allows a group/mutual connection to a transcendent power that can help in the healing and recovery process without the need for all members to share a common belief system or religion.

### BOX 81-3. The Twelve Steps of Alcoholics Anonymous

We:

1. Admitted we were powerless over alcohol; that our lives had become unmanageable.
2. Came to believe that a Power greater than ourselves could restore us to sanity.
3. Made a decision to turn our will and our lives over to the care of God as we understood Him.
4. Made a searching and fearless moral inventory of ourselves.
5. Admitted to God, to ourselves and to another human being the exact nature of our wrongs.
6. Were entirely ready to have God remove all these defects of character.
7. Humbly asked Him to remove our shortcomings.
8. Made a list of all persons we had harmed, and became willing to make amends to them all.
9. Made direct amends to such people wherever possible, except when to do so would injure them or others.
10. Continued to take personal inventory and, when we were wrong, promptly admitted it.
11. Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out.
12. Having had a spiritual experience (awakening) as the result of these steps, we tried to carry this message to alcoholics, and to practice these principles in all our affairs.

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Meetings generally begin with reading of the AA preamble and end with reading of the serenity prayer. Meetings may be open, which anyone may attend, or closed, which only alcoholics may attend. AA groups serve specific populations, such as racial or ethnic groups, gays, and lesbians, as well as specific professions, such as doctors, nurses, and other health care providers. Approximately 100,000 AA groups in nearly 150 countries now serve millions of members.

Several concepts used in AA add to the success of the program, including sponsorship, anniversaries, and social support. A new member of AA is mentored by another member, a sponsor, who is usually of the same gender and has been active in AA for a minimum of 1 year. New members are encouraged to contact their sponsors when they are considering drinking or are having difficulties with sobriety. This system of social support and mentoring has been shown to be beneficial both to the new member and to the sponsor. Cross et al<sup>59</sup> showed that 91% of sponsors maintained their abstinence from alcohol after 10 years.

Anniversaries of sobriety are emphasized in the AA model. Special events or parties are scheduled to coincide with the individual's anniversary of sobriety. The arrangement encourages members to meet goals of prolonged abstinence and provides another avenue of social support. The social nature of these events also allows members to have fun and to make strong connections with others in the group without consuming alcohol. Primary care physicians should be aware of the AA groups in their geographic area and also should know their patients' sobriety anniversaries to be supportive and to acknowledge their accomplishments in the recovery process.

Several other 12-step programs use models similar to that of AA, including Narcotics Anonymous, Cocaine Anonymous, and Al-Anon. Family support groups like Al-Anon are available to family members and friends of alcoholics and substance abusers for the support of people close to the addicted person who are also deeply affected by substance abuse-related behaviors.

## Traditional Native American Interventions

Native American Indians have the highest alcohol-related death rates and the highest prevalence of illicit drug use reported among any racial or ethnic group in the United States. According to Indian Health Service data, the total age-adjusted alcohol-related death rate among Native Americans is 627% greater than that of the U.S. all-races population.<sup>60</sup> SAMHSA reports that 10.6% of Native Americans are illicit drug users. Although alcoholism and substance abuse are common in many Native American communities, there are significant differences between tribes from different regions, and not all tribes are significantly affected by addiction.

Native American people have experienced an immense history of injustice in the past several hundred years. The theft of land, language, culture, and spirituality has created a sense of despair that continues today in many Native American communities. A detailed account of historical events is beyond the scope of this chapter, but it is important to recognize the relatively recent dramatic cultural changes that have occurred. I was fortunate to grow up in a family with many traditional healers and spiritual leaders from the

Lakota tribe, and I incorporate this traditional philosophy into my medical practice.

The effect on people of Native American heritage of the loss of their land and culture is recognized by many current traditional leaders. This sense of loss and mourning is at the root of the high rates of depression, alcoholism, substance abuse, and other chronic diseases experienced by Native Americans. As Ed McGaa, Eagle Man, states, "Native American Indians learned how to live with the earth on a deeply spiritual plane."<sup>61</sup> The loss of land resulted in a loss of spiritual tradition. According to *Wounded Warriors*, a book delineating the loss faced by many Native Americans, "We need to understand that the primary reason our people are so afflicted with addiction, poverty, abuse and strife, is that our way of life was taken from us. Everything was taken. And nothing was replaced."<sup>62</sup> From a traditional perspective, not unlike that previously described for acupuncture and mind-body medicine, the use of alcohol and illicit drugs by some Native Americans fills the void created by the loss of spirituality.

The medicine wheel is a symbol that has been used by numerous tribes to represent wholeness and balance. To be healthy, each person must achieve a sense of balance among spiritual, mental, physical, and emotional forces (Fig. 81-2). This image provides a visual format for depicting the connection between spirituality and mental, physical, and emotional health. Another interpretation of the medicine wheel shows values, decisions, actions, and reactions as representing the spiritual, mental, physical, and emotional realms, respectively. From a spiritual perspective, in this interpretation, personal values (spiritual) are interpreted into decisions (mental). These decisions are then implemented into actions (physical), and the actions produce reactions (emotional). The emotions then provide feedback to the value system (spiritual). In this way, all decisions, actions, and emotions are rooted in the spiritual realm (Fig. 81-3).<sup>61</sup> When the spiritual realm is weakened or broken, negative emotions such as depression, anger, and low self-esteem have no spiritual basis or value system in which to be processed. As a result, these negative emotions affect decision-making and actions. For many Native American people, the sense of a "broken spirit"

and emotional despair lead to high rates of alcoholism and substance abuse (Fig. 81-4).

Within this model, health care practitioners can see the importance of addressing the concept of spiritual healing and promoting balance in treating addictions. Clearly, simple allopathic pharmacologic interventions are not enough to address addiction in this setting. Comprehensive programs that incorporate traditional cultural perspectives and philosophy with AA and other treatment methods are the most successful in treating substance abuse in Native Americans.

Healing ceremonies such as the sweat lodge and talking circle are commonly used in Native American treatment programs (see Chapter 114, Creating Ceremony and Ritual in the Medical Encounter). The sweat lodge is a traditional gathering for prayer, meditation, and purification. The talking circle is analogous to a support group, in which individuals share thoughts, emotions, and prayers in a culturally relevant and sacred manner. Anecdotally, most of my patients who participate in these healing rituals in the treatment of any chronic condition, including alcoholism and substance abuse, find the traditional interventions to promote a sense of balance

FIGURE 81-3 Medicine wheel showing spiritual values in decision-making.

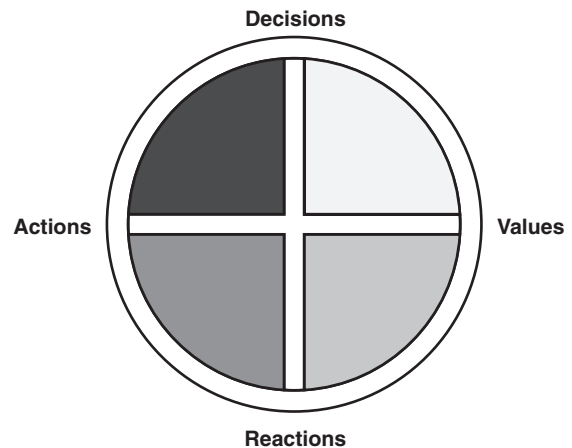


FIGURE 81-2 Traditional Lakota Indian medicine wheel.

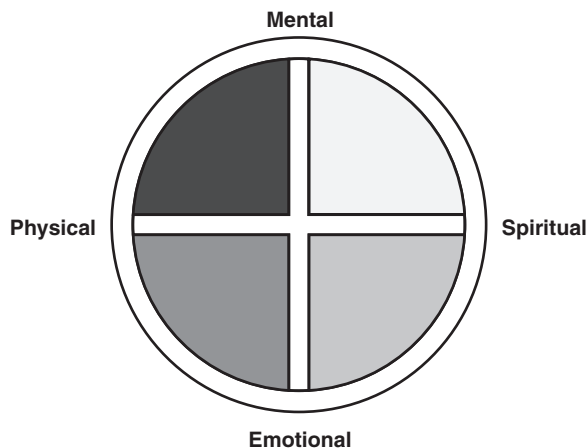
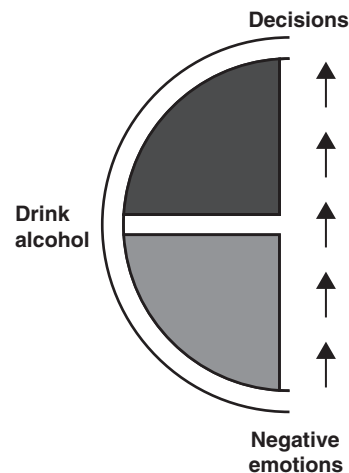


FIGURE 81-4 The "broken spirit" factor in alcoholism and substance abuse.



and wellness more effectively than anything offered by modern allopathic medicine.

## Therapies to Consider

### Nutrition

There may be a connection between nutritional deficiencies and addiction. Alcoholism is known to cause nutritional deficiencies, but it is not clear whether nutritional disorders lead to addiction. Preliminary studies of nutritional supplements appear promising in maintaining sobriety, reducing depression, and minimizing cravings. Amino acid supplementation may be an effective adjunct in the treatment of alcohol and cocaine addiction.

### Homeopathy

Homeopathic remedies have been reported to be helpful in managing addictions, anxiety, and depression. The nature of homeopathy is such that the treatment regimen is formulated to address the patient's specific characteristics and complaints. Therefore, there is no specific "anti-addiction" homeopathic remedy. A skilled homeopath may be able to prescribe remedies for specific patients that can aid in the recovery process.

## PREVENTION PRESCRIPTION

- Encourage patients to make a connection with something that gives life deeper meaning and purpose.
- Treat depression and anxiety. Work with a spiritual care provider or other health care providers before symptoms result in self-medication with alcohol or other substances.
- Encourage patients to avoid the use of illicit drugs.
- Be aware of a patient's alcohol intake. If he or she displays any of the following traits, begin an integrative approach for treatment of the addiction:
  - Craving: a strong urge to drink alcohol
  - Loss of control: being unable to stop drinking once your patient has started
  - Physical dependence: symptoms such as sweating, shaking, and anxiety after your patient stops drinking
  - Tolerance: the need for greater quantities of alcohol to feel intoxicated



## THERAPEUTIC REVIEW

The following is a summary of options for treatment of alcoholism and substance abuse. If a patient presents with a history and symptoms consistent with alcohol or substance abuse withdrawal, immediate referral to a detoxification center is warranted.

### Laboratory

Laboratory testing is not helpful in screening, but liver assessment can help in monitoring of the toxic effects of heavy drinking and be a tool in motivating behavior change.

- Alanine aminotransferase, gamma-glutamyltransferase, and carbohydrate-deficient transferrin (CDT): CDT is least affected by nonalcoholic liver disease and thus is a specific indicator for heavy ethanol use. It can be elevated if four or five drinks have been consumed at one time in the previous 2 weeks.
- Consider complete blood count and determination of levels of B<sub>12</sub>, folate, electrolytes, magnesium, uric acid, lipase, and prealbumin in chronic alcohol users.

### Pharmaceutical Agents

#### Alcohol

Benzodiazepines are commonly used for detoxification and withdrawal symptoms:

- Consider clonazepam, 1 mg three times daily, with a gradual taper during 10 to 14 days.



To reduce the high sensation associated with alcohol:

- Naltrexone (ReVia): 50 mg/day orally



To reduce the craving of alcohol:

- Acamprostate (Campral): 333 to 666 mg three times a day
- Topiramate (Topamax): titrate 25 to 300 mg weekly during 8 weeks (see Table 81-2)



To create unpleasant side effects with use of alcohol:

- Disulfiram (Antabuse): 250 to 500 mg/day



### Tobacco

- Tapered nicotine replacement: oral, patch, or inhaled over 3 to 4 weeks
- Bupropion (Zyban): 150 mg twice a day × 6 weeks. The patient should set a quit date after taking the medication for 2 weeks. It is effective in managing symptoms of withdrawal and cravings.
- Varenicline (Chantix) is started 7 days before the quit date: days 1 to 3: 0.5 mg daily; days 4 to 7: 0.5 mg twice daily; subsequent 11 weeks: 1 mg twice daily. It can be used for up to 24 weeks if needed to prevent relapse.



### Opiates

- Methadone, 15 to 20 mg/day orally for opiate addiction, is the most commonly used pharmaceutical agent in relapse prevention and management of cravings.



- Buprenorphine (Subutex) is an opioid partial agonist that reduces cravings and helps prevent relapses. It also has a lower potential than methadone for dependence. Extra training is required to prescribe it.



#### ■ Cocaine

- Antidepressant medications (selective serotonin reuptake inhibitors and tricyclic antidepressants)
- Amantadine, 100 mg orally twice daily, has been used to decrease cravings and to prevent relapse, with varying success.



#### ■ Botanicals

For anxiety, insomnia, and depression associated with substance abuse, consider the following:

- Valerian: for anxiety, 300 to 450 mg three times daily or 400 to 900 mg 2 hours before sleep. It must be used for 2 to 3 weeks before an effect can be seen.
- Kava kava extract standardized to 70% kava-lactones: 100 mg three times a day for anxiety. Avoid in patients with liver disease because of the potential for hepatic toxicity.
- St. John's wort, 300 mg three times daily or 450 to 600 mg twice daily, is used for depression, but its role in alcohol and substance abuse recovery is yet to be determined.
- Kudzu is a traditional Chinese herb that has been used in alcohol recovery. The recommended dose is 1.2 g twice daily.



#### ■ Acupuncture

Acupuncture is effective in producing relaxation and minimizing cravings for most substances of abuse.

Treatment protocols typically involve five needles placed in each ear several times a week and are most effective as part of a comprehensive treatment program.



Not all treatment facilities offer acupuncture, and referring practitioners should be aware of the treatment options available in their geographic area.

#### ■ Mind-Body Therapies



Meditation, biofeedback, hypnosis, guided imagery, yoga, and prayer have been shown to be effective adjunctive therapies in treatment programs, but most of the studies conducted to assess them have not been well controlled.

#### ■ Spirituality



Numerous studies have shown a benefit in the recovery process in persons who have a strong spiritual connection or actively participate in various religious practices. There is no correlation between a specific religion or belief system and recovery; the important factor appears to be the presence of a spiritual connection or practice.

#### ■ Twelve-Step Programs



Alcoholics Anonymous has proved to be successful in the alcoholism recovery process. The Twelve Steps are rooted in spirituality and social support.

Other programs, such as Narcotics Anonymous, Cocaine Anonymous, and Al-Anon, use similar principles and focus on other substances of abuse and their effects on the abuser's family.

Primary care physicians should be aware of the programs available in their geographic area.

#### ■ Culturally Specific Interventions



Various cultural and ethnic groups have been affected by alcoholism and substance abuse to different degrees. In many cultures, including Native American cultures, culture-specific interventions and practices can aid in the recovery process.

Physicians should be aware of the patient's cultural background and belief system when making referrals to treatment facilities.

## KEY WEB RESOURCES

National Institute of Alcohol Abuse and Alcoholism: <a href="http://www.niaaa.nih.gov">http://www.niaaa.nih.gov</a>	Patient education, resources, and helpful links
<a href="http://rethinkingdrinking.niaaa.nih.gov/ToolsResources/CalculatorsMain.asp">http://rethinkingdrinking.niaaa.nih.gov/ToolsResources/CalculatorsMain.asp</a>	Clinical calculators for alcohol, including those used to determine alcohol content of cocktails, calories in alcohol, financial costs, and blood alcohol concentrations
National Acupuncture Detoxification Association (NADA): <a href="http://www.acudetox.com/">http://www.acudetox.com/</a>	
Alcoholics Anonymous (AA): <a href="http://www.aa.org">www.aa.org</a>	
<a href="http://www.aa.org/lang/en/meeting_finder.cfm?origpage=29">http://www.aa.org/lang/en/meeting_finder.cfm?origpage=29</a>	To find AA meetings and times
National Institute on Drug Abuse (NIDA): <a href="http://www.nida.nih.gov">www.nida.nih.gov</a>	Information on drugs of abuse for clinicians, patients, teachers, and students
<a href="http://www.PCSSmentor.org">www.PCSSmentor.org</a>	NIDA also has a free “warmline” (warm because contact is made within 24 hours) that offers primary care clinicians mentors who can provide clinical assistance and resources, or call 877-630-8812

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## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- National Institute on Alcohol Abuse and Alcoholism. *What is alcoholism?* [www.niaaa.nih.gov/FAQs/General.English/FAQ1.htm](http://www.niaaa.nih.gov/FAQs/General.English/FAQ1.htm); Accessed 26.12.11.
- National Institute on Drug Abuse. *Drug abuse information.* [www.nida.nih.gov/drugpages.html](http://www.nida.nih.gov/drugpages.html); Accessed 26.12.11.
- McLellan AT, Lewis DC, O'Brien CP, Kleber HD. Drug dependence, a chronic medical illness: implications for treatment, insurance, and outcomes evaluation. *JAMA*. 2000;284:1689–1695.
- Leshner AI. Drug abuse and addiction are biomedical problems. *Hosp Pract Spec Rep*. 1997;2–4 April.
- Barbutt JC, West SL, Carey TS, et al. Pharmacological treatment of alcohol dependence: a review of the evidence. *JAMA*. 1999;281:1318–1325.
- Baltieri DA, De Andrade AG. Acamprosate in alcohol dependence: a randomized controlled efficacy study in a standard clinical setting. *J Stud Alcohol*. 2004;65:136–139.
- Leshner AI, Adler MW, Barthwell AG, et al. *Principles of Drug Addiction Treatment: A Research Based Guide*. NIH Publication No. 99-4180 Bethesda, MD: National Institutes of Health; 1999.
- Johnson BA. Medication treatment of different types of alcoholism. *Am J Psychiatry*. 2010;167:630–639.
- Florez G, Saiz PA, Garcia-Portilla P, et al. Topiramate for the treatment of alcohol dependence: comparison with naltrexone. *Eur Addict Res*. 2011;17:29–36.
- Cahill K, Stead LF, Lancaster T. Nicotine receptor partial agonists for smoking cessation. *Cochrane Database Syst Rev*. 2008;(3): CD006103.
- Wongwiwatthanakut S, Jack HM, Popovich NG. Smoking cessation. Part 2: pharmacologic approaches. *J Am Pharm Assoc (Wash)*. 1998;38:339–353.
- Stine SM, Meandzija B, Kosten TR. Pharmacologic therapies for opioid addiction. In: Graham AW, Schultz TK, eds. *Principles of Addiction Medicine*. 2nd ed. Chevy Chase, MD: American Society of Addiction Medicine; 1998:545–555.
- Center for Substance Abuse Treatment. *Clinical Guidelines for the Use of Buprenorphine in the Treatment of Opioid Addiction. Treatment Improvement Protocol (TIP) Series 40*. DHHS Publication No. (SMA) 04-3939. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2004.
- Barnett PG, Rodger JH, Bloch DA. A meta-analysis comparing buprenorphine to methadone for treatment of opiate dependence. *Addiction*. 2001;96:683–690.
- Gorelick DA. Pharmacologic therapies for cocaine and other stimulant addiction. In: Graham AW, Schultz TK, eds. *Principles of Addiction Medicine*. 2nd ed. Chevy Chase, MD: American Society of Addiction Medicine; 1998:531–544.
- Schottenfeld RS, Pakes JR, Oliveto A, et al. Buprenorphine vs methadone maintenance treatment for concurrent opioid dependence and cocaine abuse. *Arch Gen Psychiatry*. 1997;54:713–720.
- Xie CI, Lin RC, Antony V, et al. Daidzin, an antioxidant isoflavonoid, decreases blood alcohol levels and shortens sleep time induced by ethanol intoxication. *Alcohol Clin Exp Res*. 1994;18:1443–1447.
- Keung WM, Vallee BL. Daidzin and daidzein suppress free-choice ethanol intake by Syrian golden hamsters. *Proc Natl Acad Sci U S A*. 1993;90:10008–10012.
- Lukas SE, Penetar D, Berko J, et al. An extract of the Chinese herbal root kudzu reduces alcohol drinking by heavy drinkers in a naturalistic setting. *Alcohol Clin Exp Res*. 2005;29:756–762.
- Shebek J, Rindone JP. A pilot study exploring the effect of kudzu root on the drinking habits of patients with chronic alcoholism. *J Altern Complement Med*. 2000;6:45–48.
- Grant BF, Harford TC. Comorbidity between DSM-IV alcohol use disorders and major depression: results of a national survey. *Drug Alcohol Depend*. 1995;39:197–206.
- Gilman SE, Abraham HD. A longitudinal study of the order of onset of alcohol dependence and major depression. *Drug Alcohol Depend*. 2001;63:277–286.
- Pandey SC, Zhang H, Roy A, et al. Deficits in amygdaloid cAMP-responsive element-binding protein signaling play a role in genetic predisposition to anxiety and alcoholism. *J Clin Invest*. 2005;115:2762–2773.
- Gruenewald J, Brendler T, Jaenicke C, et al. *PDR for Herbal Medicines*. 2nd ed. Montvale, NJ: Medical Economics; 2000.
- Fleming T, ed. *PDR for Herbal Medicines*. Montvale, NJ: Medical Economics; 1998:943.
- Aesoph L. Addictions. In: Strohecker J, Trivieri L, Lewis D, et al, eds. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine; 1995:485–493.
- Helms JM. An overview of medical acupuncture. *Altern Ther Health Med*. 1998;4:35–45.
- Wen JL, Cheung SYC. Treatment of drug addiction by acupuncture and electrical stimulation. *Asian J Med*. 1973;9:138–141.
- Smith MO, Khan I. An acupuncture programme for the treatment of drug-addicted persons. *Bull Narc*. 1988;40:35–41.
- Auricular acupuncture for addiction treatment. In: *NADA Acupuncture Detoxification Specialist Trainee Manual*. Seattle: National Acupuncture Detoxification Association; 2000.
- McLellan AT, Grossman DS, Blaine JD, Haverkos HW. Acupuncture treatment for drug abuse: a technical review. *J Subst Abuse Treat*. 1993;10:569–576.
- Helms JM. *Acupuncture Energetics: A Clinical Approach for Physicians*. Berkeley, CA: Medical Acupuncture Publishers; 1995.
- Bullock ML, Culliton PD, Olander RT. Controlled trial of acupuncture for severe recidivist alcoholism. *Lancet*. 1989;1:1435–1439.
- Shwartz M, Saitz R, Mulvey K, Brannigan P. The value of acupuncture detoxification programs in a substance abuse treatment system. *J Subst Abuse Treat*. 1998;17:305–312.
- Avants SK, Margolin A, Holford TR, Kosten TR. A randomized controlled trial of auricular acupuncture for cocaine dependence. *Arch Intern Med*. 2000;160:2305–2312.
- Bier ID, Wilson J, Studt P, et al. Auricular acupuncture, education and smoking cessation: a randomized sham-controlled trial. *Am J Public Health*. 2002;92:1642–1647.
- Bullock ML, Kiresuk TJ, Sherman RE, et al. A large randomized placebo controlled study of auricular acupuncture for alcohol dependence. *J Subst Abuse Treat*. 2002;22:71–77.
- Shapiro D. Meditation. In: Strohecker J, Trivieri L, Lewis D, et al, eds. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine; 1995:339–345.
- Walton KG, Levitsky D. A neuroendocrine mechanism for the reduction of drug use and addiction by transcendental meditation. In: O'Connell DF, Alexander CN, eds. *Self Recovery: Treating Addictions Using Transcendental Meditation and Maharishi Ayur-Veda*. New York: Harrington Park; 1995.
- Gelderloos P, Walton KG, Orme-Johnson DW, Alexander CN. Effectiveness of the transcendental meditation program in preventing and treating substance misuse: a review. *Int J Addict*. 1991;26:293–325.
- Taub E, Steiner SS, Weingarten E, Walton KG. Effectiveness of broad-spectrum approaches to relapse prevention in severe alcoholism: a long-term, randomized, controlled trial of transcendental meditation, EMG biofeedback and electronic neurotherapy. *Alcoholism Treat Q*. 1994;11:187–220.
- O'Connell DF, Alexander CN. Introduction: recovery from addictions using transcendental meditation and Maharishi Ayur-Veda. In: O'Connell DF, Alexander CN, eds. *Self Recovery: Treating Addictions Using Transcendental Meditation and Maharishi Ayur-Veda*. New York: Harrington Park; 1995.
- Alfonso JP, Caracul A, Delgado-Pastor LC, Verdejo-Garcia A. Combined goal management training and mindfulness meditation improve executive functions and decision-making performance in abstinent polysubstance abusers. *Drug Alcohol Depend*. 2011;117:78–81.
- Katz N. Hypnosis and the addictions: a critical review. *Addict Behav*. 1980;5:41–47.
- Spiegel D, Bloom JR, Kraemer HC, Gottheil E. Effect of psychosocial treatment on survival of patients with metastatic breast cancer. *Lancet*. 1989;2:888–891.
- Page R, Handley G. The use of hypnosis in cocaine addiction. *Am J Clin Hypn*. 1993;36:120–123.
- Rossman ML. Guided imagery. In: Strohecker J, Trivieri L, Lewis D, et al, eds. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine; 1995:244–252.
- Pekala RJ, Maurer R, Kumar VK, et al. Self-hypnosis relapse prevention training with chronic drug/alcohol users: effects on self-esteem, affect, and relapse. *Am J Clin Hypn*. 2004;46:281–297.
- Ballentine R, Munro R, Schatz MP. Yoga. In: Strohecker J, Trivieri L, Lewis D, et al, eds. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine; 1995:469–481.
- Peterson EA, Nelson K. How to meet your client's spiritual needs. *J Psychol Nurs*. 1987;25:34–39.



51. Khalsa SB, Khalsa GS, Khalsa HK, Khalsa MK. Evaluation of a residential kundalini yoga lifestyle pilot program for addiction in India. *J Ethn Subst Abuse*. 2008;7:67–79.
52. Kurtz E, Ketcham K. *The Spirituality of Imperfection: Modern Wisdom From Classic Stories*. New York: Bantam Books; 1992.
53. Johnsen E. The role of spirituality in recovery from chemical dependency. *J Addictions Offender Counseling*. 1993;13:58–61.
54. Walker SR, Tonigan JS, Miller WR, et al. Intercessory prayer in the treatment of alcohol abuse and dependence: a pilot investigation. *Altern Ther Health Med*. 1997;3:79–86.
55. Warfield RD, Goldstein MB. Spirituality: the key to recovery from alcoholism. *Counseling Values*. 1996;40:196–205.
56. Miller WR. Researching the spiritual dimensions of alcohol and other drug problems. *Addiction*. 1998;93:979–990.
57. Spangler JG, Bell RA, Knick S, et al. Church-related correlates of tobacco use among Lumbee Indians in North Carolina. *Ethn Dis*. 1998;8:73–80.
58. Hardesty PH, Kirby KM. Relation between family religiousness and drug use within adolescent peer groups. *J Soc Behav Personality*. 1995;10:421–430.
59. Cross GM, Morgan CW, Mooney AJ, et al. Alcoholism treatment: a ten-year follow up study. *Alcohol Clin Exp Res*. 1990;14:169–173.
60. U.S. Department of Health and Human Services, Indian Health Services. *Regional Differences in Indian Health 1998–99*. [www.ihs.gov/PublicInfo/Publications/trends98/RD\\_98a.pdf](http://www.ihs.gov/PublicInfo/Publications/trends98/RD_98a.pdf) (page 6); Accessed 26.12.11.
61. McGaa EEM. *Mother Earth Spirituality: Native American Paths to Healing Ourselves and Our World*. San Francisco: Harper & Row; 1989.
62. Arbogast D. *Wounded Warriors: A Time For Healing*. Omaha, Neb: Little Turtle; 1995.
63. Biery JR, Williford JH, McMullen EA. Alcohol craving in rehabilitation: assessment of nutrition therapy. *J Am Diet Assoc*. 1991;91:463–466.



# Cataracts

Robert Abel, Jr., MD

## Etiology

The lens is one of the body's most solid tissues, being approximately 36% solid. It is composed of mostly proteins (crystalline fibers and enzymes) and some carbohydrate and polyunsaturated fatty acids. The lens curvature and the alignment of the fibers are designed for the bending of light rays in the visual spectrum and the absorption of radiation above and below that spectrum. A cataract is any opacification of the normally clear crystalline lens of the eye. Oxidation of lens fibers, catalyzed by short, phototoxic ultraviolet (UV) wavelengths of light, destroys the sulfhydryl protein bonds. Breaking of these bonds leads to a denaturation and clumping of the protein, with consequent loss of lens clarity.

The eye is a remote outpost that relies on good nutrition, liver function, circulation, and breathing. The lens, in particular, has no direct vascular or neurologic innervations and therefore must rely on the circulation of the small amount of aqueous humor, going from the ciliary body out through the trabecular meshwork, for delivery of nutrition and removal of toxins.

The aqueous humor has very high levels of water-soluble compounds, such as ascorbic acid, glutathione, and its key amino acid, cysteine, the major diet-derived antioxidants that protect lens clarity.

However, the eye is not an isolated organ; it is connected to the brain and cardiovascular and digestive systems. It requires protection from bright illumination, which is provided by the lids, lashes, watery tear film, cornea, and iris. Cataract formation is often symptomatic of deeper abnormalities and systemic imbalances. In a common clinical scenario, the ophthalmologist tells the patient that he or she has a cataract, followed by reassurance of its nonacute nature, "Don't worry, I'll see you in 6 months." Six months later the patient is told, "It's time to operate!" Earlier interventions directed at the disturbances underlying cataract formation can halt or significantly retard this inevitable progression.

There has been evidence to suggest the role of diabetes in the development of cataracts. From a biochemical

perspective, the sugar within the bloodstream diffuses into the aqueous humor and, in combination with light, performs photo-oxidation of the lens proteins.<sup>1</sup> Therefore, it is not unusual for diabetic patients to present with eye complaints related to cataract earlier than one would expect. In fact, Iranian researchers compared patients with type 2 diabetes and a control group to show that the diabetic patients demonstrated visually debilitating cataracts 5 years earlier than the control group.<sup>2</sup>

Cataracts are the leading cause of vision impairment in both developed and developing countries and are the major cause of blindness worldwide.

Vision provides up to 80% of our sensory input and is to be preserved at any cost. This chapter reviews the current evidence correlating antioxidant deficiency with the prevalence of cataract formation as well as the administration of specific antioxidants to reduce the incidence of lens opacification.

## Screening

### Changes in Vision

Subtle cataract development leads to unrecognized loss of color interpretation and fine detail and to difficulty with contrast and distance vision. In younger patients, fluctuating vision is often related to refractive error, computer use, diminishing accommodation, and even medications. As reported by mature adults, the following visual symptoms may indicate early cataract formation and can serve as the basis for questioning of the patient during a general medical history and physical examination:

- Blurred vision
- Difficulty with reading road signs and distance vision

- Trouble reading
- Loss of depth perception
- Difficulty following a golf ball
- Difficulty with night driving
- Glare, especially at night
- Double vision
- Reduced vision

Patients may not volunteer information about decreasing vision because they do not notice the gradual decrement, may fear losing a driver's license, or are anxious about having their eyes examined.

### Primary Care Diagnosis

The small-pupil Welch Allyn ophthalmoscope enables primary care physicians to look at the fundus of the eye to detect diabetic and other changes. The device is focused by a simple rotary movement of the thumb. With this instrument, it is possible to assess lens transparency as well as to observe the fundus.<sup>3</sup> Patient complaints are the first symptom. Distance vision problems and glare far exceed near-vision disturbances in patients with cataracts; the reverse is true in patients with macular degeneration.

### Ophthalmologic Referral

The definitive diagnosis of cataract is made by ophthalmologic referral and slit-lamp examination. Distance visual acuity, near vision, and depth perception as well as contrast sensitivity and peripheral vision can be evaluated. Glare testing may also approximate real-world conditions and may corroborate functional impairment.

### Documentation of Progression

Because cataracts are slowly progressive and phacoemulsification removal with intraocular lens implantation is an elective procedure, most ophthalmologists choose to wait for patients to volunteer information about level of inconvenience or significant loss of function. The mere appearance of early cataract changes alone rarely warrants surgical intervention. Additional difficulty is posed with lens grading because it requires multiple observers.

Every year in the United States, cataract surgery is performed in more than 3 million people, engendering more than \$2 billion in Medicare costs. Delay of cataracts for 10 years would lead to tremendous cost savings.

### Epidemiology

Cataracts are by far the leading cause of blindness worldwide. In fact, cataracts are a major cause of reversible blindness in the United States and Western Europe. The frequency increases with age; modern dogma is that everyone will get cataracts, but the truth is that most will.<sup>4</sup>

### BOX 82-1. Major Stressors to the Eye and Lens

Ultraviolet and blue light (sunlight)  
 Inadequate nutrition  
 Lifestyle habits  
 Stress  
 Chronic disease

### Risk Factors

The incidence of cataract formation varies with a number of risk factors (Box 82-1). Cataract formation is not inevitable with age. It is not unusual to find men and women in their 80s and 90s with relatively clear lenses who have had healthy lifestyle habits. The following risk factors for cataract formation have been identified:

- Age
- Sunlight exposure
- Stress
- Medications
- Smoking
- Alcohol excess
- Obesity and high body mass index
- Chronic disease
- Malnutrition
- Saturated-fat diet
- Heredity and genetics
- Trauma
- Congenital disorders
- Inborn errors of metabolism
- Dehydration
- Diabetes
- Vitamin deficiencies
- Low estrogen
- Glass blowing
- Lead exposure
- Long-term aspirin use
- African-American race

### Integrative Therapy

#### Lifestyle Interventions

##### *Ultraviolet Light-Blocking Sunglasses*

Increased solar exposure and high altitudes have long been known to raise the frequency of cataracts in all decades of life. UV light, especially in the presence of oxygen, contributes strongly to the denaturation of lens protein,

which results in cataract formation; this phenomenon was known to occur even before the deterioration of the ozone layer.

There currently are anecdotal veterinary reports of a higher incidence of cataract in rabbits in Patagonia and in dogs in Australia, both due to thinning of the ozone layer. Beachgoers and sunlamp users must be counseled to always wear adequate eye protection. Parents should encourage their children, including infants, to wear sunglasses and other forms of eye protection. Airline pilots have also been found to have a higher incidence of nuclear cataracts, as have astronauts, who may go into space only once in their lifetimes. Part of this risk may be attributable to cosmic radiation and blue light as well as to UV light.

Nevertheless, appropriate protective lenses should also be used in occupations such as welding and ironwork, in which workers experience prolonged exposure to hazardous radiation, even above and below the visual spectrum (400 to 700 nm). Use of hats and visors has been the recommendation of several long-term epidemiologic and longitudinal studies. UVA (also called near-UV) light and UVB (far-UV) light constitute toxic radiation, and their long-term effects are cumulative. Near-UV light penetrates the cornea and is generally absorbed by the lens, whereas far-UV light is more damaging but is usually absorbed by the cornea, although not entirely. For this reason, astronauts had been known to take large amounts of *N*-acetylcysteine (3000 mg/day), a glutathione booster, while on space missions.

### **Stress Management**

Stress depresses immune function, alters sleep patterns, impairs gastrointestinal absorption, and reduces available antioxidants. Stress also stimulates the sympathetic nervous system, causing vasoconstriction, increasing muscle tension, and, during long periods, decreasing microcirculation through the ophthalmic artery and its tributaries. A direct correlation between stress and cataract formation remains to be proved in humans, but there is ample evidence that stress, smoking, nutritional deficiency, radiation, and corticosteroids increased cataract formation in animal models.

### **Pharmaceuticals**

More than 300 common medications are known to be photosensitizing agents. Many antibiotics, diuretics, antihypertensives, botanicals (St. John's wort), psoralens, and other agents increase the sensitivity of lens protein to UV damage. Therefore, it is important to advise all people taking medicine to wear sunglasses and to ask their pharmacists about whether their medications are photosensitizers. Many medications also require hepatic excretion and may interfere with normal nutritional biochemistry in the liver. For instance, many cholesterol-lowering agents decrease the production of coenzyme Q10 and glutathione in the liver. Glutathione, a sulfur-containing tripeptide, is a major free radical scavenger in the human lens.

### **Corticosteroids**

Corticosteroids by any route of administration (topical, oral, intranasal, inhaled, or intravenous) are known to raise the incidence of both cataracts and glaucoma in susceptible persons. This adverse effect is most common with topical corticosteroids used in treatment of ocular inflammation

and allergies. Therefore, it is advisable for patients who are prescribed ocular steroids for allergies not to have refills without appropriate ophthalmologic supervision. There are other ways to treat ocular allergy, such as with topical antihistamines, mast cell stabilizers, and the administration of oral vitamin C (1000 mg/day) and the eucalyptus bioflavonoid preparation quercetin (1000 mg/day).

Often, the patient who sees many physicians develops a polypharmacy, which is perpetuated. Chinese and Ayurvedic healers tend to use a mixture of herbal remedies for a limited time; they then reevaluate the patient within 2 weeks and readjust the formula. This approach is a good one to incorporate into contemporary Western medicine.

### **Smoking**

Smoking not only reduces available ascorbic acid and alpha-tocopherol but also has a direct toxic effect on the lens of the eye. The longitudinal Physicians' Health Study and Nurses' Health Study have shown a significant rise in cataract formation in smokers, with twice the incidence in the male physicians' study and two thirds more cataract operations in the women who smoked.<sup>5,6</sup> In many pack-a-day smokers, a yellow-brown cast to the nucleus develops during 20 years of smoking.

### **Alcohol**

Excess intake of alcohol is known to raise the incidence of cataract formation, probably by loss of some of the B and fat-soluble vitamins and through the possible alteration of liver function.

### **Lack of Exercise**

Exercise stimulates breathing and parasympathetic activity. This effect is especially desirable in persons with chronic glaucoma conditions and macular degeneration. A group of University of Oregon investigators<sup>7</sup> found that 30 to 40 minutes of walking, four times weekly, lowered intraocular pressure and also reduced stress. Improved aqueous flow is important to the health of the crystalline lens of the eye as well.

### **Overweight**

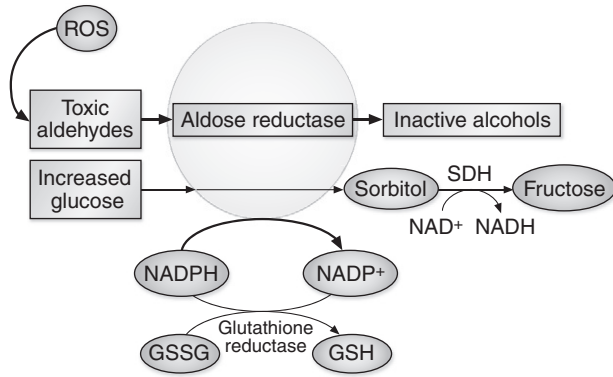
Obesity or an unfavorable waist-to-hip ratio has been associated with a higher incidence of cataract formation.<sup>8</sup> Chinese researchers noted that there is a higher rate of so-called age-related cataracts in individuals who are deemed overweight and obese by body mass index.<sup>9</sup> This association is yet another reason that it is important to encourage maintenance of ideal body weight and moderation of calorie intake.

### **Management of General Medical Conditions**

Patients with diabetes have three to five times the risk of cataract formation noted in the general population.<sup>10</sup> Effective management of diabetes is important for avoidance of both the highs and the lows of serum glucose levels. An elevation in blood glucose concentration causes an influx of fluid into the lens of the eye, significantly changing the refractive error. This change in permeability ultimately enhances protein decomposition and cataract formation through the sorbitol pathway (Fig. 82-1). Quercetin, a preparation of naturally occurring eucalyptus bioflavonoids, inhibits the

**FIGURE 82-1**

The sorbitol pathway. GSH, reduced glutathione; GSSG, oxidized glutathione;  $\text{NAD}^+$ , oxidized form of nicotinamide adenine dinucleotide (NAD); NADH, reduced form of NAD;  $\text{NADP}^+$ , oxidized form of nicotinamide adenine dinucleotide phosphate (NADP); NADPH, reduced form of NADP; ROS, reactive oxygen species; SDH, sorbitol dehydrogenase. (From Brownlee M. Biochemistry and molecular cell biology of diabetic complications. *Nature* 2001;414:813–820.)



aldose reductase pathway. Several studies also indicate that hypothyroidism is more common in persons with cataracts. Hypertension and Cushing syndrome are also associated with cataract formation.

### Female Gender

Some studies have indicated a higher incidence of cataracts in women that cannot be accounted for solely by the slight preponderance of women in the general population older than 65 years. Replacement estrogen therapy is correlated with a protective effect; therefore, the use of natural or synthetic estrogens may be appropriate in patients without contraindications to it.

### Aging and Longevity

Because the incidence of cataract rises every decade after the age of 45 years, it is important to screen people older than 45 years for general health and driving ability. Several studies in the orthopedic literature have indicated that visual disability is one of the risk factors for hip fracture. The loss of depth perception makes people particularly vulnerable to falls because they assume that they can see well with one eye yet may be likely to miscalculate steps and distances. Cataract development is seemingly related to overall health and other medical conditions. Several articles point to an inverse relationship between cataract development and life span. In fact, Age-Related Eye Disease Study (AREDS) participants with age-related macular degeneration and cataracts had a shorter life expectancy than those without both diseases.<sup>11</sup>

### Lack of Sleep

Patients should be advised to get plenty of sleep. Darkness is a time when the eyes, especially the retina, have a chance to rest, recover, and replenish. The lens and intraocular structures are bombarded by light, with the formation of free radicals, all day; sleep provides an opportunity for the liver and circulation to replenish the necessary antioxidants and minerals to the lens and other ocular tissues.

## Nutrition

### Fruits and Vegetables

Ascorbic acid, carotenoids, tocopherol, and glutathione are present in the lens epithelium and lens fibers. Proteolytic enzymes that act to remove damaged protein are also present in the lens and are spared by glutathione and other free radical scavengers. In general, the colored bioflavonoids and carotenoids are nature's protectors and should be part of a balanced diet. Multiple studies have identified green leafy vegetables as being preventive of cataract as well as of age-related macular degeneration.<sup>12</sup> The Australian Blue Mountains Eye Study, which involved 3654 persons, found that subjects with a diet high in protein, fiber, vitamin A, niacin, thiamine, and riboflavin had a lower incidence of nuclear cataracts. Persons whose diet had higher levels of polyunsaturated fatty acids had a significantly lower rate of cortical cataract formation.<sup>13</sup> Low serum levels of alpha-tocopherol may not reflect the actual concentration within the lens; interestingly, this may be true for many other nutrients as well.<sup>14</sup> Increased dietary fructose induces cataracts in diabetics and nondiabetics.<sup>15</sup>

### Vitamin C

Citrus fruits and many other fruits and vegetables contain high levels of ascorbic acid, which is a major antioxidant in the lens of the eye. The lens and aqueous humor concentrate ascorbic acid in amounts more than 10 times those found in human plasma. Ascorbate is richer in the cortical fibers than in the older, nuclear fibers. As expected, patients with senile cataracts have a lower serum ascorbate level than that of controls.<sup>16</sup> Higher blood levels of the vitamin seem to confer some protection against cataract. Persons with higher than average vitamin C intake appear to have a lower risk of nuclear cataract, and those younger than 60 years have a lower risk of cortical opacities, with intake range of 150 to 300 mg/day.<sup>17</sup>

### Lutein-Containing Foods

Spinach, kale, collard greens, guava, and even corn and eggs contain lutein, which has been found to be protective against cataract formation. People who consume high levels of green leafy vegetables and whose serum lutein levels are in the highest quintile have a 20% reduced risk of cataract formation.<sup>18,19</sup> In both the Physicians' Health Study and the Nurses' Health Study, cataract surgery was associated with lower intake of foods such as spinach, which are rich in lutein and zeaxanthin carotenoids rather than beta-carotene.

### Avoidance of Saturated Animal Fat

By reducing saturated fats, the patient will find it easier to reach and to maintain an ideal body weight. The change from saturated fat and *trans*-fat acids to polyunsaturated fatty acids is protective to the lens and is currently being evaluated in AREDS 2.<sup>20</sup> As an added benefit, the change also helps the patient improve his or her serum lipid profile.

### Hydration

The patient should be encouraged to drink plenty of water. The lens of the eye is a dehydrated tissue much like a fingernail, another avascular ectodermal structure. Drinking six to eight glasses of filtered water a day is an excellent way to increase aqueous humor circulation, which supports lens health. Tips for prevention of dry eyes are presented in [Box 82-2](#).

**BOX 82-2. Tips for Prevention of Dry Eyes**

- Adequate hydration can be promoted by drinking six to eight glasses of water daily.
- It is important to remember to blink, especially during work with computers and other tasks requiring visual concentration.
- The beneficial fats in the tear film can be reinforced with supplementation of docosahexaenoic acid (DHA) and fat-soluble nutrients such as vitamin A and lutein. DHA produces significant improvement in comfort within a week. Recommend 800 to 1000 mg/day (or 2 g/day of fish oil).
- Use of eye drops and ointments as moisturizers is recommended. For example, Tears Again (Cynacon/OCuSOFT, Inc., Rosenberg, Tex), a liposomal vitamin A and E spray, can be applied externally on the lid and appears to penetrate the eye quickly, providing relief.
- Mechanical problems with the lower lids should be ruled out, especially in patients who may be sleeping with their eyes open. When observing the patient, the clinician should check to see whether the lower lid moves during routine blinking.
- A humidifier should be kept in the bedroom.
- Periodic evaluation of the patient's medication profile is recommended.

**Sulfur-Containing Foods**

Glutathione, a major antioxidant in the lens, is found in such foods as onions, garlic, avocados, cruciferous vegetables, asparagus, and watermelon. Glutathione and its boosters are thiol compounds, which scavenge free radicals. These glutathione boosters include L-cysteine, lipoic acid, and methanylesulfonylmethane. Glutathione also spares proteolytic enzymes in the cortical lens fibers. In studies from the late 1960s, extracted mature cataracts were demonstrated to contain very low levels of glutathione and ascorbic acid; this finding was considered to represent a secondary aspect of cataract formation. In retrospect, this deficiency appears to be a preliminary event and one that can be managed nutritionally.

**Algae-Eating Fish**

Single-cell algae are at the bottom of the food chain. When the early hominids began eating fish, their brains developed further, approaching human dimensions. The traditional Japanese diet appears to protect against cataract formation because of the inclusion of cold-water fish and algae, both of which are rich in docosahexaenoic acid (DHA). (Examples of such fish are tuna, mackerel, salmon, sardines, and cod.) Currently, fish such as salmon are being farm raised. Because farm-raised fish are fed grain instead of algae, they contain less DHA and provide less benefit to the eyes and body.

**Supplements**

For a more complete listing of supplements that promote eye health, see Chapter 83, Age-Related Macular Degeneration.

**Lutein and Zeaxanthin**

Results of the Physicians' Health Study and Nurses' Health Study have indicated an approximately 20% protection against cataract formation among persons with serum lutein values in the highest quintile.<sup>18,19</sup> Lutein and its isomer, zeaxanthin, are present in high levels in ocular tissues, including the lens. Their importance may lie in the fact that they absorb and reflect the phototoxic blue and UV wavelengths. The carotenoids present in the lens turn out to be lutein and zeaxanthin more than beta-carotene. A daily dose of 2.4 mg of lutein has been shown to double the serum level. Olmedilla et al<sup>21</sup> showed that lutein had a slowing effect on cataract progression during their 2-year study. In fact, they concluded that visual function improved in patients who received lutein supplementation, suggesting that higher intakes of lutein may enhance vision in spite of cataractous lens changes. Christen et al<sup>22</sup> found that supplementing with C, E, lutein, and zeaxanthin significantly lowered the risk of cataracts.

**■ Dosage**

Patients with early cataracts should take 10 mg/day for the first month then 6 mg/day as part of their daily regimen.

**Vitamin C**

Numerous studies have shown that increased vitamin C consumption (60 to 600 mg/day) during many years protects against cataracts. In one study, the 5-year risk for the development of any cataract was 60% lower among 3634 participants, aged 43 to 86 years, who had been taking a multivitamin that included vitamin C for 10 years than in participants who had not.<sup>23</sup> Another study showed a 45% protection rate against cataract surgery in women who had consumed vitamin C supplements for 10 years.<sup>24</sup> Jacques et al<sup>25</sup> found that women with a mean vitamin C intake of 359 mg/day for 10 years had a 77% lower prevalence of earlier lens opacities.

**■ Dosage**

The investigators of the study on vitamin C supplementation recommend approximately 300 mg/day of vitamin C, although I recommend 1000 mg/day.

**■ Precautions**

Vitamin C supplementation can cause gastrointestinal disturbance, including cramping and diarrhea.

**Vitamin A**

Hankinson et al<sup>24</sup> found a 39% lower incidence of cataract formation in more than 50,000 nurses who had an adequate intake of vitamin A during an 8-year period than in nurses in the study who did not. This association has been reported in other studies as well. However, this finding must be balanced with a study<sup>26</sup> that has described an association of hip fractures with vitamin A supplementation at more than 17,000 units/day in women. This association may be due to competition of vitamin A with vitamin D absorption in some way.

**■ Dosage**

Most good multivitamins contain 5000 units of vitamin A or beta-carotene. Additional supplementation is usually not warranted.

### Multivitamins

Multivitamin intake has been observed to reduce the risk for cataracts by approximately 20% to 60%, depending on the content of ascorbic acid. Vitamin E (*d*-alpha-tocopherol) is also protective, as found by numerous studies. Robertson et al<sup>27</sup> found that vitamin C (300 to 600 mg/day) and vitamin E (400 units/day) had a 50% protective effect.

The 10-year randomized AREDS was concluded early. It supported the use of a multivitamin with A, C, E, and zinc in macular degeneration but did not find a reduction in cataract development. There is not enough scientific evidence to support the notion that a high dose of a single nutrient provides a greater benefit in reducing cataract risk than a daily multivitamin or a healthy diet.<sup>28</sup> One randomized clinical trial showed that one multivitamin preparation prevented the development of cataract but did not stop the progression once it was fully developed.<sup>29</sup> Others found that ascorbate, lutein, and retinol inversely affected the rate of cataract development.<sup>30</sup>

#### ■ Dosage

Taking a multivitamin is a convenient way to obtain a daily amount of beta-carotene or vitamin A, trace minerals, lutein, and other essential nutrients in two to four capsules, depending on the brand.

### Vitamin E

The Lens Opacities Case-Control Study confirmed that alpha-tocopherol is protective against lens opacity.<sup>31</sup> Another study from Linxian, China, also found vitamin E to be protective against cataract formation in persons older than 45 years.<sup>32</sup> Results of other studies suggest that vitamin E has no protective effect against cataract formation,<sup>33</sup> but the question remains whether natural (*d*-alpha) or synthetic (*dl*-alpha) vitamin E was administered in these studies.

### B Vitamins

The B vitamins, especially riboflavin (3 mg), thiamine (10 mg), and niacin (40 mg), were found to be protective against cataracts in both the Blue Mountains Eye Study in Australia and another study from Linxian, China.<sup>13,32</sup>

### Docosahexaenoic Acid

DHA, the end product of omega-3 fatty acid metabolism, is known to protect cell membranes and thiol groups. An important constituent of retina and brain, DHA has also been found in the lens of the eye. With its presence in all cell membranes and its six double bonds, replenishment of this compound is important. Reduction of DHA stores in women who have experienced pregnancy may be a reason for the gender discrepancy in cataract development. The DHA available in breast milk has been documented to reduce learning disabilities in children and to improve head size and growth in the first year of life. The Mediterranean diet has a 1:1 ratio of omega-3 to omega-6 fatty acids, whereas in the average American diet, the ratio ranges from 1:6 to 1:20.

#### ■ Dosage

A supplemental regimen of 800 to 1000 mg/day of DHA is helpful for almost all adults. Amounts up to 6 g/day have not shown any toxicity in volunteers. This supplement, like all fat-soluble vitamins and supplements, should be taken with a meal for enhanced bioavailability.

### Carnosine

*N*-Acetyl-L-carnosine eye drops are appearing everywhere on vitamin store shelves. Toh et al<sup>34</sup> reviewed the modern treatment of cataracts and stated that the clinical trials with carnosine eye drops are encouraging. It is commonly found in antiaging products because of its inhibition of advanced glycosylation end products. Limited human data are available.

### Botanicals

Numerous herbs are known to improve blood flow to the eye and to strengthen liver function. Bioflavonoids in certain berries have been proved to enhance capillary formation; however, their effect on night vision is inconclusive. Astragalus, milk thistle (silymarin), oleander, turmeric root, garlic bulb in oil, and wheat sprouts are botanicals that strengthen liver function.<sup>35</sup> Some supplements are used to improve and support liver function, such as *S*-adenosyl-L-methionine (SAMe) and silymarin.

### Turmeric

Curcumin, a constituent of turmeric (*Curcuma longa*), is a spice found in Indian curry dishes. This compound is an effective antioxidant known to induce the glutathione-linked detoxification pathways in rats. It significantly reduces the rate of cataract formation in laboratory rats, but human studies have not been done in the West.<sup>36</sup>

### Cineraria

*Cineraria maritima*, or *Senecio cineraria* (silver ragwort), has been used for centuries as an eye drop preparation for the treatment of conjunctivitis and early cataract. Homeopathic preparations have also been employed, but they have not been subjected to controlled studies.

### Bioflavonoids

The eucalyptus bioflavonoid preparation quercetin has been found in multiple laboratory studies to inhibit the formation of cataracts induced by steroids, diabetes, and radiation.

### Surgery

Cataract surgery is the most common surgery performed in the United States today; more than 3 million procedures are performed annually. The subsequent laser treatment of an opacified capsule ranks among the 10 most common surgical procedures. With appropriate history and physical examinations and regular eye examination, early cataract formation can be detected long before functional visual loss develops.

Cataract surgery is performed under sterile conditions with local anesthesia. The procedure involves removal of the cataract by phacoemulsification and insertion of an implant within the lens capsule. The synthetic implant may be silicone, polymer, or acrylic. The complications of cataract surgery include infection, lens dislocation, retinal hemorrhage, and retinal detachment. With modern technology, however, this is one of the safest surgical procedures today. In fact, most patients who undergo cataract surgery in one eye can immediately notice the difference and are satisfied with the results.<sup>37,38</sup>

## PREVENTION PRESCRIPTION

- Recommended eye examination annually for people older than 50 years and for people at risk. Use of preventive measures is appropriate even in patients with early cataracts.
- Advise use of sunglasses, with side shields as necessary, as well as hats or visors and sunblock in persons whose occupation or interests dictate spending time outdoors.
- Recommend a balanced diet with five or six servings of fruits and vegetables as well as grains, nuts, berries, and organic eggs for amino acids, with consumption of cold-water fish two or more times per week.
- Recommend lutein-rich foods, such as spinach, three times a week; these foods are especially important for ocular protection.
- Promote adequate hydration with intake of six to eight glasses of filtered water daily, with reduction in intake of soft drinks and artificial sweeteners.
- Recommend a daily multivitamin including taurine, zinc, lutein, an additional 1000 to 2000 mg of vitamin C, 400 units of vitamin E, and 5000 units of vitamin A palmitate.
- Advise the patient to maintain an appropriate body weight and to avoid animal fat in the diet.
- Encourage the healthful lifestyle habits of stretching, exercise, moderate alcohol intake, and a regular sleep pattern, with cessation of smoking.
- Advise the patient to maintain a positive attitude and optimism.
- Periodically review prescription and other medications for ophthalmologic effects.
- Encourage regular physical examination and vision testing.



## THERAPEUTIC REVIEW

Abundant evidence suggests that we can develop new strategies to maintain our health now instead of waiting for cataracts to form.

Here is a summary of therapeutic and preventive options for cataracts. If a patient presents with severe symptoms, such as profound visual obstruction, it would be to his or her benefit for the clinician to immediately begin a more aggressive therapy, such as referral for elective surgery. For the patient who has mild to moderate symptoms, however, this ladder approach is appropriate.

### ■ Remove Exacerbating Factors

The patient should be encouraged to

- Stop taking steroid-containing and photosensitizing medications for prolonged use.
- Stop smoking; have moderate alcohol intake; try to lose weight, if needed, through diet and exercise; and substitute good fats in place of bad fats in the diet.
- Wear sunglasses while outside and a hat or visor with at least a 3-inch brim.

### ■ Nutrition

- Encourage a low-fat, low-cholesterol diet.



- Encourage foods rich in omega-3 fatty acids (wild salmon, nuts, flaxseed) or supplementation with DHA 800 to 1000 mg/day.



### ■ Supplements

- Multivitamins: daily multivitamin including taurine, zinc, lutein, an additional 1000 to 2000 mg of vitamin C, 400 units of vitamin E, and 5000 IU of vitamin A palmitate
- Docosahexaenoic acid (DHA): 500-800 mg/day
- Lutein: 6 mg/day for 1 month, then 2 mg/day



### ■ Botanicals

- Turmeric is a major antiinflammatory agent used throughout Asia; there are many data in the Chinese literature of its effectiveness in reducing the risk of cataracts.



### ■ Surgical Therapy

If the patient's symptoms persist or worsen despite the preceding measures, referral for ophthalmic evaluation and treatment is warranted:

- Cataract extraction by phacoemulsification with intraocular lens insertion (one-step)





**KEY WEB RESOURCES**

<http://eyeadvisory.com/>

This Web site is devoted to providing the latest options in both traditional and complementary therapies for 21st-century eye care.

<http://www.ageingeye.net/>

Current options in cataract care are explored in laymen's language.

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**References**

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Kysel'ova Z, Krizanova L, Soltes L, Stefek M. Electrophoretic analysis of oxidatively modified eye lens proteins in vitro: implications for diabetic cataract. *J Chromatogr A*. 2005;1084:95–100.
- Janghorbani M, Amini M. Cataract in type 2 diabetes mellitus in Isfahan, Iran: incidence and risk factors. *Ophthalmic Epidemiol*. 2004;11:347–358.
- Bresnick G, Mukamel D, Dickinson J, et al. A screening approach to the surveillance of patients with diabetes for the presence of vision threatening retinopathy. *Ophthalmology*. 2000;107:19–24.
- Babalola OE, Murdoch IE, Cousens S, et al. Blindness: how to assess numbers and causes? *Br J Ophthalmol*. 2003;87:282–284.
- Hankinson SE, Willett WC, Colditz GA, et al. A prospective study of cigarette smoking and risk of cataract surgery in women. *JAMA*. 1992;268:994–998.
- Cristen WG, Manson JA, Seddon JM, et al. A prospective study of cigarette smoking and risk of cataract surgery in men. *JAMA*. 1992;268:989–993.
- Passo MS, Goldberg L, Elliot DL, Van Buskirk EM. Exercise training reduces intraocular pressure among subjects suspected of having glaucoma. *Arch Ophthalmol*. 1991;109:1096–1098.
- Schaumberg DA, Glynn RJ, Christen WG, et al. Relations of body fat distribution and height with cataract in men. *Am J Clin Nutr*. 2000;72:1495–1502.
- Kuang TM, Tsai SY, Hsu WM, et al. Body mass index and age-related cataract: the Shihpai Eye Study. *Arch Ophthalmol*. 2005;123:1109–1114.
- Bunce G. Animal studies on cataract. In: Taylor A, ed. *Nutritional and Environmental Influences on the Eye*. Boca Raton, FL: CRC Press; 1999:105–115.
- Clemons TE, Kurinij N, Sperduto RD, AREDS Research Group. Associations of mortality with ocular disorders and an intervention of high-dose antioxidants and zinc in the Age-Related Eye Disease Study: AREDS Report No. 13. *Arch Ophthalmol*. 2004;122:716–726.
- Meyer CH, Sekundo W. Nutritional supplementation to prevent cataract formation. *Dev Ophthalmol*. 2005;38:103–119.
- Cumming RG, Mitchell P, Smith W. Diet and cataract: the Blue Mountains Eye Study. *Ophthalmology*. 2000;107:450–456.
- Krepler K, Schmid R. Alpha-tocopherol in plasma, red blood cells and lenses with and without cataract. *Am J Ophthalmol*. 2005;139:266–270.
- Gul A, Rahman MA, Hasnain SN. Role of fructose concentration on cataractogenesis in senile diabetic and non-diabetic patients. *Graefes Arch Clin Exp Ophthalmol*. 2009;24:802–809.
- Jalal D, Koorosh F, Fereidoun H. Comparative study of plasma ascorbic acid levels in senile cataract patients and in normal individuals. *Curr Eye Res*. 2009;34:118–122.
- Taylor A. Nutrition and cataract risk. *Ophthalmol Clin*. 2000;40:27.
- Chasan-Taber L, Willett WC, Seddon JM, et al. A prospective study of carotenoid and vitamin A intakes and risk of cataract extraction in U.S. women. *Am J Clin Nutr*. 1999;70:509–516.
- Brown L, Rimm ER, Seddon JM, et al. A prospective study of carotenoid intake and risk of cataract extraction in U.S. men. *Am J Clin Nutr*. 1999;70:517–524.
- Age-Related Eye Disease Study 2 (AREDS2). <http://www.nei.nih.gov/neitrials/viewStudyWeb.aspx?id=120>; Accessed 22.8.06
- Olmedilla B, Granado F, Blanco I, Vaquero M. Lutein, but not alpha-tocopherol, supplementation improves visual function in patients with age-related cataracts: a 2-y double-blind, placebo-controlled pilot study. *Nutrition*. 2003;19:21–24.
- Christen WG, Liu S, Glynn RJ, et al. Dietary carotenoids, vitamins C and E, and risk of cataract in women: a prospective study. *Arch Ophthalmol*. 2008;126:102–109.
- Mares Perlman JA, Lyle BJ, Klein R, et al. Vitamin supplement use and incident cataracts in a population-based study. *Arch Ophthalmol*. 2000;118:1556–1563.
- Hankinson SE, Stampfer MJ, Sedden JM, et al. Nutrient intake and cataract extraction in women: a prospective study. *BMJ*. 1992;305:335–339.
- Jacques PF, Taylor A, Hankinson SE, et al. Long-term vitamin C supplement use and prevalence of early age related lens opacities. *Am J Clin Nutr*. 1997;66:911–916.
- Feskanich D, Singh V, Willett WC, Colditz GA. Vitamin A intake and hip fractures among postmenopausal women. *JAMA*. 2002;287:47–54.
- Robertson JM, Danner AP, Trevithick JR. A possible role for vitamin C and E in cataract prevention. *Am J Clin Nutr*. 1991;53:346S–351S.
- Mares JA. High-dose antioxidant supplementation and cataract risk. *Nutr Rev*. 2004;62:28–32.
- Maraini G, Sperduto RD, Ferris F, et al. A randomized, double-masked, placebo-controlled clinical trial of multivitamin supplementation for age-related lens opacities. Clinical trial of nutritional supplements and age-related cataract report no. 3. *Ophthalmology*. 2008;115:599–607.
- Dherani M, Murthy GV, Gupta SK, et al. Blood levels of vitamin C, carotenoids and retinol are inversely associated with cataract in a North Indian population. *Invest Ophthalmol Vis Sci*. 2008;49:3328–3335.
- Leske MC, Chylack LT, Wu SY. The Lens Opacities Case-Control Study: risk factors for cataract. *Arch Ophthalmol*. 1991;109:244–251.
- Sperduto RD, Milton RC, Zhao JL, et al. The Linxian cataract studies. *Arch Ophthalmol*. 1993;111:1246–1253.
- Christen WG, Glynn RJ, Chew EY, et al. Vitamin E and age-related cataract in a randomized trial of women. *Ophthalmology*. 2008;115:822–829.
- Toh T, Morton J, Coxon J, Elder MJ. Medical treatment of cataract. *Clin Experiment Ophthalmol*. 2007;35:664–671.
- Tillotson AK. *The One Earth Herbal Sourcebook*. New York: Kensington; 2001.
- Kumar PA, Reddy PY, Srinivas PN, et al. Delay of diabetic cataract in rats by the antiglycating potential of cumin through modulation of alpha-crystallin chaperone activity. *J Nutr Biochem*. 2009;20:553–562.
- Thompson AM, Sachdev N, Wong T, et al. The Auckland Cataract Study: 2-year postoperative assessment of aspects of clinical, visual, corneal topographic and satisfaction outcomes. *Br J Ophthalmol*. 2004;88:1042–1048.
- Kostoff RN. Literature-related discovery (LRD): potential treatments for cataracts. *Technological Forecasting Social Change*. 2008;75:215–225.



# Age-Related Macular Degeneration

Robert Abel, Jr., MD

Nowhere has there been so much scientific documentation about nutritional prevention as in the case of macular degeneration. The irony lies in the fact that this information is often virtually ignored by the very specialists who manage patients with the disease.

## Etiology

Age-related macular degeneration (AMD) is the scourge of the “golden years.” People 65 years and older constitute the fastest-growing segment of the population in developed countries; the risk for AMD and its impact will only become greater in the future. There is a tremendous need to develop preventive strategies to counter AMD and to arrest early cases before the loss of useful vision.

Retinal photoreceptors are subjected to oxidative stress from the combined exposure to light and oxygen on a daily basis. The body's ability to resupply the photoreceptors and underlying pigment epithelium with essential nutrients is the basis for maintenance of good vision throughout life. Diseases of the retina are the leading cause of blindness throughout the developed countries of the world. Among these diseases, macular degeneration is the most common, and its incidence is rising as the population ages. Population-based studies indicate that approximately 10% of people 65 to 74 years and 30% of those 75 years and older demonstrate early signs of the disease, and 7% already have late signs of disease.<sup>1</sup>

Free radicals are thought to attack the rod and cone cell membranes; the retinal pigment epithelium (RPE), a monolayer beneath the retina, fails to keep up with the removal of lipid debris, which accumulates as drusen (yellow spots of different sizes). The melanin pigment protects the retina from radiation, but the amount of this pigment diminishes with age, smoking, and low serum lutein levels. When the RPE cells drop out, pigmentary defects can be noted by

ophthalmoscopic examination and on retinal photography. Drusen and progressive RPE atrophy characterize the dry form of macular degeneration, which accounts for 90% of cases of AMD (Figs. 83-1 and 83-2).

The other 10% of cases are attributable to the exudative or vascular type of AMD. A hyaline membrane (i.e., Bruch's membrane) separates the choroidal blood supply from the RPE and overlying retina. Degeneration of Bruch's membrane, retinal anoxia, and impairment of choroidal circulation are believed to be factors that induce the vascular ingrowth characteristic of this form of the disease. These fragile new vessels grow rapidly and may bleed spontaneously.

Most ophthalmologists agree that oxidative stress combined with failure to fortify the retinal photoreceptors is a major pathophysiologic mechanism in this disease, which currently affects 20 million older Americans. Many of these physicians also consider vision loss from macular degeneration to be inevitable, believing that nothing can be done for the dry form and that perhaps only recent interventional therapies are useful for treatment of the wet form of macular degeneration, if it is detected in time. Nowak et al<sup>2</sup> demonstrated significantly higher concentrations of lipid peroxidation products in AMD patients. This finding adds credence to the considerable evidence that nutritional approaches play a major part in prevention and management of this age-related disease. Cumulative photooxidative stress, other systemic diseases, and nutritional deficiencies contribute to the onset and progression of AMD. With aging, the protective cell-derived enzymes—catalase, superoxide dismutase, and glutathione peroxidase—decrease, as does the ability to absorb the diet-derived antioxidants.

## Screening

Owing to the swelling ranks of the elderly, the number of persons with macular degeneration is growing. Routine dilated-eye examinations are fundamental to early detection

**FIGURE 83-1**

Atrophic (dry) age-related macular degeneration. Geographic atrophy of the retinal pigment epithelium causes loss of central vision. (From Fillit H. *Brocklehurst's Textbook of Geriatric Medicine and Gerontology*. 7th ed. Philadelphia: Saunders; 2010.)

**FIGURE 83-2**

Exudative (wet) age-related macular degeneration. Leakage and scarring from a subretinal neovascular membrane destroy central retinal function. (From Fillit H. *Brocklehurst's Textbook of Geriatric Medicine and Gerontology*. 7th ed. Philadelphia: Saunders; 2010.)



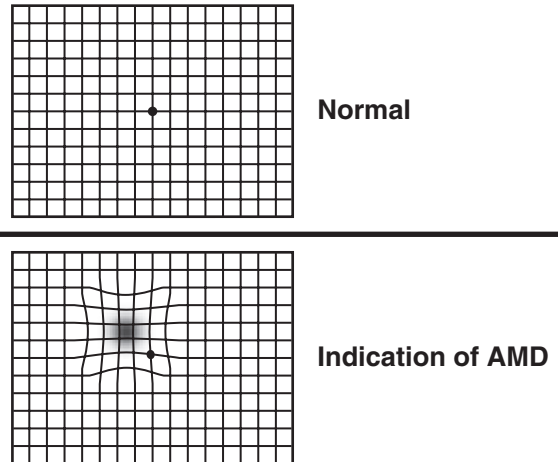
and management of AMD. The onset is often so gradual as to go unnoticed.

Use of an Amsler grid, a 4 × 4-inch checkerboard square with a central dot for fixation, is an excellent way to diagnose AMD and allows home monitoring of the condition. This approach to management is especially useful in patients with the slowly progressive, dry form of the disease (Fig. 83-3).

Primary care physicians should know the AMD risk profiles to alert patients about preventive steps and the need for periodic eye examinations. Patients with multiple systemic

**FIGURE 83-3**

Amsler grid. This checkerboard-patterned square has parallel vertical and horizontal lines. The patient looks at the central dot with one eye covered and notes the pattern of the lines. If any line in any direction is missing or wavy, the patient marks it in with a pencil or makes a note. The Amsler grid can be used to determine whether there is a disorder of the optic nerve or macula; in particular, use of the grid is an excellent way to monitor macular degeneration to determine whether it is stable or progressing.



diseases are at greatest risk. Early detection offers greater flexibility in the use of complementary therapies.

Referral to an ophthalmologist is indicated for dilated fundusoscopic examination and retinal imaging (photograph, laser tomography, and fluorescein angiography), which can clearly document stages of AMD. On occasion, retinal specialists are needed for advanced management.

Primary care physicians should help patients coordinate the various medicines used in the management of underlying and concurrent diseases. Periodic review of medications is important because polypharmacy may contribute to the risk for AMD.

## Risk Factors

The following risk factors for AMD have been identified:

- Age
- Sunlight exposure
- Previous cataract surgery
- Light-colored irises, fair complexion
- Obesity
- Female gender, parity
- Postmenopausal status
- Inflammation
- Smoking
- Physical inactivity
- Elevated serum cholesterol values
- Hypertension
- Nocturnal hypotension

- Poor digestion, use of antacids
- Hypothyroidism, use of thyroid hormones
- Family history
- Low dietary intake of carotenoids, low serum carotenoid levels
- Low macular pigment density
- Low serum zinc levels
- Hyperopia

The National Health and Nutrition Examination Survey demonstrated that for 65- to 70-year-old respondents, the chance for development of AMD was nearly five times that for 45- to 54-year-old respondents.<sup>3</sup>

## Sunlight

Reducing exposure to sunlight through the use of hats and sunglasses has been stressed in numerous studies.<sup>4</sup> A University of Wisconsin study of 3684 persons between the ages of 43 and 84 years found a positive correlation between daily sun exposure and the development of AMD. Persons who spent more than 5 hours a day in the sun were twice as likely to have AMD as those with less than 2 hours a day of sun exposure.<sup>5</sup>

## Gender

The incidence of AMD is at least three times greater in postmenopausal women than in men of similar age. Two studies have indicated that hormone replacement therapy (HRT) significantly reduces this risk, although a third study did not find any correlation. Apparently, women require more lutein than men do because it is preferentially deposited in fatty tissue rather than in the retina.<sup>6</sup> Obstetricians and gynecologists should inform their patients about early prevention and participate in decisions about biocompatible HRT when appropriate.

## Inflammation

Clemons et al<sup>7</sup> showed that early or moderate AMD advances with smoking, increasing body mass index, and, probably, use of antacid and antiinflammatory medications. Seddon et al<sup>8</sup> demonstrated that C-reactive protein levels were higher in individuals with advanced AMD.

## Smoking and Other Factors

Numerous investigators have determined that current smokers, especially those who smoke one pack a day or more, have a significantly higher risk for development of AMD than do nonsmokers and persons who have given up smoking 10 years previously. The Nurses' Health Study indicated that women who smoked 25 or more cigarettes a day were more than twice as likely as nonsmokers to have AMD.<sup>9</sup> The Physicians' Health Study also showed a greater than two-fold incidence in men who smoked 20 or more cigarettes daily.<sup>10</sup> One study indicated an association between smoking, low serum selenium levels, and the development of AMD. Smoking has been shown to contribute to reduced levels of circulating antioxidants as well as of the lutein pigment in the macular area.

The Age-Related Eye Disease Study (AREDS) found that smoking is associated with three of its five stages of macular degeneration.<sup>11</sup> This multicenter, randomized controlled trial also found that hypertension, obesity, hyperopic refractive error, white race, and increased use of thyroid hormones and antacids were indicators for the most severe stages of the disease.

## Integrative Therapy

### Lifestyle Interventions

#### *Sunglasses, Hats, and Visors*

Everyone's need to wear sunglasses with light protection, hats, and visors should be emphasized as early as childhood. People with dilated pupils, outdoor workers, and people who frequent tanning beds may be at a higher risk for development of macular degeneration. Microscope light during cataract surgery is another source of phototoxicity. Sun exposure is a known causative factor in the progression of the hereditary disorder retinitis pigmentosa.

#### *Stress Management*

Hormonal imbalance and lack of sleep contribute to debilitation of retinal health. Depression contributes to food habituation, overeating, and abnormal sleep patterns. Ocular health remains in a sensitive balance between oxidative stress and antioxidant support of cell membranes. Therefore, smoking and inadequate nutrition both tip the scale toward increased or imbalanced free radical activity.

#### *Limiting Alcohol Intake*

Alcohol excess has been associated with cardiovascular and liver disorders. The Beaver Dam Eye Study documented an association between beer consumption and risk of RPE degeneration. Two further studies have indicated that one or two glasses of red wine daily can confer a 40% to 50% reduction in risk for AMD. However, the Physicians' Health Study and Nurses' Health Study, conducted between 1980 and 1994, could not confirm any significant benefit. Red wine has a protective effect on cardiovascular health and may improve retinal and choroidal blood flow. Apparently, white wine, which lacks the high levels of grape skin bioflavonoids, does not confer as much ocular protection.

#### *Recognition of Medication Effects*

Numerous medications, including phenothiazines, hydroxychloroquine, and ethambutol, may negatively affect the RPE. Other agents may alter digestion or liver function. The liver not only filters out all of the nutrients and toxins from the gastrointestinal tract but also stores fat-soluble vitamins, activates the B vitamins, and manufactures glutathione. Chinese and Ayurvedic physicians have known for millennia that the liver is essential to good vision.

Antacid use has been positively correlated with the development of AMD. The lack of gastric acidity reduces the stimulus for secretion of pancreatic and biliary enzymes into the duodenum.

### Hydration

Drinking six or more glasses of good water a day hydrates the body, flushes the liver and kidneys, and decreases appetite. Patients should be counseled against excessive consumption of caffeinated soft drinks.

### Exercise

Exercise plays a role in cardiovascular health and in stimulating the parasympathetic nervous system. Physical activity also plays a part in relaxation of the mind, decreasing intraocular pressure and improving ocular blood flow.

### Breathing

Deep breathing relaxes the mind, strengthens the diaphragm, and improves blood flow to the eye. Conscious attention to breathing is the foundation of meditation and stress reduction practices.

### Whole Body Health

Management of concurrent medical conditions is essential. Regulating blood pressure and serum cholesterol level, controlling diabetes, supporting necessary weight reduction, and managing cardiovascular health are important to the long-term maintenance of good vision. It is wise to remember that the eye is intimately connected to the rest of the body.

### Estrogen

Women are more likely than men to have AMD. Several studies have demonstrated that postmenopausal women who are taking HRT exhibit a lower incidence of macular degeneration, especially the wet form of the disease.<sup>12</sup> However, one study was unable to determine any significant effect of estrogen replacement therapy. Nonetheless, clinicians find that more postmenopausal women have AMD than men do.

### Sleep

Sleep is crucial to restoration of photoreceptor and ocular health. The eye requires darkness to restore photoreceptor integrity and to replenish nutrients consumed during the daylight hours, when ultraviolet wavelengths and bright light are constantly bombarding the eye.

### Attitude

Adopting a positive attitude is the first step in lifestyle modification. The placebo effect is another demonstration of the “power of positive thinking.” In one study, 68% of persons who took a multivitamin for 6 months showed an improvement in macular appearance on electroretinograms; however, 32% of the placebo group also showed improvement. Similarly, in an initial study of photodynamic therapy to control retinal bleeding, approximately 50% of subjects receiving the therapy demonstrated some benefit compared with 28% of the placebo group. This nearly 30% placebo effect, which contributed to the cessation of retinal bleeding, is a demonstration of the power of positive thinking.

### Nutrition

Box 83-1 lists the foods recommended for preservation of sight.

#### BOX 83-1. Top 10 Foods for Sight Preservation

- *Cold-water fish (sardines, cod, mackerel, and tuna):* an excellent source of DHA, which provides structural support to cell membranes and is recommended for dry eyes, treatment of macular degeneration, and sight preservation (see Chapter 86, The Antiinflammatory Diet).
- *Spinach, kale, and green leafy vegetables:* rich in carotenoids, especially lutein and zeaxanthin; lutein, a yellow pigment, protects the macula from sun damage and from blue light.
- *Eggs:* rich in cysteine, sulfur, lecithin, amino acids, and lutein; sulfur-containing compounds protect the lens of the eye from cataract formation.
- *Garlic, onions, shallots, and capers:* rich in sulfur, which is necessary for the production of glutathione, an important antioxidant for the lens of the eye and for the whole body.
- *Soy:* low in fat, rich in protein; has become a staple in vegetarian diets; contains essential fatty acids, phytoestrogens, vitamin E, and natural antiinflammatory agents.
- *Fruits and vegetables:* contain vitamins A, C, and E and beta-carotene; the yellow vegetables, such as carrots and squash, are important for daytime vision.
- *Blueberries and grapes:* contain anthocyanins, which improve night vision; a cupful of blueberries or huckleberry jam or a 100-mg bilberry supplement may improve dark adaptation within 30 minutes.
- *Wine:* known to exert a cardioprotective effect; has many important nutrients that protect vision, heart, and blood flow (as with any alcohol, moderation is always important).
- *Nuts and berries:* nature's most concentrated food sources; grains such as flaxseed are high in the beneficial omega-3 fatty acids, which help lower serum cholesterol and stabilize cell membranes.
- *Extra-virgin olive oil:* a monounsaturated oil and a healthy alternative to butter and margarine.

### Fruits and Vegetables

Fruits and vegetables contain vitamins A, C, and E and beta-carotene and lutein. The yellow-orange vegetables, such as carrots and sweet potatoes, are important for daytime vision. Cho et al<sup>13</sup> found strong evidence of a protective role of fruit against the risk for neovascular AMD or age-related maculopathy.

### Lutein-Containing Foods

Spinach, collard greens, kale, guava, and many other green and yellow fruits and vegetables contain lutein and its isomer, zeaxanthin. These two carotenoids are concentrated in the macular pigment; their accumulation depends directly on dietary intake and serum level.

The complete name of the visually sensitive center of the retina is macula lutea because of its yellow color (Latin *luteus*, “yellow”). Lutein and zeaxanthin are known to be responsible for the yellow color. The normal retina is capable of concentrating these carotenoids to a level several orders of magnitude greater than the serum level. Evidence suggests that the lutein in macular pigment is entirely of dietary origin and is highly protective against AMD.<sup>14</sup>

In one study, persons consuming lutein-rich foods five times a week were eight times less likely to have AMD than those consuming such foods once a month.<sup>15</sup> In addition, persons with serum lutein values in the highest quintile had a 43% lower risk for AMD. Another study demonstrated that consumption of 4 to 8 oz/day of spinach for 4 months resulted in greater macular pigment density. The vitamin K content in spinach may interfere with blood-thinning agents such as warfarin sodium. Preliminary data have demonstrated improvement in visual function in patients with the dry form of AMD whose diet was modified to provide an abundance of dark green vegetables.<sup>16</sup>

There is 44 mg of lutein per cup of cooked kale, 26 mg per cup of cooked spinach, and 3 mg per cup of broccoli.

### Avoidance of Saturated Fats

Patients should be advised to decrease their intake of saturated fats. Diets high in saturated fats contribute to the risk of AMD, whereas those high in unsaturated fats reduce that risk.<sup>17</sup>

### Cold-Water Fish

Docosahexaenoic acid (DHA), found in cold-water, deep-dwelling fish, is an essential nutrient for good brain and retinal function. The flesh of algae-eating fish is high in DHA, which is important in building and protecting photoreceptor membranes. In one study, persons consuming cold-water fish more than once a week were half as likely to experience macular degeneration as those consuming fish less than once a month.<sup>18</sup> The same study found a 2.7-fold greater incidence of AMD in persons consuming high levels of dietary cholesterol. Eating oily fish at least once weekly compared with less than once weekly halved the incidence of neovascular AMD.<sup>19</sup>

### Wine in Moderation

Most researchers agree that consumption of moderate amounts of red wine reduces the risk of macular degeneration. In addition, many studies report that moderate wine consumption is associated with lengthened life span.

### Glutathione

An important study found that glutathione and related precursor amino acids are protective against damage to human RPE cells, which underlie the macula. Foods that contain the tripeptide glutathione are onions, garlic, avocados, asparagus, watermelon, and cruciferous vegetables.

## Supplements

### Multivitamins

Many studies indicate the protective effect of antioxidants on retinal photoreceptors and the RPE. Some studies have demonstrated an association between vitamin or mineral deficiencies (e.g., of zinc, tocopherol, carotenoids, taurine) and a higher risk of AMD. Ascorbate as well as lipoic acid helps recycle tocopherol in retinal tissue. Patients with AMD in general were found in one study to have a lower intake of tocopherol, magnesium, zinc, pyridoxine, and folic acid. In an important Veterans Affairs study, patients with AMD who were taking an antioxidant capsule (containing

19 ingredients) twice daily maintained better vision than the placebo control group.<sup>20</sup> One review found positive evidence for vitamins A, C, and E and beta-carotene, lutein and zeaxanthin, selenium, and zinc, with the best evidence for vitamins C and E, lutein, and zeaxanthin.<sup>21</sup>

The 10-year randomized, controlled AREDS was concluded 3 years early because of the significant difference in the vitamin groups versus placebo. It demonstrated that the combination of vitamins C and E, beta-carotene, and zinc significantly reduced the progression of macular degeneration.<sup>22</sup> Ophthalmologists regard this as a landmark study acknowledging the effect of supplementation on macular degeneration. This proof of specific benefits of a balanced diet and broader nutrient supplementation has exciting implications.

The National Eye Institute is instituting AREDS II. It will reduce the amounts of zinc and beta-carotene in the study combination and add lutein and DHA.<sup>23</sup> In a 1-year Italian study, a combination of vitamin C, vitamin E, zinc, copper, lutein, and zeaxanthin improved established AMD.<sup>24</sup> The 6-month TOZAL study found similar results with a multivitamin including C, E, zinc, beta-carotene, and lutein and recommended prolonged administration.<sup>25</sup>

### Lutein

Carotenoids are powerful antioxidants. Lutein and zeaxanthin have been precisely identified at high levels in the retina, particularly in the macular area. They have also been identified at significant concentrations in the iris, choroid, and lens (where they are needed to quench singlet oxygen and to filter out blue light). Greater lutein consumption is directly associated with elevated serum values and an increased macular pigment density. Investigators studying 23 pairs of donor eyes found that the eyes with lower lutein and zeaxanthin levels were the ones with histopathologic signs of AMD.<sup>26</sup> Another study evaluated lutein and zeaxanthin levels in 56 donor eyes affected by AMD and 56 donor eyes known to be without the disease. Donor eyes with the highest amounts of lutein and zeaxanthin were 82% less likely to exhibit the signs of macular degeneration.<sup>27</sup>

As little as 2.4 mg/day of lutein can double the serum level. A dose of 6 mg/day produced a 43% lower prevalence of AMD.<sup>15</sup> The Veterans Lutein Antioxidant Supplementation Trial (LAST) documented improvement in visual function with lutein alone or in combination with other nutrients.<sup>28</sup> With the addition of DHA, lutein buildup in the macular pigment density is even more effective.<sup>29</sup>

### ■ Dosage

Healthy persons should select a multivitamin containing 6 mg of lutein, and patients already diagnosed with AMD should take 10 or more mg/day for several months to build up plasma and macular levels of this nutrient.

### Beta-Carotene, Vitamin A, and Other Carotenoids

Investigators have confirmed in both laboratory and clinical studies that carotenoids such as vitamin A protect retinal cell membranes from light damage. Vitamin A is required to provide adequate levels of rhodopsin for optimal rod function. Severe vitamin A deficiency causes keratomalacia, xerophthalmia, and visual impairment. Administration of

vitamin A has been helpful in patients suffering from retinitis pigmentosa. An early study documented an association between low vitamin A levels and macular degeneration and encouraged the inclusion of yellow fruits and vegetables in the diet.<sup>3</sup> The value of beta-carotene in the management of AMD remains inconclusive.<sup>30,31</sup> Only one study indicated a specific beneficial effect of the carotenoid lycopene on the macula.

### Tocopherols

Tocopherols protect against lipid peroxidation in cell membranes. Multiple studies have shown a powerful protective effect of *d*-alpha-tocopherol against macular degeneration. Some of these studies indicate a similar protective effect of plasma ascorbic acid and beta-carotene as well. High serum levels of *d*-alpha-tocopherol have been associated with decreased prevalence of drusen and late macular degeneration. French researchers examining 2500 patients found that those with the highest serum levels of vitamin E had an 82% lower prevalence of AMD.<sup>32</sup> Gamma-tocopherol and tocotrienol may prove superior to *d*-alpha-tocopherol.

### Vitamin C

Ascorbic acid reduces the loss of rhodopsin and photoreceptor cell nuclei that occurs on exposure to light. Vitamin C also rejuvenates vitamin E- and cell membrane-related enzymes. In several of the major studies that showed a protective effect of multivitamins against AMD, the multivitamin included at least 60 mg of vitamin C. Ocular tissues, especially the lens, contain high levels of vitamin C and glutathione.

### Alpha-Lipoic Acid

Alpha-lipoic acid is an important nerve stabilizer that reduces insulin resistance in diabetic patients. It may protect the remaining ganglion cells and nerve fibers in patients with glaucoma. In addition, alpha-lipoic acid helps regenerate the reduced form of ascorbic acid.

### B Vitamins

Pyridoxine deficiency has been identified in two observational studies in AMD populations. Folate deficiency has been identified in one of the studies. The B vitamins in general are important for nerve conduction, and the methylators (B<sub>4</sub>, B<sub>6</sub>, and B<sub>12</sub>) reduce homocysteine levels. Christen et al<sup>33</sup> reported a reduction in AMD development in 5205 women observed for 7.3 years with supplementation of folate, pyridoxine, and cyanocobalamin. Niacin, a B vitamin used to treat lipid abnormalities, has been shown to increase choroidal blood volume within 30 minutes of administration; the perfusion is at a slower rate, however, so niacin has not been shown to increase total flow to the choroid.<sup>34</sup>

### Glutathione

Glutathione has been reported to be protective against damage to human RPE cells. Glutathione is manufactured in the liver after ingestion of the appropriate amino acids and sulfur-containing foods. This underappreciated water-soluble compound serves as an antioxidant and regenerator of vitamin E and carotenoids as well as an intracellular enzyme. Because glutathione is hydrolyzed in the stomach, supplementation with glutathione boosters is recommended. The following have been found to increase glutathione: *N*-acetylcysteine, 600 mg twice a day; methylsulfonylmethane, 1000 mg once

daily; *S*-adenosylmethionine (SAMe), 200 mg twice a day; and alpha-lipoic acid, 250 mg twice daily.

### Bioflavonoids

Studies show that quercetin, a preparation of eucalyptus and citrus bioflavonoids, facilitates vitamin E protection of bovine and rat retina from induced lipid peroxidation. It also exerts an antihistaminic effect that may be beneficial for patients with chronic allergies.

### Amino Acids

Taurine, the only nonbound circulating amino acid, is a stabilizer of biologic membranes that protects rod outer segments, supports cardiovascular function, and modulates nerve transmission. Isolated taurine deficiency has been documented to cause retinal degeneration, and taurine administration has been shown in several studies to stabilize retinal changes.<sup>35</sup>

Arginine is one of the most important regulators of ocular perfusion. Intravenous administration of arginine has been shown to increase retinal (and choroidal) blood flow in healthy volunteers. This discovery merits further investigation in the AMD population.<sup>36</sup>

### Minerals

#### ■ Zinc and Copper

Zinc is found in high concentrations in the retina, RPE, and choroid. This trace mineral serves as a cofactor with many important retinal enzymes, including superoxide dismutase, catalase, carbonic anhydrase, retinol dehydrogenase, and protein phosphorylase; it also releases vitamin A from the liver. A 2-year study demonstrated that 100 mg/day of zinc sulfate significantly slowed the progression of AMD compared with the course of the disease in controls.<sup>37</sup> A study using a dietary intake questionnaire found a significant inverse association between zinc consumption and number of drusen.<sup>30</sup> Copper is adversely affected by prolonged elevation of zinc levels (30 mg or more orally) and needs to be supplemented as well. A good multivitamin for long-term use includes 15 to 30 mg of zinc and 2 mg of copper. Both copper and zinc are needed to synthesize superoxide dismutase, and both act with other retinal enzymes to scavenge free radicals.

#### ■ Magnesium

Magnesium has a significant role in nerve conduction and also dilates blood vessels. This mineral is important for maintenance of blood flow to the eye and brain in older persons with macular degeneration or diabetes whenever blood pressure is decreased because they are lying down. The dose is 400 to 500 mg at bedtime.

#### ■ Selenium

Selenium (maximum dose, 200 mcg/day) is a cofactor for vitamin E and glutathione enzymes. Low serum selenium levels and smoking have been associated with AMD.

### Docosahexaenoic Acid

The primary source of DHA is algae and the cold-water, deep-dwelling fish that eat them. DHA not only supports retinal health in general but also improves hand-to-eye coordination, sharpens night-driving ability, and stabilizes cell membranes throughout the body. With its six unsaturated double bonds, it composes 30% to 50% of the "good" fat in the outer



segments of the retinal photoreceptors. Because people are undersupplied with DHA from infancy, it is important to incorporate DHA capsules in the diet. The suggested supplementation amount is 500 to 1000 mg/day. One study found that lutein supplementation at 12 mg/day increased macular pigment ocular density (MPOD) in the peripheral macula, whereas the addition of DHA (800 mg/day) increased peripheral and central MPOD.<sup>38</sup> This evidence strengthens the support for supplementing polyunsaturated fatty acids in the diet to raise their concentration in macular photoreceptors. Feher et al<sup>39</sup> reported that the combination of omega-3 fatty acids, acetyl-L-carnitine, and coenzyme Q10 showed significant stabilization and improvement in vision in a 106-patient study. These three compounds along with vitamin E favorably affect mitochondrial lipid metabolism. A 12-year study confirmed the reduction in neovascular AMD with high intake of omega-3 fatty acids.<sup>40</sup>

Alpha-linolenic acid (present in flaxseed oil, among others) is the parent omega-3 fatty acid. It takes 20 to 30 of the 18-carbon alpha-linoleic acid molecules to make one 22-carbon DHA molecule, which is a building block for every cell membrane in the body.

## Botanicals

### Ginkgo

The ginkgo tree is the sole survivor of a family of trees that flourished before the Ice Age. *Ginkgo biloba*, which increases cerebral blood flow, has been demonstrated to improve retinal blood flow by 23%<sup>41</sup> and is prescribed regularly by certain glaucoma specialists. For vasodilation, I recommend either 15 to 60 drops of a ginkgo solution (24% ginkgosides) in water or a 30-mg tablet twice daily. Be sure to check the patient's other medications first for possible blood-thinning influences because ginkgo can exacerbate this effect.

### Sage

Sage (*Salvia officinalis*) also improves circulation, but unlike ginkgo, which has an excitatory effect, it has a calming effect.<sup>42</sup> A controlled study from Hunan Medical College in China indicated that *Salvia miltiorrhiza* as part of a four-herb formula improved visual field in a third of a glaucoma population receiving the formula for more than 19 months. Herbalists recommend 1 g orally twice daily. More studies are necessary, however.

### Bilberry

Bilberry (*Vaccinium myrtillus*) has been said to improve night vision; with the exception of one preliminary French study, however, it has not proved effective in stabilizing AMD. Bilberry only improves the effectiveness of rhodopsin, which is necessary for night vision.

### Milk Thistle

Silymarin, from the herb milk thistle (*Silybum marianum*), is a major supporter of liver function. The liver is the key organ for maintenance of eye health because the fat-soluble vitamins and glutathione are stored and the B vitamins are activated there. The usual dose of milk thistle is 150 mg two or three times a day. SAMe in a dose of 200 mg twice daily is an alternative.

The eye is subjected to bright light throughout the day, and the important ingredients for molecular repair are stored in the liver. When the liver is overburdened, eyesight is compromised.

## Chinese Herbs

Experienced herbalists report that tien chi root, dang gui root, triphala, lycium fruit, ginseng root, cooked and raw rehmannia, shilajatu, wild asparagus root, and elderberry have been used in ancient formulas to treat vascular disease inside the eye.<sup>42</sup> None of these remedies has been used in controlled studies, although there is ample anecdotal evidence in the Chinese literature of success as measured by nonprogression of disease during 3 years.

## Pharmaceuticals

Ranibizumab (Lucentis) and bevacizumab (Avastin) are two new vascular endothelial growth factor (VEGF) inhibitors that can remarkably reverse leakage into the retina in wet AMD. Ranibizumab has been approved by the U.S. Food and Drug Administration (FDA); bevacizumab, an intravenous therapy for colon cancer, is used off label. Intraocular injections of steroids, pegaptanib sodium (Macugen, an intraocular anti-VEGF), and verteporfin (Visudyne, an intravenous dye that highlights leaky retinal vessels) are relegated to ancillary roles. Dosages are to be determined by the retinal specialist.

## Other Therapy

The FDA may soon approve implantable silicone devices that will serve as replacement for damaged retina. Implantable devices and telescopic lenses are also in phase II FDA testing.

Low-vision experts have many optical devices to support those people with failing vision.

## PREVENTION PRESCRIPTION

- Adoption of a positive attitude and awareness of risk factors and potential medication effects
- Use of sunglasses and other sun protection
- Increased consumption of green leafy vegetables
- Diet rich in polyunsaturated fatty acids and low in saturated fats
- Multivitamins with zinc, taurine, and lutein
- Use of supplements, with attention to overall good dietary nutrition
- Avoidance of long-term use of antacids or gastric acid suppression
- Regular exercise
- Performance of deep-breathing exercises on a regular basis
- Periodic eye examinations with use of the Amsler grid
- Use of low-vision aids for vision loss

Early intervention after recognition of macular degeneration is crucial. The performance of an Amsler grid examination is recommended in all patients (see Fig. 83-3). It is important to remember that the retina can be rebuilt.





## THERAPEUTIC REVIEW

If a patient presents with severe symptoms, such as profound visual loss, it would be to his or her benefit for the clinician to immediately begin a more aggressive therapy. For the patient who has mild to moderate symptoms, however, the following nutritional and lifestyle approach is appropriate.


### ■ Remove Exacerbating Factors




- Encourage smoking cessation, moderate alcohol intake, weight management, and exercise.

### ■ Nutrition



- Encourage foods rich in omega-3 fatty acids (wild salmon, nuts, or flaxseed). 
- Increase foods rich in carotenoids, such as lutein and zeaxanthin (dark green leafy vegetables). 

### ■ Supplements


- Multivitamins have been the focus of many epidemiologic studies over the years. It is known that the combination of low-dose antioxidants is supportive of macular function; this fact became evident in the landmark AREDS. The multivitamin should include vitamin C, vitamin E, beta-carotene, zinc, selenium, taurine, lutein, and zeaxanthin. 

- Incorporate lutein, 6 to 10 mg/day (6 mg for prevention, 10 mg for treatment). 
- DHA supplementation: 500 to 800 mg daily 
- Vitamin C, 1000 mg/day, has been shown useful in some observational studies to act as an antioxidant and therefore to protect the retinal pigment epithelium from oxidative stressors. 

### ■ Botanicals


- *Ginkgo biloba* has been shown to improve ocular blood flow by 23%; 30 mg twice daily. 
- Milk thistle is the primary source of the bioflavonoid silymarin, a major supporter of hepatocyte function, which in turn supports eye health; 150 mg two or three times a day 

### ■ Chinese Herbs

- Although clinical data are lacking, there is an abundance of historical data on the benefits of the use of Chinese herbs for AMD. 

### ■ Pharmaceutical Injection

Anti-vascular endothelial growth factor (VEGF) therapy

- Intraocular injections of ranibizumab (Lucentis) and bevacizumab (Avastin) have become the best treatment of more advanced disease. 

## KEY WEB RESOURCES

<http://www.aaopt.org/>

<http://www.allaboutvision.com/conditions/amsler-grid.pdf>

The American Academy of Ophthalmology's Web site provides an updated list of current research and protocols for AMD.

PDF of the Amsler grid for screening for macular degeneration

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Friedman DS, O'Colmain BJ, Muñoz B, et al. Prevalence of age-related macular degeneration in the United States. *Arch Ophthalmol*. 2004;122:564–572.
- Nowak M, Swietochowska E, Wielkoszynski T, et al. Changes in blood antioxidants and several lipid peroxidation products in women with age-related macular degeneration. *Eur J Ophthalmol*. 2003;13:281–286.
- Goldberg J, Flowerdew G, Smith E, et al. Factors associated with age-related macular degeneration. *Am J Epidemiol*. 1988;128:700–710.
- Cruickshank KJ, Klein R, Klein BE. Sunlight and age related macular degeneration. The Beaver Dam Eye Study. *Arch Ophthalmol*. 1993;111:514–518.
- Cruickshank KJ, Klein R, Klein BE, et al. Sunlight and the 5-year incidence of early age-related maculopathy. *Arch Ophthalmol*. 2001;119:246–250.
- Johnson EJ, Hammond BR, Yeum KJ, et al. Relation among serum and tissue concentrations of lutein and zeaxanthin. *Am J Clin Nutr*. 2000;71:1555–1562.
- Clemons TE, Milton RC, Klein R, et al. Age-Related Eye Disease Study Research Group. Risk factors for the incidence of advanced age-related macular degeneration in the Age-Related Eye Disease Study (AREDS). AREDS report No. 19. *Ophthalmology*. 2005;112:533–539.
- Seddon JM, Gensler G, Milton RC, et al. Association between C-reactive protein and age-related macular degeneration. *JAMA*. 2004;291:704–710.
- Seddon JM, Willett WC, Speizer FE, et al. A prospective study of cigarette smoking and risk of age-related macular degeneration in women. *JAMA*. 1996;276:1141–1146.
- Christen WG, Glynn RJ, Manson JE, et al. A prospective study of cigarette smoking and risk of age-related macular degeneration in men. *JAMA*. 1996;276:1147–1151.
- Age-Related Eye Disease Study Research Group. Risk factors associated with age-related macular degeneration: a case-control study in the age-related eye disease study. Age-Related Eye Disease Study Report Number 3. *Ophthalmology*. 2000;107:2224–2232.
- The Eye Disease Case-Control Study Group. Risk factors for neovascular age-related macular degeneration. *Arch Ophthalmol*. 1992;110:1701–1708.
- Cho E, Seddon JM, Rosner B, et al. Prospective study of intake of fruits, vegetables, vitamins, and carotenoids and risk of age-related maculopathy. *Arch Ophthalmol*. 2004;122:883–892.
- Koh HH, Murray IJ, Nolan D, et al. Plasma and macular responses to lutein supplement in subjects with and without age-related maculopathy: a pilot study. *Exp Eye Res*. 2004;79:21–27.
- Seddon JM, Ajani UA, Sperduto RD, et al. Dietary carotenoids, vitamins A, C, and E, and advanced age-related macular degeneration. *JAMA*. 1994;272:1413–1420.
- Richer S. ARMD—pilot (case series) environmental intervention data. *J Am Optom Assoc*. 1999;70:24–36.
- Parekh N, Voland RP, Moeller SM, et al. Association between dietary fat intake and age-related macular degeneration in the Carotenoids in Age-Related Eye Disease Study (CAREDS): an ancillary study of the Women's Health Initiative. *Arch Ophthalmol*. 2009;127:1483–1493.
- Smith W, Mitchell P, Leeder S. Dietary fat and fish intake and age-related maculopathy. *Arch Ophthalmol*. 2000;118:401–404.
- Augood C, Chakravarthy U, Young I, et al. Oily fish consumption, dietary docosahexaenoic acid and eicosapentaenoic acid intakes, and associations with neovascular age-related macular degeneration. *Am J Clin Nutr*. 2008;88:398–406.
- Richer S. Multicenter ophthalmic and nutritional age-related macular degeneration study. Part 2: antioxidant intervention and conclusions. *J Am Optom Assoc*. 1996;67:30–49.
- Beaumont PE, Kang HK. Balancing the risks and benefits in AMD. *Clin Experiment Ophthalmol*. 2005;33:108–110; author reply 110–111.
- Age-Related Eye Disease Study Research Group. A randomized placebo-controlled clinical trial of high dose supplementation with vitamins C and E, beta-carotene and zinc for age-related macular degeneration and vision loss. AREDS report No. 8. *Arch Ophthalmol*. 2001;119:1417–1436.
- Seddon JM. Multivitamin multimineral supplements and eye disease: age-related macular degeneration and cataract. *Am J Clin Nutr*. 2007;85:304S–307S.
- Parisi V, Tedeschi M, Gallinaro G, et al. Carotenoids and antioxidants in age-related maculopathy Italian study: multifocal electroretinogram modifications after 1 year. *Ophthalmology*. 2008;115:324–333.
- Cangemi FE. TOZAL study: an open case control study of an oral antioxidant and omega-3 supplement for dry AMD. *BMC Ophthalmol*. 2007;7:3.
- Bone RA, Landrum JT, Dixon Z, et al. Lutein and zeaxanthin in the eyes, serum and diet of human subjects. *Exp Eye Res*. 2000;71:239–245.
- Bone RA, Landrum JT, Mayne ST, et al. Macular pigment in donor eyes with and without AMD: a case-control study. *Invest Ophthalmol Vis Sci*. 2001;42:235–240.
- Richer S, Stiles W, Statkute L, et al. Double-masked, placebo-controlled, randomized trial of lutein and antioxidant supplementation in the intervention of atrophic age-related macular degeneration: the Veterans LAST study (Lutein Antioxidant Supplementation Trial). *Optometry*. 2004;75:216–230.
- Johnson EJ, Chung H, Caldarella S, et al. The influence of supplemental lutein and docosahexaenoic acid on serum, lipoproteins, and macular pigmentation. *Am J Clin Nutr*. 2008;87:1521–1529.
- VandenLangenberg GM, Mares-Perlman JA, Klein R, et al. Associations between antioxidant and zinc intake and the 5-year incidence of early age-related maculopathy in the Beaver Dam Eye Study. *Am J Epidemiol*. 1998;148:204–214.
- Christen WG, Manson JE, Glynn RJ, et al. Beta-carotene supplementation and age-related maculopathy in a randomized trial of US physicians. *Arch Ophthalmol*. 2007;125:333–339.
- Delcourt C, Cristol JP, Tessier F, et al. Age-related macular degeneration and antioxidant status in the POLA Study. *Arch Ophthalmol*. 1999;117:1384–1390.
- Christen WG, Glynn RJ, Chew EY, et al. Folic acid, pyridoxine, and cyanocobalamin combination treatment and age-related macular degeneration in women. *Arch Intern Med*. 2009;169:335–341.
- Metelitsina TI, Grunwald JE, DuPont JC, Ying GS. Effect of niacin on the choroidal circulation of patients with age related macular degeneration. *Br J Ophthalmol*. 2004;88:1568–1572.
- Lombardini JB. Taurine: retinal function. *Brain Res Rev*. 1991;16:151–169.
- Garhofer G, Resch H, Lung S, et al. Intravenous administration of L-arginine increases retinal and choroidal blood flow. *Am J Ophthalmol*. 2005;140:69–76.
- Newsome DA, Swartz M, Leone NC, et al. Oral zinc in macular degeneration. *Arch Ophthalmol*. 1988;100:192–198.
- Snodderly DM, Chung H, Caldarella S, Johnson E. The influence of supplemental lutein and docosahexaenoic acid on their serum levels and on macular pigment [abstract]. *Invest Ophthalmol Vis Sci*. 2005;46.
- Feher J, Kovacs B, Kovacs I, et al. Improvement of visual functions and fundus alterations in early age-related macular degeneration treated with a combination of acetyl-L-carnitine, ω-3 fatty acids, and coenzyme Q10. *Ophthalmologica*. 2005;219:154–166.
- Sangiiovanni JB, Agrón E, Meleth AD, et al. ω-3 Long-chain polyunsaturated fatty acid intake and 12-y incidence of neovascular age-related macular degeneration and central geographic atrophy: AREDS report 30, a prospective cohort study from the Age-Related Eye Disease Study. *Am J Clin Nutr*. 2009;90:1601–1607.
- Chung HS, Harris A, Kristinsson JK, et al. Ginkgo biloba extract increases ocular blood flow velocity. *J Ocul Pharmacol Ther*. 1999;15:233–240.
- Tillotson AK. *One Earth Herbal Sourcebook*. New York: Kensington; 2001.



# Food Intolerance and Elimination Diet

J. Adam Rindfleisch, MD, MPhil

Detecting and eliminating specific antagonistic foods, and designing a nutritionally sound diet to ensure the optimum health of the food-sensitive person, is the ultimate aim in food sensitivity management. This process is often tedious and time consuming, and requires tremendous knowledge, skill, commitment, and dedication. . . . However, when a person who has been chronically sick suddenly feels well for the first time in many years, as so often happens, the rewards for both practitioner and client more than justify the time and effort of the endeavor.

*J. V. Joneja<sup>1</sup>*

Indian Ayurvedic healing for centuries has emphasized the elimination of certain foods and the use of others.<sup>2</sup> Foods, like drugs, can have both helpful and adverse effects. Pesticide contamination, the use of growth hormones and antibiotics in meat production, genetic engineering of food sources, and the health risks associated with fast and processed foods are topics of concern that can arise in an integrative medicine visit.

For many disorders, identification of adverse food reactions and recommendation of elimination diets can be of potential benefit. This chapter describes various classes of adverse food reactions. An overview of the state of the research on the elimination diet as a clinical tool is provided. Tips for prescribing elimination diets, pitfalls to avoid in their use, and resources for further information are also provided. A Patient Handout on elimination diets appears at the end of the chapter.

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## Adverse Food Reactions: What Are They?

Adverse reactions to foods may be classified on a pathophysiologic basis.<sup>3,4</sup> Often, a distinction is made between food allergy and food intolerance. A food allergy involves an

immune-mediated reaction, usually to a glycoprotein found in a given food. Food intolerance, in contrast, is defined more generally as any adverse physiologic response to a food product.

An intolerance may be classed as immune or nonimmune, structural, or functional. Nonimmune reactions are estimated to have a prevalence of 15% to 20%.<sup>3</sup> **Table 84-1** lists key clinical entities on the food intolerance spectrum and offers clinical pointers regarding their etiology, differential diagnosis, and treatment.

There are many types of adverse food reaction. Keep in mind diagnoses such as eosinophilic esophagogastritis, histaminergic food reactions, and reactions associated with psychological or structural disorders. Keep lactose intolerance and celiac disease in mind as two of the most commonly encountered disorders.

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## Pathophysiology

The epithelial cells of the gastrointestinal tract have been found to function as nonprofessional antigen-presenting cells.<sup>5</sup> The gut is constantly sampling various potential antigens, ultimately allowing only 2% of them to move into the bloodstream. The epithelial cells, gut dendritic cells, and at least five different T-cell types help regulate intestinal immunity. One of the T cells' main functions is to allow tolerance to develop; that is, the body must be able to minimize allergic reactions to the foreign antigens commonly consumed in foods. In some individuals, this process seems to break down, and certain foods begin to elicit symptoms.<sup>6</sup>

Greater intestinal permeability, or “leaky gut,” has been proposed as one means by which antigens that are typically

**TABLE 84-1. Differential Diagnosis of Adverse Food Reactions**

INTOLERANCE CATEGORY	DESCRIPTION	COMMENTS AND CLINICAL TIPS
Food allergy <sup>4,32,33</sup>	Immune mediated, mainly by IgE, to a food glycoprotein Symptoms arise in minutes to hours Manifested the same way with every exposure, usually with rash, angioedema, anaphylaxis; GI symptoms may also arise with histamine release	Prevalence increasing (4%-8% in children, 1%-4% in adults) One fourth of the population claims to have a food allergy One third of infants with frequent spitting up respond to oral challenge testing; 10% who react to cow's milk also react to soy; 45% retain a milk allergy past 1 year of age
Celiac disease <sup>34,35</sup>	Gliadin, a portion of the grain protein gluten, triggers chronic inflammation through reactive CD4 <sup>+</sup> T cells in people with the alleles for HLA DQ2 or DQ8 Affects all age groups Two to three times more common in females than in males May affect multiple organ systems 10%-23% may develop neurologic symptoms, such as idiopathic ataxia and paresthesias Grains that can contribute are wheat, rye, barley, spelt, kamut, semolina, triticale, and malt. Oats do not have gluten but are often contaminated with it, so many providers encourage avoidance.	Prevalence 1% and increasing as more testing is being done 50% of adults with disease present with diarrhea Increased risk with Down syndrome, Turner syndrome, type 1 diabetes 2%-5% do not respond to gluten-free diet and are at risk for T-cell lymphoma Laboratory results may show decreased calcium and protein, increased levels on liver function tests People with celiac disease have higher risks of iron deficiency and osteoporosis Best tests are transglutaminase IgA, antiendomysial antibodies, and tissue transglutaminase (an enzyme that reacts with gliadin). These are 90% sensitive, and titers indicate degree of damage.
Cross-allergy <sup>3,4</sup>	Arises when foods with similarities to environmental allergens trigger a response Often characterized by oral tingling (oral allergy syndrome)	Examples: Birch, alder, and hazelnut can cross-react with apples, pears, cherries, hazelnuts, walnuts, and pistachios. Grass and cereal pollens can be linked to allergy to wheat, rye, and oat flour as well as to tomato, kiwi, and celery. In people with latex allergies, pineapple, kiwi, avocado, potato, banana, and nuts can cause reactions. Feather allergies can mean allergies to hen's eggs, poultry meat, and giblets. House dust mite allergy can be associated with shellfish allergy.
Pseudoallergies <sup>3,4</sup>	Foods trigger mast cell degranulation without involving IgE antibodies	Examples: Strawberries, chocolate, tomatoes Salicylates (cause cyclooxygenase-1 inhibition, leading to abnormal prostaglandin levels), used as food preservatives Benzoates (preservatives used in fruit drinks, pickled foods, and alcoholic beverages) Tartrazine (yellow #5)
Eosinophilic esophagogastritis <sup>34,36</sup>	Eosinophils accumulate in any or all layers of the digestive tract wall One half to two thirds will have elevated serum eosinophil counts with no other explanation	Affects all ages Diagnosed by endoscopy, colonoscopy; may be related to chronic acid suppression Responds to elimination diets, medication Worth considering in unexplained diarrhea, especially if serum eosinophil counts are inexplicably high
IgG-related intolerance <sup>8,23</sup>	Intolerances slowly develop hours to days after an exposure as IgG is created by the immune system IgG may be the pathogen itself, causing increased small intestinal permeability. IgG half-life is 22 to 96 days, which makes false-positive results possible on testing.	Isolated IgG testing in patients with irritable bowel syndrome is controversial, and no one test is likely to identify all problem foods. Foods that test positive often do not cause symptoms. Tests are not typically covered by insurance. See <a href="#">Table 84-2</a> .

Continued

**TABLE 84-1. Differential Diagnosis of Adverse Food Reactions—cont'd**

INTOLERANCE CATEGORY	DESCRIPTION	COMMENTS AND CLINICAL TIPS
Physiologic reactions <sup>4</sup>	Foods lead to gas production or cause dyspepsia by relaxing the lower esophageal sphincter	Examples of gas-generating foods include legumes, cabbage, bran, and other vegetables and grains. Heartburn and dyspepsia can result from fatty foods, alcohol, mint, chocolate, and citrus.
Pharmacologic reactions <sup>3,4</sup>	Some foods have drug-like effects. A common example is histaminergic foods, which influence the histamine pathways in the stomach and other GI tract organs. Sulfites, monosodium glutamate (Chinese restaurant syndrome), and biogenic amines may also cause symptoms through drug-like actions.	Histamine intolerance: Is present in 1% of Europeans Is more common in middle-aged women Can be associated with other histamine-caused symptoms, such as nasal congestion, dyspnea, skin reactions, and headache; dysmenorrhea may also occur Leads to opposite effects for histamine-blocking drugs, such as ranitidine
Toxin mediated <sup>3,4</sup>	A specific toxin is present in a food.	Examples include food poisoning, mycotoxins, perhaps herbicides and pesticides.
Enzymatic <sup>37-39</sup>	Deficiency of an enzyme, such as lactase, leads to poor digestion. GI symptoms result. Lactose intolerance arises as cells lose their ability to make lactase. Symptoms occur 30-120 minutes after lactose is consumed. Other sugar intolerances, such as to fructose, sorbitol, mannitol, and xylitol, are less common.	Lactose intolerance: Has lowest prevalence in northern Europeans, highest in Asians, Native Americans, African Americans Is usually not triggered by less than 12 g of lactose (the amount in a cup of milk) Is usually not affected as much by yogurt, especially as it ages Can be triggered by medications; 20% of prescription drugs and 6% of over-the-counter drugs use lactose as a base
Structural <sup>3</sup>	An underlying pathologic process leads to intolerance of different foods	Examples include achalasia, strictures, pancreatitis, inflammatory bowel disease, abdominal angina
Infectious <sup>3</sup>	Chronic infections predispose to adverse food reactions	Examples include lambliaiasis ( <i>Giardia</i> ), bacterial overgrowth (especially in immunosuppression, diabetes, or the use of proton pump inhibitors), chronic salmonellosis, <i>Blastocystis</i> infection, and parasites
Psychogenic <sup>3</sup>	Somatoform disorders, eating disorders, or the discouragement tied to food intolerance itself may lead to food reactions. Note that high norepinephrine levels can trigger histamine release, so stress can cause intolerances through some of the mechanisms listed above as well.	It is not uncommon in integrative practice to see individuals who become obsessed with their diets. This “orthorexia” can become a pathologic process unto itself. Treatment involves working closely with a nutritionist, adding mental health and mind-body approaches to care, and helping them slowly regain their ability to enjoy eating.
Other causes <sup>3</sup>	Mastocytosis, carcinoid and other neuroendocrine tumors, and GI neoplasms may also lead to symptoms.	As always, a careful history and differential diagnosis are mandatory.

GI, gastrointestinal; Ig, immunoglobulin.

unable to cross through the intestinal tract into the bloodstream become capable of doing so. Molecules that would normally be too large to pass from the gut into the bloodstream are suddenly able to move in, eliciting any number of negative physiologic effects.<sup>7,8</sup> Permeability seems to be increased by a number of factors, including inflammation, exposure to medications (e.g., nonsteroidal antiinflammatory drugs), shifts in intestinal microflora, and the presence of various disease states, such as celiac disease and ulcerative colitis.<sup>9</sup> Leaky gut is known to be increased with

radiation therapy,<sup>10</sup> in patients with intermittent claudication,<sup>11</sup> and in people with multiple sclerosis.<sup>12</sup> Its presence has been correlated with higher risk of cirrhosis in people with chronic alcoholism.<sup>13</sup> Studies have shown that children with autism have increased urinary peptides, indicating that their intestines may be more permeable to amino acids that may cross the blood-brain barrier and have harmful effects.<sup>14</sup>

It has been proposed that many cases of food intolerance may be tied to the overall process of toxicant-induced loss

**TABLE 84-2.** Laboratories Offering Testing for Delayed Hypersensitivity Reactions**Memory Antibodies**

ELISA testing is used to determine presence of immunoglobulins, usually IgG and IgE

Alletess Medical Laboratories, Rockland, MA: [www.foodallergy.com](http://www.foodallergy.com)  
 Genova Diagnostics, Asheville, NC: [www.genovadiagnostics.com](http://www.genovadiagnostics.com)  
 Great Plains Laboratories, Lexana, KS: [www.greatplainslaboratory.com](http://www.greatplainslaboratory.com)  
 Immuno Laboratories, Fort Lauderdale, FL: [www.immunolabs.com](http://www.immunolabs.com)  
 Metamatrix Clinical Laboratory, Duluth, GA: [www.metamatrix.com](http://www.metamatrix.com)  
 Meridian Valley Laboratories, Renton, WA: [www.meridianvalleylab.com](http://www.meridianvalleylab.com)  
 US Biotek Laboratories, Seattle, WA: [www.usbiotek.com](http://www.usbiotek.com)

**Automated Cytotoxic Assay**

Measures difference between normal white cell sizes and changes in overall cell size in response to exposure to various food antigens  
 Has been criticized as not differentiating between “protective” and “activating” (pathologic) responses

ALCAT (Antigen Leukocyte Cellular Antibody Test) Cell Science Systems, Deerfield Beach, FL: [www.alcat.com](http://www.alcat.com)  
 NuTron/NOVO testing, Immogenics, London, UK: [www.immogenics.com](http://www.immogenics.com)  
 MRT/LEAP Testing (Mediator Release Testing/Lifestyle Eating and Performance), Forrest Health, Riviera Beach, FL: [www.forresthealth.com/leap-mrt-food-allergy-test.html](http://www.forresthealth.com/leap-mrt-food-allergy-test.html)

**Lymphocyte Cell Culture**

Claims to use functional assays to determine if immunoglobulins are present and if they trigger reactivity through the complement cascade and other means  
 Evaluates for presence of immunoglobulins as well as type II (immune complex) and type IV (cell activation) immune responses

Elisa-Act Biotechnologies, Sterling, VA: [www.elisaact.com](http://www.elisaact.com)

**Complement Activation**

Includes assays for both IgG and circulating immune complexes (type III immune responses)

Complement testing, Sage Medical Lab, Ormond Beach, FL: [www.sagemedlab.com](http://www.sagemedlab.com)

Note that the utility of these tests in clinical management of food intolerance remains controversial. Based on a table available in Mullin GE, Swift KM, Lipski L. Testing for food reactions: the good, the bad, and the ugly. *Nutr Clin Pract.* 2010;25:192–198.

of tolerance, which is thought to be precipitated not only by foods but by inhalants, chemical exposures, and electrical stimuli.<sup>15</sup> As such, any steps that may reduce overall sensitivity may be helpful with food intolerances. Examples include exercise, minimizing body inflammation, desensitization, and detoxification regimens. It may be helpful to explore whether an individual with food intolerances is also “reactive” in other ways, physically and emotionally, to his or her environment.

## Diagnosis of Adverse Food Reactions

For food allergies, a number of tests can be considered, although they may not be easily performed in a primary care setting. Testing can begin with skin prick testing and checking for specific serum immunoglobulin (Ig) E panels.<sup>16</sup> Double-blind, placebo-controlled food challenges, which are considered the “gold standard” for food allergy diagnosis, may be obtained.<sup>17,18</sup> However, this challenge may require intravenous access, and the food products and placebos can be difficult to prepare or mask. Only 30% of positive open food challenge results correlate with positive blinded challenge results, suggesting that adverse food reactions are strongly influenced by mind-body interactions.<sup>19</sup> Radioallergosorbent testing is thought by some to be helpful to assess for the presence of food allergies.<sup>20</sup> Interestingly, one trial found that diet history and skin prick testing seemed to correlate well in predicting food allergies,

but skin prick testing, antibody measurements, and double-blind placebo-controlled food challenges did not correlate well with one another.<sup>21</sup>

Laboratory testing for nonallergy forms of food intolerance is more controversial. IgG testing has demonstrated some utility in the management of irritable bowel syndrome. In one study, tailoring of the diet to IgG-based testing led to a 26% overall decrease in symptoms in the treatment group.<sup>22</sup> **Table 84-2** lists a number of private laboratories that offer various forms of testing. Note that how best to apply test results in clinical practice remains controversial, and further research is needed. Other unproven forms of food intolerance testing are listed in **Table 84-3**. For a detailed, evidence-based review of approaches to food intolerance testing, see Mullin et al.<sup>23</sup>

Aside from certain tests for IgE-mediated food allergies, most tests for adverse food reactions remain controversial. Remember that an elimination diet can serve, in and of itself, as a useful diagnostic tool.

## The Elimination Diet for Treatment of Various Disorders

A number of disorders are known to be influenced by food. Examples include celiac disease, lactose intolerance, gastroesophageal reflux disease (see Chapter 41), cholelithiasis

**TABLE 84-3.** Unproven Diagnostic Approaches for Investigating Food Intolerance<sup>16,40</sup>

TEST	DESCRIPTION
Hair analysis	Levels of various compounds are measured in a hair sample. There is no evidence that hair levels accurately reflect body toxin levels
Iridology	Holds that there are correlations between iris patterns and pathologic changes throughout the body
Cytotoxic testing	Seeks alterations or death of white cells in vitro when an allergen is introduced to a blood sample
Applied kinesiology/DRIA	The subject holds an allergen in a container in one hand while an investigator gauges its relative effect on the strength of a given muscle group. In the DRIA test, the substance is put under the tongue rather than held.
Electrodermal testing	A galvanometer is used to measure skin conduction as a person holds two electrodes. Introduction of a poorly tolerated food extract into the circuit is said to cause a drop in conductivity of the skin.
Provocation/neutralization	A small quantity of food extract is placed under the tongue, watching for symptoms thereafter. If symptoms arise, a more dilute solution is placed under the tongue, with the expectation that symptoms will disappear.

(see Chapter 43), urolithiasis (see Chapter 58), and gout (see Chapter 65). For other disorders, the relationship between foods eaten and symptoms is less clear. [Table 84-4](#) lists a number of disorders for which treatment by use of elimination diets has been suggested. [Table 84-5](#) summarizes the research findings for some of the most-studied conditions commonly treated by elimination diets and lists foods that are eliminated for each.

### Prescribing an Elimination Diet

An elimination diet is, put simply, an eating plan that omits a food or group of foods believed to cause an adverse food reaction. Elimination diets can serve as both diagnostic and treatment strategies in an integrative setting. In general, four principal steps are followed in prescribing any elimination diet.

#### Step 1: The Planning Phase

Before recommending an elimination diet, the clinician must take a thorough patient history. Ideally, patients should provide a recent dietary log that chronicles what they ate during the course of a few weeks. They should note what symptoms they experience and when they arise relative to mealtimes and time of day. Symptoms might range from gastrointestinal complaints and skin changes to low mood, fatigue, or difficulty with concentration. [Table 84-6](#) lists key issues to address in taking the history of a patient for whom an adverse

**TABLE 84-4.** Conditions for Which Elimination Diets Might Be Used<sup>1</sup>

Cardiovascular	Palpitations Tachycardia
Dermatologic	Angioedema* Atopic dermatitis* Contact dermatitis Dermatitis herpetiformis Pruritus* Seborrheic dermatitis Urticaria* <sup>41</sup>
Gastrointestinal	Bloating, belching Celiac disease* <sup>34</sup> Cholecystitis, cholelithiasis* <sup>42</sup> Chronic diarrhea* <sup>43</sup> Colic <sup>44</sup> Constipation, including laxative resistant in children <sup>45</sup> Cyclic vomiting syndrome* <sup>46</sup> Encopresis <sup>47</sup> Eosinophilic esophagitis* <sup>5</sup> Eosinophilic gastroenteritis* <sup>48</sup> Gastroesophageal reflux* <sup>49</sup> Irritable bowel syndrome* Inflammatory bowel disease* <sup>50-53</sup> Nausea, vomiting Pruritus ani <sup>54</sup> Recurrent abdominal pain in children with confirmed allergy* <sup>55</sup>
Genitourinary	Enuresis* <sup>31,56</sup> Frequency Interstitial cystitis Vulvodynia
Neurologic/ psychological	Attention deficit hyperactivity disorder* Autistic spectrum disorders* Medication-resistant depression Migraine* Other types of headache Seizures (by ketogenic diets)* <sup>57</sup>
Respiratory/ otolaryngologic	Aphthous ulcers (recurrent) <sup>58</sup> Asthma* <sup>59-61</sup> Chronic congestion, rhinitis* <sup>62</sup> Chronic serous otitis* Conjunctivitis Laryngeal edema, hoarseness
Rheumatologic	Chronic fatigue <sup>63,64</sup> Rheumatoid arthritis* Systemic lupus erythematosus <sup>65</sup> Vasculitis
Miscellaneous	Listlessness, poor concentration Irritability Cold intolerance, low-grade fever Dizziness Excess sweating Pallor

\*Indicates that at least level B evidence (SORT criteria) exists for treatment of this condition with an elimination diet.

food reaction is suspected. A sample 1-week dietary log form is included in the Patient Handout.

After a list of potential problem foods is elicited, the next step is to create a list of foods to avoid. The list should be individualized as much as possible for each patient. [Table 84-7](#) lists



TABLE 84-5. Foods to Eliminate for Specific Disorders and Synopsis of Key Research

CONDITION	FOODS TO ELIMINATE*	RESEARCH SUMMARY
Attention deficit hyperactivity disorder (ADHD) <sup>1,66</sup>	Apples, artificial colors, aspartame (NutraSweet), butylated hydroxyanisole, butylated hydroxytoluene (in packaged cereals), benzoates (chewing gum, margarine, pickles, prunes, tea, raspberries, cinnamon, anise, nutmeg), caffeine, corn, dairy products, nitrates and nitrites (preserved meats like bacon, frankfurters, pepperoni), oranges, propyl gallate, sulfites (dried fruits, mushrooms, potatoes, baked good, canned fish, pickles, relishes), peanuts, tomatoes	Began with Feingold diet in 1975 but lost favor when research did not show benefit Food additives such as tartrazine (yellow dye #5), benzoates, and glutamate are known to affect the nervous system, but sugar does not seem to have an effect. A 2010 review concluded that no dietary interventions are helpful with ADHD, except that a small subset of children may benefit from removal of artificial food colors. <sup>67</sup> A 2008 review found moderately good evidence of effect for removal of food additives. <sup>68</sup>
Atopic dermatitis <sup>1,68,69</sup>	<i>Children:</i> dairy, eggs, soy, wheat <i>Adults:</i> pollen-related foods (fruit, nuts, vegetables) Other considerations would be artificial colors, benzoates, berries, citrus, currants, fish, legumes, sulfites, tomatoes, and occasionally beef, chicken, and pork.	Evidence of an effect of mother's diet when pregnant or breast-feeding is less clear, <sup>70</sup> but breast-feeding itself is preventive. <sup>71</sup> No other dietary interventions were conclusively found to affect atopy in children. A Korean study divided 524 patients into four groups for interferon-gamma treatment, elimination diet, or both. The elimination diet-only group had the most significant decrease in symptom severity. <sup>72</sup> A 1991 study found improvement in 49 of 66 children with eczema, which recurred when cow's milk and tomato were added back. <sup>73</sup> A 1987 study found that 37 of 101 people with eczema reacted to one or more food additives, with 16 reacting to the placebo. Only one third of the subjects had reproducibility on repeated testing. <sup>74</sup>
Autistic spectrum disorders <sup>4,30,75,76</sup>	Gluten and casein (gluten-free, casein-free [GFCF] diet), food additives, and artificial colors	Significant numbers of autistic children have relatively high titers of antibodies (IgA, IgG, and IgE) to gluten and casein. <sup>75,76</sup> A 2008 review noted that GFCF diets are "promising" but that current evidence is not conclusive. <sup>30</sup> A 2008 Cochrane review concluded that the current quality of evidence regarding the effect of the GFCF diet is poor. <sup>77</sup> GFCF diets decrease urine peptides, perhaps indicating improved intestinal permeability (after 1 year) <sup>78</sup>
Irritable bowel syndrome (IBS) <sup>1,8,79</sup>	Dairy, eggs, wheat Some diets become elaborate, focusing on which starches should and should not be consumed. See <a href="#">reference 1</a> for a comprehensive IBS diet.	>60% of IBS sufferers think that specific foods contribute to their symptoms, <sup>28</sup> and 50% report that their symptoms arise after eating. <sup>80</sup> A 2010 review found that insufficient data exist to make recommendations about elimination diets and IBS. <sup>81</sup> A 2005 review concluded that "dietary manipulation may result in substantial improvement in IBS symptomatology provided it is individualized to the particular patient." <sup>28</sup> Many IBS sufferers have changes in motility even with the sight or smell of food, which complicates diagnosis. <sup>28</sup> A 1998 review <sup>82</sup> showed a 15%-71% response rate when study data were pooled for IBS and elimination diets. Rule out lactose intolerance in IBS patients. <sup>83</sup>
Migraine <sup>1,7,60,84,85</sup>	Aspartame, beef, chocolate, coffee, corn, eggs, histamine (fish, cheese, wine, beer), monosodium glutamate (mushrooms, kelp, scallops, preserved meats, Chinese food), nitrates (processed meats), oranges, sugar, tea, tyramine (aged cheeses, some red wines), yeast See also <a href="http://www.fammed.wisc.edu/integrative/modules/headaches">www.fammed.wisc.edu/integrative/modules/headaches</a> for an online "Headache Elimination Diet" handout	A 2009 review concluded that individualized elimination diets for migraine are a useful therapeutic approach. <sup>86</sup> One study found that 29 of 55 patients had complete symptom resolution with elimination diets, and another 21 experienced improvement. <sup>87</sup> A 1979 study found that 85% of a group of 60 became headache free after following a 5-day elimination of an average of 10 different foods. The total number of headaches/month fell from an average of 402 to 6. <sup>88</sup> In a blinded study of aspartame (NutraSweet) compared with placebo, there was a 100% increase in headache frequency during the aspartame consumption phase of the trial. <sup>89</sup> More than 90% of a group of 88 children with severe migraine symptoms had response to a food elimination diet. <sup>90</sup>

Continued

**TABLE 84-5.** Foods to Eliminate for Specific Disorders and Synopsis of Key Research—cont'd

CONDITION	FOODS TO ELIMINATE*	RESEARCH SUMMARY
Serous otitis media	See the Level 2 diet in the Patient Handout. Consider removal of dairy foods.	70 of 81 children (aged 1 to 9 years) with documented food allergies had improved tympanometry findings after a 16-week individualized elimination diet. <sup>91</sup> A 1997 trial found a 70% to 83% improvement in symptoms of fullness, allergic symptoms, and overall well-being in 151 people with eustachian tube dysfunction and noted to have allergic symptoms. <sup>92</sup> A number of integrative clinicians link dairy and other foods to chronic ear and sinus congestion, and an elimination diet is worth considering in patients with these problems. <sup>93</sup>
Rheumatoid arthritis (RA)	Consider the few foods listed in the Patient Handout. Corn, dairy, and nightshade vegetables (bell peppers, eggplant, potatoes, tomatoes) are worth considering.	Interest arose in 1981 when the media described a woman with RA whose 25 years of symptoms resolved with corn elimination. <sup>94</sup> In the 1960s, the nightshade diet, which eliminates eggplant, bell peppers, potatoes, and tomatoes, became popular. There is limited evidence to support the effect of nightshades on RA. A 2009 Cochrane review concluded, "The effects of dietary manipulation, including vegetarian, Mediterranean, elemental and elimination diets, on rheumatoid arthritis are still uncertain due to the included studies being small, single trials with moderate to high risk of bias." <sup>95</sup> One small study of 70 people with RA observed that 19% were able to stay well without medications for 1 to 5 years after elimination of particular foods. <sup>96</sup>

\*Other foods may also be implicated. It is important to tailor therapy to the individual.

**TABLE 84-6.** Points to Consider Before Prescribing an Elimination Diet

Several key questions may reveal which foods should be removed <sup>77</sup>	What foods do you frequently eat? What foods do you crave? What foods make you feel better? What foods would be difficult to give up or go without?
A history should cover several specific topics <sup>1,97,98</sup>	Family history of food intolerance, irritable bowel, headache, and mouth ulcers Past medical history of respiratory allergies, chronic upper respiratory congestion, asthma, atopic dermatitis, infant colic, gastrointestinal problems (including lactose intolerance or celiac disease), or unusual reactions to medications or foods History of eating disorders (to avoid risk that an elimination diet may exacerbate these conditions) History of food allergies Previous laboratory test findings (e.g., results of skin prick testing) Relation of symptoms to exercise (some intolerances are exacerbated with increased activity) Relation of symptoms to substance use, including smoking, alcohol,* caffeine, and illicit drugs Life stressors

\*Some clinicians have noted that the development of food intolerance in some patients is preceded by changes in alcohol tolerance. Patients may first note an intolerance to red wine and beer and later an inability to drink white wine and spirits.<sup>99</sup> Ultimately, intolerance to other food items is noted.

**TABLE 84-7.** Common Food Culprits for Food Allergy and Food Intolerance<sup>1,5</sup>

Food allergy*	Citrus Dairy products Eggs Fish Peanuts Soy Gluten (barley, oats, rye, wheat) Shellfish Tree nuts (almonds, pecans, walnuts)
Food intolerance	All of the foods listed for food allergy, plus: Beef products Corn Food additives, including Antioxidants (butylated hydroxyanisole, butylated hydroxytoluene) Aspartame (NutraSweet, an artificial sweetener) Flavor enhancers (monosodium glutamate) Food colors (tartrazine and various other Food Dye and Coloring Act [FD&C] dyes, which are derived from coal tar) Nitrates and nitrites (found in preserved meats) Preservatives (sulfites, benzoates, and sorbates) Thickeners/stabilizers (tragacanth, agar-agar) Biogenic amines (histamine, tyramine, octopamine, phenylethylamine) Disaccharides (lactose) Foods high in nickel and salicylates (see <a href="#">reference 1</a> for a complete listing) Refined sugars

\*These foods account for roughly 80% of all food hypersensitivity reactions.

the foods most likely to cause adverse food reactions; [Table 84-5](#) lists foods linked to symptoms in various disease states.

Patients often have a sense of which foods are most likely to contribute to their symptoms. The clinician should be sure to explore this issue with them. Trust their “gut feelings.” Remember that comfort foods and foods that are often craved can be important culprits.

### Step 2: The Avoidance Phase

Elimination diets vary in terms of intensity.<sup>1,24</sup> The type of diet chosen varies according to the number of suspected food culprits, the likelihood of patient compliance, and the potential effects of the diet on the patient’s nutritional status. Patient compliance decreases as diets become more restrictive. The Patient Handout provides examples of three elimination diets of variable intensity.

The lowest intensity elimination diets are referred to as food-specific diets. In these, just one food or group of foods is removed. Which food or foods are to be removed is often determined on the basis of both the patients’ suspicions and their responses to the questions listed in [Table 84-6](#). For some patients, particularly those for whom maintaining healthy nutrition may be a challenge, it is most appropriate to pursue several low-intensity elimination diets, one after another, rather than to remove multiple foods or food groups simultaneously. However, some individuals display intolerance to combinations of foods or food groups; for them, a low-intensity elimination diet may not prove as useful as one in which multiple food groups are removed simultaneously.

In a moderate-intensity elimination diet, multiple foods or food groups are eliminated. However, if successfully done, moderate-intensity diets have the potential to serve as useful diagnostic and therapeutic tools. The list of foods eliminated is tailored to the individual patient; disease-specific elimination diets, such as those listed in [Table 84-5](#), are available in the reference materials listed at the end of this chapter. Because moderate-intensity elimination diets are more likely than food-specific elimination diets to lead to symptom resolution, they are popular with many integrative clinicians.

Finally, a high-intensity or “few-foods” diet may be considered. In this diet, only the foods on a specific list may be eaten. Higher levels of supervision are necessary with this type of diet to ensure that nutritional needs are met.<sup>1</sup> The Patient Handout contains an example of this diet as well.

The Patient Handout also provides a table of common “foods in disguise.” When a specific group of foods is eliminated, some common ingredients that may cause adverse food reactions must also be eliminated. For example, if a patient is to successfully perform a dairy elimination diet, he or she must also avoid anything containing whey, caramel, casein, and semisweet chocolate.

Patients should follow an elimination diet for at least 10 days; some sources suggest 2 to 4 weeks.<sup>1,16</sup> It is hypothesized that symptoms caused by food intolerance may not arise until a few days after the food has been eaten, so it is important to give the food-related symptoms time to “wear off” before the foods are reintroduced. A study performed in 2000 found that in children with cow’s milk allergy, there was a delay of 3

to 13 days between exposure to milk proteins and the onset of clinical reactions, lending support to this “rule of thumb.”<sup>25</sup>

Patients should be warned that with the elimination diet, it is not uncommon for symptoms to worsen before they begin to improve.

### Step 3: The Challenge Phase

If symptoms decrease during the avoidance phase, it is likely that the food or foods that were eliminated were in fact contributing to the symptoms. However, symptoms of many chronic conditions relapse and remit spontaneously, so it is important to reintroduce eliminated foods or food groups after symptoms are gone to see whether they recur. Because symptoms may take a few days to reappear, foods should be introduced back into the diet only every 3 or 4 days. It is best for a patient to use a small quantity of the reintroduced food at first, then to have a larger serving at subsequent meals on the same day (assuming no untoward effects are experienced with the first serving). In addition to chronic symptoms they have had previously, food-intolerant patients who reintroduce foods may experience lung congestion, increased mucus production, fatigue, concentration difficulties, digestive problems, constipation and diarrhea, bloating, fluid accumulation, mood swings, and drowsiness.<sup>1,26</sup>

During reintroduction, a previously eliminated food is eaten for only 1 day. It is then eliminated again if other foods have also been eliminated and need to be reintroduced. The Patient Handout contains a sample schedule for the elimination and reintroduction of foods in a moderate-intensity elimination diet.

Improvements in symptoms are readily apparent to the patient when they occur during an elimination diet. In fact, many patients are reluctant to attempt the challenge phase because their symptoms have improved so markedly.

### Step 4: Creating a Long-Term Diet Plan

Once the initial three phases of the elimination diet are completed, long-term diet planning is necessary. Additional elimination diets may be needed at some point if symptoms are either unchanged or not fully resolved. Many recommendations exist regarding how long a food causing adverse reactions should be avoided. A reasonable approach is to continue the elimination for at least 3 to 6 months. After that, another challenge with the eliminated food or foods may be attempted. There is some evidence that when a food is reintroduced after a lengthy period, a food intolerance may no longer be found. In a study of 10 patients who had chronic urticaria or perennial rhinitis, 38% found their different food intolerances to be resolved at retesting a year or more after the initial evaluation.<sup>27</sup>

## Risks of Elimination Diets

Although elimination diets are generally safe, particularly under the supervision of a health care professional, a few potential risks must be acknowledged, as follows:

- Elimination diets might activate “latent” eating disorders. The clinician should screen patients for anorexia and bulimia nervosa before initiating an elimination diet. Patients with irritable bowel syndrome may be especially vulnerable.<sup>28</sup>

- A food or food group that has led to an anaphylactic reaction should *never* be reintroduced without appropriate supervision by an allergist. In one small study, seven children with fish allergy eliminated it from their diets. When it was reintroduced, their hypersensitivity was more florid.<sup>29</sup>
- Malnutrition is a risk if a large number of food groups are eliminated. The clinician must ensure that dieters receive adequate fiber, nutrients (including vitamin D and calcium when dairy is restricted), and protein. Patients on gluten elimination diets often become deficient in zinc, selenium, copper, B<sub>6</sub>, and B<sub>12</sub> over time; gluten-free grains lack vitamins B<sub>1</sub>, B<sub>2</sub>, and B<sub>3</sub> as well as folate and iron. Special caution should be used in the treatment of autistic children, given that they tend to be limited in their diets at baseline.<sup>30</sup>
- The clinician must keep in mind the socioeconomic implications of prescribing an elimination diet: cost can become prohibitive—for example, various alternatives to gluten-containing grains can be costly or difficult to obtain; and patients following elimination diets have limited ability to eat at restaurants or other people's homes unless their dietary restrictions are clearly understood by those preparing their meals.<sup>31</sup>
- Enjoyment of eating, an important aspect of general health, may be diminished.
- A fear of food may be created. Some patients have significant symptom improvement with removal of a food. This success can lead to inappropriate association of symptoms with other foods that can snowball toward malnutrition. The goal should be temporary removal of a food, repair of the gastrointestinal ecosystem, and slow reintroduction of the food in the future if possible for non-IgE food intolerances.
- The likelihood of patient noncompliance with the diet must always be kept in mind; this can often be quite high, especially for diets prescribed for children.

The clinician must be mindful of the potential pitfalls of prescribing elimination diets. Patient compliance, nutritional status, and the psychosocial impacts of such a diet must be given consideration. When judiciously used, elimination diets are associated with minimal risk.

## References

References are available at [expertconsult.com](http://expertconsult.com).

**Patient Handout: Using an Elimination Diet**

An elimination diet can be used to determine whether or not certain foods are contributing to your symptoms. If they are, the diet can also be used as a form of treatment.

There are four main steps to an elimination diet:

**Step I: Planning**

This step involves working with your provider to make a list of foods that might be causing problems. You may be asked to keep a diet journal for a week, listing the foods you eat and when you have symptoms. To decide what foods might be causing problems, ask yourself these questions:

- What foods do I eat most often?
- What foods do I crave?
- What foods do I eat to “feel better” (comfort foods)?
- What foods would be hard for me to stop eating?

The answers are foods you should try to eliminate. Other common problematic foods are listed below.

**Step II: Avoiding the Foods on Your List**

After you have made a list of foods to avoid, you start the elimination diet. You should stop eating the foods on your list for two weeks. If you make a mistake and eat something on the list, you should start over. The foods on the list should be avoided in their whole form and also when they are ingredients in other foods. For example, if you are avoiding all dairy products, you need to check labels for whey, casein, and lactose so you can avoid them as well. Elimination diets take a lot of willpower. You must pay close attention to food labels, and be careful if you are eating out, since you may not know all the ingredients of the foods you eat.

Many people notice that in the first week, especially in the first few days, their symptoms get worse before they get better. If your symptoms become severe or increase for more than a day or two, consult your healthcare provider.

**Step III: Add the Foods Back**

If your symptoms have not improved in two weeks, you will need to stop the diet and decide whether or not to try it again with a different list of foods. If you feel better after eliminating the foods, the next step is to see if your symptoms come back when you start eating the foods again. As you do this, keep a written record of your symptoms.

A new food or food group should be added every three days. It takes three days to see if your symptoms come back if they are going to. On the day you introduce an eliminated food back into your diet for the first time, start with just a small amount in the morning. If you don't notice any symptoms, eat a larger portion at lunch and dinner. After a day of eating the new food, wait for two days to see if you notice the symptoms. Then add back another eliminated food or food group. Follow the pattern until all foods are added back. If a food doesn't cause symptoms during a challenge, it is unlikely to be a problem food and can be added back into your diet for good. However, don't add the food back until you have tested ALL the other foods on your list.

**Step IV: Create Your New, Long-Term Diet**

Based on your results, you can plan how to change what you eat so that you'll be most likely to prevent your symptoms. Remember:

- Some people have problems with more than one food.
- Sometimes symptoms come and go for other reasons besides what foods we eat, so it can be confusing to tell for certain if a specific food is the cause.
- Be sure that you are getting adequate nutrition during the elimination diet and as you change your diet for the long-term. For example, if you give up dairy, you must get calcium from other sources.
- You may need to try several different elimination diets before you identify problematic foods.
- If a food causes you to have an immediate allergic reaction, or causes you to have throat swelling, a severe rash, or other severe allergy symptoms, it is important to seek the care of an allergist before re-introducing foods that cause problems.

The elimination diet is not a perfect test. A lot of other factors could interfere with the results. Try and keep everything else (the other foods you eat, your stress level, etc.) as constant as possible while you are on the diet.

**The Three Levels of Elimination Diets**

**Level 1: The Simple Diet**

Eliminates milk, eggs, and wheat

	FOODS ALLOWED	FOODS ELIMINATED
Animal proteins	Beef, chicken, lamb, pork, turkey	Dairy products Chicken eggs
Grains and starches	Arrowroot, barley, buckwheat, corn, millet, oats, rice, rye, sweet potato, tapioca, white potatoes, yams	Wheat
Oils	Any non-dairy oils	Dairy-based butter and margarines
All fruits, vegetables, salt, spices, sweeteners, and vegetable proteins are allowed.		

**Level 2: The Stricter Diet**

The stricter diet eliminates several foods at once.

	FOODS ALLOWED	FOODS ELIMINATED
Animal proteins	Lamb	All others, including eggs and milk
Vegetable proteins	None	Beans, bean sprouts, lentils, peanuts, peas, soy, all other nuts
Grains and starches	Arrowroot, buckwheat, corn, rice, sweet potato, tapioca, white potato, yams	Barley, millet, oats, rye, wheat
Vegetables	Most allowed	Peas, tomatoes
Fruits	Most allowed	No citrus or strawberries
Sweeteners	Cane or beet sugar, maple syrup, corn syrup	Any others, including aspartame
Oils	Coconut, olive, safflower, sesame	Animal fats (lard), butter, corn, margarine, shortening, soy, peanut, other vegetable oils
Other	Salt, pepper, a minimal number of spices, vanilla, lemon extract	Chocolate, coffee, tea, colas and other soft drinks, alcohol

**Level 3: A Few-Foods Diet**

**Only** the foods listed below can be eaten. **All others** are avoided.

- Apples (juice okay)
- Apricots
- Asparagus
- Beets
- Cane or beet sugar
- Carrots
- Chicken
- Cranberries
- Honey
- Lamb
- Lettuce
- Olive oil
- Peaches
- Pears
- Pineapple
- Rice (including rice cakes and cereal)
- Safflower oil
- Salt
- Sweet potatoes
- White vinegar

Modified from Mahan LK, Escot-Stump S: *Krause's Food Nutrition and Diet Therapy*. 11<sup>th</sup> ed. Philadelphia: Saunders; 2004.

**A Sample Elimination Diet Calendar**

Day Number	Step
1	Begin Elimination Diet
2–7	You may notice symptoms worsen for a day or two
8–14	Symptoms should go away if the right foods have been removed
15	Re-introduce food #1 (for example, dairy)
16–17	Stop food #1 and watch for symptoms*
18	Re-introduce food #2 (for example, wheat)
19–20	Stop food #2 again and watch for symptoms
21	Re-introduce food #3
	...And so on, until all eliminated foods have been re-introduced

\*You only re-introduce a new food for one day. Until the diet is over, it is not added back into the diet again.

**Some Helpful Tips:**

A number of foods can be 'disguised' when you look at food labels.

If You Are Avoiding	Also Avoid
Dairy	Caramel candy, carob candies, casein and caseinates, custard, curds, lactalbumin, goat's milk, milk chocolate, nougat, protein hydrolysate, semisweet chocolate, yogurt, pudding, whey. Also beware of brown sugar flavoring, butter flavoring, caramel flavoring, coconut cream flavoring, "natural flavoring," and Simplese.
Peanuts	Egg rolls, "high-protein food," hydrolyzed plant protein, hydrolyzed vegetable protein, marzipan, nougat, candy, cheesecake crusts, chili, chocolates, pet feed, sauces.
Egg	Albumin, apovitellin, avidin, béarnaise sauce, eggnog, egg whites, flavoprotein, globulin, hollandaise sauce, imitation egg products, livetin, lysozyme, mayonnaise, meringue, ovalbumin, ovoglycoprotein, ovomucin, ovomucoid, ovomuxoid, Simplese.
Soy	Chee-fan, ketjap, metiauza, miso, natto, soy flour, soy protein concentrates, soy protein shakes, soy sauce, soybean hydrolysates, soby sprouts, sufu, tao-cho, tao-si, taotjo, tempeh, textured soy protein, textured vegetable protein, tofu, whey-soy drink. Also beware of hydrolyzed plant protein, hydrolyzed soy protein, hydrolyzed vegetable protein, natural flavoring, vegetable broth, vegetable gum, vegetable starch.
Wheat	Atta, bal ahar, bread flour, bulgar, cake flour, cereal extract, couscous, cracked wheat, durum flour, farina, gluten, graham flour, high-gluten flour, high-protein flour, kamut flour, laubina, leche alim, malted cereals, minchin, multi-grain products, puffed wheat, red wheat flakes, rolled wheat, semolina, shredded wheat, soft wheat flour, spelt, superamine, triticale, vital gluten, vitalia macaroni, wheat protein powder, wheat starch, wheat tempeh, white flour, whole-wheat berries. Also beware of gelatinized starch, hydrolyzed vegetable protein, modified food starch, starch, vegetable gum, vegetable starch.

Data from Joneja JV. *Dietary Management of Food Allergy and Intolerance*. 2nd ed. Vancouver, BC: Hall Publishing Group, 1998; and Mahan LK, Escot-Stump S: *Krause's Food Nutrition and Diet Therapy*. 11<sup>th</sup> ed. Philadelphia: Saunders; 2004.

**A One-Week Food Diary Chart**

(Log in foods eaten and times. Note the symptoms you have and what times as well)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Morning Foods							
Morning Symptoms							
Afternoon Foods							
Afternoon Symptoms							
Evening Foods							
Evening Symptoms							



## References

- Joneja JV. *Dietary Management of Food Allergy and Intolerance*. 2nd ed. Vancouver, BC: Hall Publishing Group; 1998.
- Arora D, Kumar M. Food allergies: leads from Ayurveda. *Indian J Med Sci*. 2003;57:57–63.
- Zopf Y, Baenkler HW, Silbermann A, et al. The differential diagnosis of food intolerance. *Dtsch Arztebl*. 2009;106:359–370.
- Degaetani MA, Crowe SE. A 41-year-old woman with abdominal complaints: is it food allergy or food intolerance? How to tell the difference. *Clin Gastroenterol Hepatol*. 2010;8:755–759.
- Sampson HA. Update on food allergy. *J Allergy Clin Immunol*. 2004;113:805–819.
- Sampson HA, Sicherer SH, Birnbaum AH. AGA technical review on the evaluation of food allergy in gastrointestinal disorders. *Gastroenterology*. 2001;120:1026–1040.
- Bjarnason I, MacPherson A, Hollander D. Intestinal permeability: an overview. *Gastroenterology*. 1995;108:1566–1581.
- Wald A, Rakei D. Behavioral and complementary approaches for the treatment of irritable bowel syndrome. *Nutr Clin Pract*. 2008;23:284–292.
- Hollander D. Intestinal permeability, leaky gut, and intestinal disorders. *Curr Gastroenterol Rep*. 1999;1:410–416.
- Nejdfors P, Ekelund M, Westrom BR, et al. Intestinal permeability in humans is increased after radiation therapy. *Dis Colon Rectum*. 2000;43:1582–1587.
- Iwata H, Matsushi M, Nishikimi N, et al. Intestinal permeability is increased in patients with intermittent claudication. *J Vasc Surg*. 2000;31:1003–1007.
- Yacyshyn B, Meddings J, Sadowski D, et al. Multiple sclerosis patients have peripheral blood CD45RO<sup>+</sup>B cells and increased intestinal permeability. *Dig Dis Sci*. 1996;41:2493–2498.
- Keshavarzian A, Holmes EW, Patel M, et al. Leaky gut in alcoholic cirrhosis: a possible mechanism for alcohol-induced liver damage. *Am J Gastroenterol*. 1999;94:200–207.
- Reichelt KL, Knivsberg AM. The possibility and probability of a gut-to-brain connection in autism. *Ann Clin Psychiatry*. 2009;21:205–211.
- Genuis SJ. Sensitivity-related illness: the escalating pandemic of allergy, food intolerance, and chemical sensitivity. *Sci Total Environ*. 2010;408:6047–6061.
- Patriarca G, Schiavino D, Pecora V, et al. Food allergy and food intolerance: diagnosis and treatment. *Intern Emerg Med*. 2009;4:11–24.
- Bock SA, Sampson HA, Atkins FM, et al. Double-blind, placebo-controlled food challenge (DBPCFC) as an office procedure: a manual. *J Allergy Clin Immunol*. 1988;82:986–987.
- Niggeman B, Beyer K. Diagnosis of food allergy: toward a standardization of food challenge. *J Pediatr Gastroenterol Nutr*. 2007;45:399–404.
- Pastorello EA, Pravettoni V, Stocchi L, et al. Are double-blind food challenges necessary before starting an elimination diet? *Allergy Proc*. 1991;2:319–325.
- Sicherer SH. Manifestations of food allergy: evaluation and management. *Am Fam Physician*. 1999;59:415–424; 429–430.
- Vatn MH, Grimstad IA, Thorsen L, et al. Adverse reaction to food: assessment by double-blind placebo-controlled food challenge and clinical, psychosomatic and immunologic analysis. *Digestion*. 1995;56:421–428.
- Atkinson W, Sheldon TA, Shaath N, Whorwell PJ. Food elimination based on IgG antibodies in irritable bowel syndrome: a randomised controlled trial. *Gut*. 2004;53:1459–1464.
- Mullin GE, Swift KM, Lipski L, et al. Testing for food reactions: the good, the bad, and the ugly. *Nutr Clin Pract*. 2010;25:192–198.
- Mahan LK, Escott-Stump S, eds. *Krause's Food, Nutrition and Diet Therapy*. 11th ed. Philadelphia: Saunders; 2004.
- Carroccio A, Montalto G, Custro N, et al. Evidence of very delayed clinical reactions to cow's milk in cow's milk-intolerant patients. *Allergy*. 2000;55:574–579.
- Johnson K. The elimination diet and diagnosing food hypersensitivities. In: Rakei D, ed. *Integrative Medicine*. Philadelphia: Saunders; 2003: 655–659.
- Pastorello EA, Stocchi L, Pravettoni V, et al. Role of the elimination diet in adults with food allergy. *J Allergy Clin Immunol*. 1989;84:475–483.
- Lea R, Whorwell PJ. The role of food intolerance in irritable bowel syndrome. *Gastroenterol Clin North Am*. 2005;34:247–255.
- Larramendi CH, Martin-Esteban M, Pascual-Marcos C, et al. Possible consequences of elimination diets in asymptomatic immediate hypersensitivity to fish. *Allergy*. 1992;47:490–494.
- Elder JH. The gluten-free, casein-free diet in autism: an overview with clinical implications. *Nutr Clin Pract*. 2008;23:583–588.
- Leffler DA, Edwards-George J, Dennis M, et al. Factors that influence adherence to a gluten-free diet in adults with celiac disease. *Dig Dis Sci*. 2008;53:1573–1581.
- Assa'ad AH. Gastrointestinal food allergy and intolerance. *Pediatr Ann*. 2006;35:720–726.
- Chafen JJS, Newberry S, Riedl MA, et al. Diagnosing and managing common food allergies: a systematic review. *JAMA*. 2020;303:1848–1856.
- Green PHR, Cellier C. Celiac disease. *N Engl J Med*. 2007;357: 1731–1743.
- Hadjivasiliou M, Sanders DS, Grunewald RA, et al. Gluten sensitivity: from gut to brain. *Lancet Neurol*. 2010;9:3218–3230.
- Guruta GT, Liacouras CA, Collins MH, et al. Eosinophilic esophagitis in children and adults: a systematic review and consensus recommendations for diagnosis and treatment. *Gastroenterology*. 2007;133:1342–1363.
- Shaukat A, Levitt MD, Taylor BC. Systematic review: effective management strategies for lactose intolerance. *Ann Intern Med*. 2010;152:797–803.
- Perino A, Cabras S, Obinu D, Sforza LC. Lactose intolerance: a non-allergic disorder often managed by allergologists. *Eur Ann Allergy Clin Immunol*. 2009;41:3–16.
- Montalto M, Curigliano V, Santoro L, et al. Management and treatment of lactose malabsorption. *World J Gastroenterol*. 2006;12:187–191.
- Beyer K, Teuber SS. Food allergy diagnostics: scientific and unproven procedures. *Curr Opin Allergy Clin Immunol*. 2005;5:261–266.
- Kemp AS, Schembri G. An elimination diet for chronic urticaria of childhood. *Med J Aust*. 1985;143:234–235.
- Moga MM. Alternative treatment of gallbladder disease. *Med Hypotheses*. 2003;60:143–147.
- Kneepkens CM, Jakobs C, Douwes AC. Apple juice, fructose, and chronic nonspecific diarrhoea. *Eur J Pediatr*. 1989;148:571–573.
- Hill DJ, Roy N, Heine RG, et al. Effect of a low-allergen maternal diet on colic among breastfed infants: a randomized-controlled trial. *Pediatrics*. 2005;116:709–715.
- Carroccio A, Iacono G. Review article: chronic constipation and food hypersensitivity—an intriguing relationship. *Aliment Pharmacol Ther*. 2006;24:1295–1304.
- Lucarelli S, Corrado G, Pelliccia A, et al. Cyclic vomiting syndrome and food allergy/intolerance in seven children: a possible association. *Eur J Pediatr*. 2000;159:360–363.
- Oei HD, Pelikan-Filipek M, Pelikan Z, et al. Enuresis and encopresis as a reaction to food. *Ned Tijdschr Geneesk*. 1989;133:1555–1557.
- Oh HE, Chetty R. Eosinophilic gastroenteritis: a review. *J Gastroenterol*. 2008;43:741–750.
- Festi D, Scaioli E, Baldi F, et al. Body weight, lifestyle, dietary habits, and gastroesophageal reflux disease. *World J Gastroenterol*. 2009;15:1690–1701.
- Brown AC, Roy M. Does evidence exist to include dietary therapies in the treatment of Crohn's disease? *Expert Rev Gastroenterol Hepatol*. 2010;4:191–215.
- Candy S, Borok G, Wright JP, et al. The value of an elimination diet in the management of patients with ulcerative colitis. *S Afr Med J*. 1995;85:1176–1179.
- Galardi D, Allgaier HP. Diet therapy in chronic inflammatory bowel disease: results from meta-analysis and randomized controlled trials. *Praxis (Bern 1994)*. 2002;91:2041–2049.
- Riordan AM, Hunter JO, Cowan RE, et al. Treatment of active Crohn's disease by exclusion diet: East Anglian multi-center controlled trial. *Lancet*. 1993;342:1131–1134.
- Siddiqi S, Vijay V, Ward M, et al. Pruritus ani. *Ann R Coll Surg Engl*. 2008;90:457–463.
- Kokkonen J, Ruuska T, Karttunen TJ, et al. Mucosal pathology of the foregut associated with food allergy and recurrent abdominal pains in children. *Acta Paediatr*. 2001;90:16–21.
- Miller K. Concomitant nonpharmacologic therapy in the treatment of primary nocturnal enuresis. *Clin Pediatr (Phila)*. 1993; Spec No:32–37.
- Lefevre F, Aronson N. Ketogenic diet for the treatment of refractory epilepsy in children: a systematic review of efficacy. *Pediatrics*. 2000;105:E46.
- Hay KD, Reade PC. The use of an elimination diet in the treatment of recurrent aphthous ulceration of the oral cavity. *Oral Surg Oral Med Oral Pathol*. 1984;57:504–507.
- Farchi S, Forastiere F, Agabiti N, et al. Dietary factors associated with wheezing and allergic rhinitis. *Eur Respir J*. 2003;22:772–780.

60. Ogle KA, Bullock JD. Children with allergic rhinitis and/or bronchial asthma treated with elimination diet: a five-year follow-up. *Ann Allergy*. 1980;44:273.
61. Novembre E, Martino M, Vierrucci A. Foods and respiratory allergy. *J Allergy Clin Immunol*. 1988;81:1059–1065.
62. Asero R. Food additives intolerance: does it present as perennial rhinitis? *Curr Opin Allergy Clin Immunol*. 2004;4:25–29.
63. Locan AC, Wong C. Chronic fatigue syndrome: oxidative stress and dietary modifications. *Altern Med Rev*. 2001;6:450–459.
64. Morris DH, Stare FJ. Unproven diet therapies in the treatment of the chronic fatigue syndrome. *Arch Fam Med*. 1993;2:181–186.
65. Patavino T, Brady DM. Natural medicine and nutritional therapy as an alternative treatment in systemic lupus erythematosus. *Altern Med Rev*. 2001;6:460–471.
66. David TH. Behaviour problems. In: David TH, ed. *Food and Food Additive Intolerance in Childhood*. Boston: Blackwell Scientific; 1993:420–437.
67. Ballard W, Hall MN. Do dietary interventions improve ADHD symptoms in children? *J Fam Pract*. 2010;59:234–235.
68. Ghuman JK, Arnold E, Anthony BJ. Psychopharmacological and other treatments in preschool children with attention deficit/hyperactivity disorder: current evidence and practice. *J Child Adolesc Psychopharmacol*. 2008;8:413–447.
69. Breuer K, Kapp A, Werfel T. The impact of food allergy in patients with atopic dermatitis. *Hautarzt*. 2003;54:121–129.
70. Greer FR, Sicherer SH, Burks AW. Effects of early nutritional interventions on the development of atopic disease in infants and children: the role of maternal dietary restriction, breastfeeding, timing of introductions of complementary foods, and hydrolyzed formulas. *Pediatrics*. 2008;121:183–191.
71. Host A, Halken S, Muraro A. Amendment to previous published articles in Pediatric Allergy and Immunology 2004, by an expert group set up by the Section on Pediatrics, European Academy of Allergology and Clinical Immunology. *Pediatr Allergy Immunol*. 2008;19:1–4.
72. Lee SS, Lee KY, Noh G. The necessity of diet therapy for successful interferon-gamma therapy in atopic dermatitis. *Yonsei Med J*. 2001;43:161–171.
73. Sloper KS, Wadsworth J, Brostoff J. Children with atopic eczema. I: clinical response to food elimination and subsequent double-blind food challenge. *Q J Med*. 1991;80:677–693.
74. Veien NK, Hattel T, Justesen O, et al. Oral challenge with food additives. *Contact Dermatitis*. 1987;17:100–103.
75. Rossignol DA. Novel and emerging therapies for autism spectrum disorders: a systematic review. *Ann Clin Psychiatry*. 2009;21:213–236.
76. Srinivasan P. A review of dietary interventions in autism. *Ann Clin Psychiatry*. 2009;21:237–247.
77. Millward C, Ferriter M, Calver SJ, Connell-Jones GG. Gluten- and casein-free diets for autistic spectrum disorder. *Cochrane Database Syst Rev*. 2008;(2): CD003498.
78. Reichelt KL, Knivsberg AM. The possibility and probability of a gut-to-brain connection in autism. *Ann Clin Psychiatry*. 2009;21:205–211.
79. Alun-Jones V, McLaughlan P, Shorthouse M, et al. Food intolerance: a major factor in the pathogenesis of IBS. *Lancet*. 1982;2:1115–1117.
80. Ragnarsson G, Bodemar G. Pain is temporally related to eating but not to defecation in IBS: patients' description of diarrhea, constipation and symptom variation during a prospective six-week study. *Eur J Gastroenterol Hepatol*. 1998;10:415–421.
81. Morcos A, Dinan T, Quigley E. IBS: role of food in pathogenesis and management. *J Dig Dis*. 2009;10:237–246.
82. Niec AM, Frankum B, Talley NJ. Are adverse food reactions linked to IBS? *Am J Gastroenterol*. 1998;93:2184–2190.
83. Bolin T. IBS or intolerance? *Aust Fam Physician*. 2009;38:962–965.
84. Millichap JG, Yee MM. The diet factor in pediatric and adolescent migraine. *Pediatr Neurol*. 2003;28:9–15.
85. Sinclair S. Migraine headaches: nutritional, botanical and other alternative approaches. *Altern Med Rev*. 1999;4:86–95.
86. Sun-Edelstein C, Mauskop A. Foods and supplements in the management of migraine. *Clin J Pain*. 2009;25:446–452.
87. Balyeat RM, Brittain FL. Allergic migraine. *Am J Med Sci*. 1930;80:212–221.
88. Grant EC. Food allergies and migraine. *Lancet*. 1979;1:966–969.
89. Koehler SM, Glaros A. The effect of aspartame on migraine headache. *Headache*. 1988;28:10–14.
90. Egger J, Wilson J, Carter CM, et al. Is migraine food allergy? A double-blind controlled trial of oligoantigenic diet treatment. *Lancet*. 1983;2:865–869.
91. Nsouli TM, Nsouli SM, Linde RE, et al. Role of food allergy in serous otitis media. *Ann Allergy*. 1994;73:215–219.
92. Derebery MJ, Berliner KI. Allergic eustachian tube dysfunction: diagnosis and treatment. *Am J Otol*. 1997;18:160–165.
93. Ivker RS. Respiratory disease: sinusitis, upper respiratory infection, otitis media. *Clin Fam Pract*. 1997;18:160–165.
94. Buchanan HM, Preston SJ, Brooks PM, et al. Is diet important in rheumatoid arthritis? *Br J Rheumatol*. 1991;30:125–134.
95. Hagen KB, Byfuglien MG, Falzon L, et al. Dietary interventions for rheumatoid arthritis. *Cochrane Database Syst Rev*. 2009;(1): CD006400.
96. Darlington LG. Dietary therapy for arthritis. *Rheum Dis Clin North Am*. 1991;17:273–285.
97. Teuber SS, Porch-Curren C. Unproved diagnostic and therapeutic approaches to food allergy and intolerance. *Curr Opin Allergy Clin Immunol*. 2003;3:217–221.
98. Hodge L. Food allergy and intolerance. *Aust Fam Physician*. 2009;38:765–777.
99. Saifer PL, Saifer M. Clinical detection of sensitivity to preservatives and chemicals. In: Brostoff J, Challacombe SJ, eds. *Food Allergy and Intolerance*. London: Baillière Tindall; 1987:416–424.



# The Glycemic Index/Load

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At present, the American Diabetes Association (ADA)<sup>1</sup> does not recognize a role for the glycemic index in the prevention of disease. On the basis of its review, diets with a low glycemic index may reduce postprandial glycemia but may be difficult to maintain long term. The ADA holds that additional evidence to support the glycemic and lipid benefits of low-glycemic index diets is needed.<sup>1,2</sup> Data from a later review of the literature, however, suggest that glycemic index information should be incorporated into exchanges and teaching materials<sup>3</sup> specifically for disease prevention of diabetes, cardiovascular disease, inflammation, and, possibly, some cancers. In this chapter, the definitions of glycemic index and glycemic load are reviewed, and studies demonstrating their possible use in disease prevention are provided.

## Glycemic Index

The glycemic index (GI) has proved to be a useful nutritional concept—the chemical classification of carbohydrate (simple or complex, sugars or starches, available or unavailable)—that fosters new insights into the relationship between the physiologic effects of carbohydrate-rich foods and health.<sup>4</sup> The GI measures how quickly a consumed carbohydrate affects postprandial serum glucose levels in a specified time. By definition, the GI compares equal quantities of available carbohydrate in foods and provides a measure of carbohydrate quality. Available carbohydrates can be calculated by summing the quantity of available sugars, starch, oligosaccharides, and maltodextrins.<sup>5</sup> In effect, the GI is an indicator of the relative glycemic response to dietary carbohydrates. Glucose and white bread are often used as the “gold standard” because they cause the fastest and most dramatic rise in glucose levels. In the evaluation of individual foods, either glucose or white bread is assigned a value of 100, the highest index possible. All other foods are then assigned proportionately lower values on the basis of how they affect serum glucose levels in comparison with glucose or white bread.<sup>6</sup> The GI is now widely recognized as a reliable, physiologically based classification of foods according to their postprandial

glycemic effects.<sup>4</sup> For example, in healthy individuals, stepwise increases in GI have been shown to predict stepwise elevations in postprandial blood glucose and insulin levels (Fig. 85-1).<sup>5,7</sup>

The GI measures how quickly a consumed carbohydrate affects postprandial serum glucose levels in a specified time.

## Glycemic Load

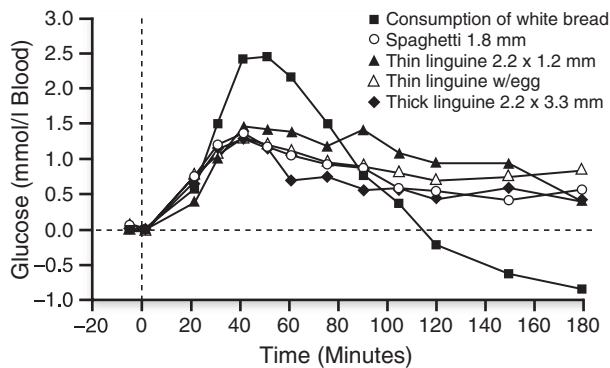
To provide a more accurate description of the quantity and quality of carbohydrate in a meal simultaneously, researchers developed the concept of the glycemic load (GL), which takes the concept of GI a step further, accounting not only for how rapidly a food's carbohydrates are converted to glucose but also the relative amounts of carbohydrate the food contains in an average serving. GL is generally held to be a more accurate measure of a food's overall effect on pancreatic insulin release and serum glucose levels. The GL of a food is calculated by multiplying the GI value by the amount of carbohydrates in grams provided by a serving of food and dividing the total by 100.<sup>5</sup> Therefore, the GL provides a summary measure of the relative glycemic impact of a “typical” serving of the food. In general, items with a low GI tend to have a correspondingly low GL. However, foods with a high GI may vary as to whether their GL is low or high. For example, the carbohydrates in watermelon are rapidly converted to glucose, so watermelon's GI is high at 72. However, because watermelon is made up primarily of water and contains little absolute carbohydrate content, its GL is relatively low at a value of 4.<sup>4</sup>

Several prospective observational studies have documented an independent association between a long-term consumption of a diet with a high GL and a higher risk for development of type 2 diabetes mellitus, cardiovascular disease, and certain cancers.<sup>4</sup> In another study, implementation of a low-GL diet was associated with substantial and sustained improvements in abdominal obesity, cholesterol

concentration, and glycemic control.<sup>8</sup> A low-GL diet has been associated with more weight loss in young adults who are insulin resistant.<sup>9</sup> Use of GL to guide dietary choices has been found to have several benefits. High-GL foods can often lead to rapid release of large amounts of insulin, which can ultimately cause blood glucose levels to fall below fasting levels a few hours after eating. This rebound hypoglycemia can be characterized by fatigue, which decreases substantially when high-GL foods are removed from the diet. Interestingly, a low-GI meal leads to a lower glycemic response to subsequent meals as well.<sup>10</sup> On average, people who eat low-GL diets tend to eat smaller meals; their food cravings diminish. Diets of predominantly high-GI foods have been associated with a higher risk of insulin resistance syndrome and type 2 diabetes mellitus (Tables 85-1 and 85-2).<sup>11</sup>

**FIGURE 85-1**

Mean incremental blood glucose responses in healthy subjects 65 to 70 years of age. (Modified from Bjorck I, Granfeldt Y, Liljeberg H, et al. Food properties affecting the digestion and absorption of carbohydrates. *Am J Clin Nutr.* 59[suppl]:699S-705S, 1994.)



**TABLE 85-1. Food Rating Values for Glycemic Index and Glycemic Load**

VALUE	GLYCEMIC INDEX	GLYCEMIC LOAD
High	>70	>20
Medium	56-69	11-19
Low	<55	<10

**TABLE 85-2. Calculating the Difference Between Glycemic Index and Glycemic Load**

**Example: Watermelon**

Glycemic index: 72 (high)

Glycemic load: 4 (low)

Amount of carbohydrate per serving: 6 g (low)

**Calculating Glycemic Load (GL)**

$GL = (\text{Glycemic index})/100 \times (\text{carbohydrates per serving in grams})$

or

$$72/100 (0.72) \times 6 = 4$$

Note: Although the glycemic index of the sugar in watermelon is high, most of watermelon is water and the amount of carbohydrate per serving size is low (6g), which results in a low glycemic load.

## Disease Prevention

### Diabetes

In sedentary middle-aged men with one or more traditional cardiac risk factors, a high-GI, high-carbohydrate diet was associated with the least favorable postprandial profile, whereas the low-GI, high-carbohydrate diet had the most favorable profile.<sup>12</sup> In another study, 4 weeks of a low-GI diet was shown to improve glycemic control, glucose use, some lipid profiles, and the capacity for fibrinolysis in type 2 diabetes mellitus.<sup>13</sup> Results of a 2004 meta-analysis support the use of the GI as a scientifically based tool to enable selection of carbohydrate-containing foods to reduce total cholesterol levels and to improve overall metabolic control of diabetes.<sup>14</sup>

In summary, a low-GI diet has been found to help with weight management, to improve insulin sensitivity and glycated hemoglobin level, and to reduce the overall risk of type 2 diabetes.<sup>15</sup>

A low GI has correlated with a reduction in hemoglobin A1c, elevated high-density lipoprotein concentration, and lower levels of triglycerides.

### Cardiovascular Diseases

In cardiovascular disease, dietary fats and lipids tend to receive the majority of attention. Carbohydrates with a high GI, however, may not be the ideal alternative when fats are restricted.<sup>16</sup>

Effects of a low-GI, low-GL diet on cholesterol appear to be most dramatic on triglycerides because there is less need for the liver to make this cholesterol to bind excessive glucose in the blood to be stored as fat. Mixed meals containing slowly digestible carbohydrate that induce low glycemic and insulinemic responses reduce the postprandial accumulation of both hepatically and intestinally derived triacylglycerol-rich lipoproteins in obese subjects with insulin resistance.<sup>17</sup> In a study comparing a low-GI diet with legumes and fiber to a healthy American diet with no legumes and less fiber, the GI diet was associated with lower fasting total cholesterol and low-density lipoprotein levels.<sup>18</sup> GL appears to be an important independent predictor of high-density lipoprotein cholesterol in youth.<sup>19</sup>

Findings suggest that high intake of refined carbohydrates is associated with risk for hemorrhagic stroke, particularly among overweight or obese women. In addition, high consumption of cereal fiber was associated with lower risk of total and hemorrhagic stroke.<sup>20</sup> An ad libitum low-GL diet may be more efficacious than a conventional, energy-restricted, low-fat diet in reducing cardiovascular disease risk.<sup>21</sup> When saturated fats were replaced with carbohydrates with a low GI, there was a lower risk of myocardial infarction in a prospective cohort of 53,644 men and women; but if saturated fat was replaced with carbohydrates with a high GI, the risk was increased.<sup>22</sup> A retrospective analysis of cardiovascular deaths in Denmark found that men who ate a high-GI diet were more likely to die of heart disease.<sup>23</sup> In an Italian cohort (The EPICOR study), a high-GL diet increased the overall risk of cardiovascular disease in women but not in men.<sup>24</sup>

## Inflammation

The extent to which dietary GL can affect inflammation remains unclear, but a relationship does appear to exist. In both human and animal studies, hyperglycemia in the presence of diabetes has been linked to the production of reactive oxygen species, with consequent lipid peroxidation and resultant atherosclerosis. Hyperglycemia in nondiabetic subjects has similarly been found to increase the production of reactive oxygen species in vitro, with resultant oxidative cellular damage and the ultimate triggering of inflammatory responses. Leukocyte rolling, adherence, and movement from the bloodstream have also been noted in the presence of high glucose concentrations.<sup>25</sup> Subclinical inflammation, characterized by increased levels of interleukin (IL)-1beta and IL-6, has been noted to precede the development of type 2 diabetes mellitus in one large European study.<sup>26</sup>

The exact mechanisms by which elevated glucose values might be associated with inflammation are unclear, but increased production of tumor necrosis factor-alpha (TNF-alpha) may play a role. Production of acute-phase reactants rises in hyperglycemia, perhaps in response to TNF-alpha levels. Liu et al,<sup>27</sup> using prospective data from the Women's Health Study, found a statistically significant association between dietary GL and plasma levels of highly sensitive C-reactive protein (hs-CRP), a marker for systemic inflammation associated with an increased risk of coronary artery disease and other inflammatory disorders. The risk was higher in women who had an elevated body mass index.<sup>27</sup> This relationship may partially explain why it has been concluded, on the basis of epidemiologic data, that a diet with a high overall GL is associated with more coronary heart disease in women, independent of other known risk factors.<sup>28</sup>

Diets low in GL and high in fiber may increase plasma adiponectin concentrations in diabetic patients. Adiponectin may improve insulin sensitivity, reduce inflammation, and ameliorate glycemic control.<sup>29</sup> Higher adiponectin levels are associated with better glycemic control, more favorable lipid profile, and reduced inflammation in diabetic women.<sup>30</sup> A study of more than 3000 men and women in Greece found that those who most strictly followed the Mediterranean diet (rich in olive oil, fruits, vegetables, multigrain breads, fish, and lean meat) had, on average, 20% lower CRP levels, 17% lower IL-6 levels, 15% lower homocysteine levels, and 6% lower fibrinogen levels than those who did not follow the diet<sup>31</sup> (see Chapter 86, The Antiinflammatory Diet).

Additional research is needed to fully elucidate the relationship between GL and inflammation. However, given the

relatively low risks associated with use of GL or GI to guide dietary carbohydrate choices, doing so may prove to be a useful part of an antiinflammatory diet.

## Cancer

A number of case-control and cohort studies suggest a link between GL and various cancers. A positive association has been noted between GL and the risk for development of gastric,<sup>32</sup> colorectal,<sup>33</sup> and upper aerodigestive tract<sup>34</sup> cancers. Slightly higher risks of endometrial<sup>35</sup> and pancreatic cancers<sup>36,37</sup> have been suggested as well. A meta-analysis of 10 studies of 577,538 subjects showed that a high-GI diet is associated with a significantly increased risk of breast cancer, although this did not hold true for GL.<sup>38</sup>

## Conclusion

The rate of carbohydrate absorption after a meal, as quantified by GI and GL, has a significant effect on postprandial hormonal and metabolic responses. A review of the literature demonstrates that the consumption of low-GI, low-GL foods may positively affect many parameters associated with diabetes, cardiovascular disease, inflammation parameters, and cancer progression.<sup>11-37</sup> Providing clinical guidelines for patients on how to benefit from a low-GI, low-GL food consumption is strongly encouraged. [Table 85-3](#) lists GI and GL values for common foods.

### Practical Clinical Guidelines

- Increase consumption of fruits, vegetables, and legumes.
- Consume fruits that are underripe instead of overripe (e.g., bananas).
- Consume grain products processed according to traditional rather than modern methods (e.g., al dente pasta, stone-ground breads, old-fashioned oatmeal).
- Avoid puffed grains and finely ground flour or grain products.
- Acid in food lowers GI (i.e., sourdough bread has a lower GI than non-sourdough bread).
- Limit intake of potatoes and concentrated sugars.
- Consume high glycemic foods with fat and protein to reduce their GI.<sup>39</sup>
- In general, reduce consumption of "white foods" (potatoes, breads, pasta) and increase consumption of multicolored whole, nonprocessed foods.

**TABLE 85-3.** Glycemic Index and Glycemic Load Values for Select Foods

FOOD ITEM	GLYCEMIC INDEX (glucose = 100)	SERVING SIZE (g)	AVAILABLE CARBOHYDRATE (g/serving)	GLYCEMIC LOAD (per serving)
<b>Bakery Products</b>				
Angel food cake	67	50	29	19
Pound cake	54	53	28	15
Apple muffin (no sugar)	48 ± 10	60	19	9
Bran muffin	60	57	24	15
Oatmeal	69	50	35	24
Pancakes	67 ± 5	80	58	39
Waffles	76	35	13	10

*Continued*

**Table 85-3.** Glycemic Index and Glycemic Load Values for Select Foods—cont'd

FOOD ITEM	GLYCEMIC INDEX (glucose = 100)	SERVING SIZE (g)	AVAILABLE CARBOHYDRATE (g/serving)	GLYCEMIC LOAD (per serving)
<b>Beverages</b>				
Coca-Cola	63	250mL	26	16
Smoothie drink, soy, banana	30 ± 3	250mL	22	7
Apple juice, pure, cloudy, unsweetened	37 ± 3	250mL	28	10
Cranberry juice cocktail	68 ± 3	250mL	36	24
Orange juice	50 ± 4	250mL	26	13
Tomato juice, canned, no sugar	38 ± 4	250mL	9	4
Gatorade	78 ± 13	250mL	15	12
<b>Breads</b>				
Bagel (white)	72	70	35	25
Baguette (white)	95 ± 15	30	15	15
Oat-bran bread	44	30	18	8
Rye-kernel (whole-grain pumpernickel)	46	30	11	5
Wheat bread (80% intact kernels and 20% white-wheat flour)	52	30	20	10
Wonder enriched white bread	73 ± 2	30	14	10
Healthy Choice Hearty 7-Grain bread	55 ± 6	30	14	8
<b>Breakfast Cereals and Related Products</b>				
All-Bran	38	30	23	9
Cheerios	74	30	20	15
Cornflakes	92	30	26	24
Muesli	66 ± 9	30	24	17
Pop-Tarts, double chocolate	70 ± 2	50	36	25
Raisin Bran	61 ± 5	30	19	12
Special K	69 ± 5	30	21	14
<b>Cereal Grains</b>				
Sweet corn	60	150	33	20
Taco shells, cornmeal	68	20	12	8
White rice boiled	64 ± 7	150	36	23
Parboiled white rice (high amylose)	35 ± 4	150	39	14
Brown rice, steamed	50	150	33	16
Cracked wheat bulgur	48 ± 2	150	26	12
Semolina (roasted or steamed)	55 ± 1	150	11	6
<b>Cookies</b>				
Graham wafers	74	25	18	14
Vanilla wafers	77	25	18	14
<b>Crackers</b>				
Breton Crackers (wheat)	67	25	14	10
Corn Thins	87 ± 10	25	20	18
Rice cakes (low amylose)	91 ± 7	25	21	19
Rye Crisp bread	63	25	16	10
Stoned Wheat Thins	67	25	17	12
<b>Dairy Products and Alternatives</b>				
Milk	27 ± 4	250	12	3
Milk, condensed, sweetened	61 ± 6	250	136	83
Ice cream	61 ± 7	50	13	8
Yogurt	36 ± 4	200	9	3
Soy milk	44 ± 5	250	17	8
Tofu-based frozen dessert with high-fructose corn syrup	115 ± 14	50	9	10

TABLE 85-3. Glycemic Index and Glycemic Load Values for Select Foods—cont'd

FOOD ITEM	GLYCEMIC INDEX (glucose = 100)	SERVING SIZE (g)	AVAILABLE CARBOHYDRATE (g/serving)	GLYCEMIC LOAD (per serving)
<b>Fruit and Fruit Products</b>				
Apple (raw)	40	120	13	6
Apple juice (unsweetened)	40	250mL	29	12
Banana (ripe)	51	120	25	13
Cranberry juice cocktail	68 ± 3	250mL	35	24
Fruit cocktail (canned)	55	120	16	9
Grapes (raw)	43	120	17	7
Orange (raw)	48	120	11	5
Orange juice (reconstituted from frozen)	57 ± 6	250mL	26	15
Pineapple (raw)	39 ± 15	120	12	5
Strawberry (raw)	40 ± 7	120	3	1
Strawberry jam	51 ± 10	30	20	10
Watermelon (raw)	72 ± 13	120	6	4
<b>Legumes</b>				
Black-eyed beans	42 ± 9	150	30	13
Chickpeas (garbanzo)	28 ± 6	150	30	8
Kidney beans	28 ± 4	150	25	7
Lentils (green)	22	150	18	4
Lentils (red)	26 ± 4	150	18	5
Mung beans	31	150	17	5
Pigeon peas	22	150	20	4
Pinto beans	39	150	26	10
Soya beans	18 ± 3	150	6	1
<b>Pasta and Noodles</b>				
Fettuccine (egg)	40 ± 8	180	46	18
Linguine (thick, durum wheat)	46 ± 3	180	48	22
Mung bean noodles (Lungkow)	26	180	45	12
Macaroni	47 ± 2	180	48	23
Rice noodles (dried)	61 ± 6	180	39	23
Rice noodles (fresh)	40 ± 4	180	39	15
Rice pasta (brown rice)	92 ± 8	180	38	35
Spaghetti (white)	32	180	48	15
Spaghetti (durum wheat)	64 ± 15	180	43	27
Spaghetti (whole meal)	32	180	44	14
<b>Nuts</b>				
Cashew nuts (salted)	22 ± 5	50	13	3
Peanuts	14 ± 8	50	6	1
<b>Sport Bars</b>				
Power bar (chocolate)	56 ± 3	65	42	24
Ironman PR Bar (chocolate)	39	65	26	10
<b>Vegetables</b>				
Beetroot	64 ± 16	80	7	5
Carrots (raw)	16	80	8	1
Corn (sweet, boiled)	60	80	18	11
Green peas	48 ± 5	80	7	3
Parsnips	97 ± 19	80	12	12
Baked potato (in skin)	60	150	30	18
Yam (peeled, boiled)	37 ± 8	150	36	13

Modified from Foster-Powell K, Holt SHA, Brand-Miller JC. International table of glycemic index and glycemic load values: 2002. *Am J Clin Nutr.* 2002;76:5–56.

## KEY WEB RESOURCES

<http://www.glycemicindex.com>

This is the official Web site for the Glycemic Index and International GI Database that is based in the Human Nutrition Unit, School of Molecular and Microbial Biosciences, University of Sydney. The Web site is updated and maintained by the University's GI Group, which includes research scientists and dietitians working in the area of glycemic index, health, and nutrition, including research into diet and weight loss, diabetes, cardiovascular disease, and polycystic ovary syndrome, headed by Professor Jennie Brand-Miller. Each month, the Group publishes a free e-newsletter, *GI News*, to bring consumers and health professionals up to date with the latest GI research from around the world.

[http://www.fammed.wisc.edu/sites/default/files//webfm-uploads/documents/outreach/im/handout\\_glycemic\\_index\\_patient.pdf](http://www.fammed.wisc.edu/sites/default/files//webfm-uploads/documents/outreach/im/handout_glycemic_index_patient.pdf)

Patient Handout on glycemic index/load from University of Wisconsin Integrative Medicine

<http://www.ajcn.org/content/76/1/5/T1.expansion>

International Table of Glycemic Index and Glycemic Load Values from the *American Journal of Clinical Nutrition*

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## References

References are available online at [expertconsult.com](http://expertconsult.com).



## References

- American Diabetes Association. Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications. *Diabetes Care*. 2003;26:51S–61S.
- Gottesman I. Managing obesity and glycemic control in insulin-using patients: clinical relevance and practice recommendations. *Diabetes Res Clin Pract*. 2004;65(suppl 1):S17–S22.
- Anderson JW, Randles KM, Kendall CW, Jenkins DJ. Carbohydrate and fiber recommendations for individuals with diabetes: a quantitative assessment and meta-analysis of the evidence. *J Am Coll Nutr*. 2004;23:5–17.
- Foster-Powell K, Holt SHA, Brand-Miller JC. International table of glycemic index and glycemic load values: 2002. *Am J Clin Nutr*. 2002;76:5–56.
- Barclay AW, Brand-Miller JC, Wolever TM. Glycemic index, glycemic load, and glycemic response are not the same. *Diabetes Care*. 2005;28:1839–1840.
- Johnson K. The glycemic index. In: Rakek D, ed. *Integrative Medicine*. Philadelphia: Saunders; 2002:661–666.
- Brand-Miller JC, Thomas M, Swan V, et al. Physiological validation of the concept of glycemic load in lean young adults. *J Nutr*. 2003;133:2728–2732.
- LaHaye SA, Hollett PM, Vyselaar JR, et al. Comparison between a low glycemic load diet and a Canada Food Guide diet in cardiac rehabilitation patients in Ontario. *Can J Cardiol*. 2005;21:489–494.
- Ebbeling CB, Leidig MM, Feldman HA, et al. Effects of a low-glycemic load vs low-fat diet in obese young adults: a randomized trial. *JAMA*. 2007;297:2092–2102.
- Wolever T. The glycemic index: aspects of some vitamins, minerals, and enzymes in health and disease. *World Rev Nutr Diet*. 1990;62:120–185.
- Schulze MB, Liu S, Rimm EB, et al. Glycemic index, glycemic load, and dietary fiber intake and incidence of type 2 diabetes in younger and middle aged women. *Am J Clin Nutr*. 2004;80:348–356.
- Brynes AE, Mark Edwards C, Ghatei MA, et al. A randomised four-intervention crossover study investigating the effect of carbohydrates on daytime profiles of insulin, glucose, non-esterified fatty acids and triacylglycerols in middle-aged men. *Br J Nutr*. 2003;89:207–218.
- Rizkalla SW, Taghrid L, Laromiguiere M, et al. Improved plasma glucose control, whole-body glucose utilization, and lipid profile on a low-glycemic index diet in type 2 diabetic men: a randomized controlled trial. *Diabetes Care*. 2004;27:1866–1872.
- Opperman AM, Venter CS, Oosthuizen W, et al. Meta-analysis of the health effects of using the glycaemic index in meal-planning. *Br J Nutr*. 2004;92:367–381.
- Marsh K, Barclay A, Colagiuri S, Brand-Miller J. Glycemic index and glycemic load of carbohydrates in the diabetes diet. *Curr Diab Rep*. 2011;11:120–127.
- Brand-Miller JC. Glycemic index in relation to coronary disease. *Asia Pac J Clin Nutr*. 2004;13(suppl):S3.
- Harbis A, Perdreau S, Vincent-Baudry S, et al. Glycemic and insulinemic meal responses modulate postprandial hepatic and intestinal lipoprotein accumulation in obese, insulin-resistant subjects. *Am J Clin Nutr*. 2004;80:896–902.
- Zhang Z, Lanza E, Kris-Etherton PM, et al. A high legume low glycemic index diet improves serum lipid profiles in men. *Lipids*. 2010;45:765–775.
- Slyper A, Jurva J, Pleuss J, et al. Influence of glycemic load on HDL cholesterol in youth. *Am J Clin Nutr*. 2005;81:376–379.
- Oh K, Hu FB, Cho E, et al. Carbohydrate intake, glycemic index, glycemic load, and dietary fiber in relation to risk of stroke in women. *Am J Epidemiol*. 2005;161:161–169.
- Ebbeling CB, Leidig MM, Sinclair KB, et al. Effects of an ad libitum low-glycemic load diet on cardiovascular disease risk factors in obese young adults. *Am J Clin Nutr*. 2005;81:976–982.
- Jakobsen MU, Dethlefsen C, Joensen AM, et al. Intake of carbohydrates compared with intake of saturated fatty acids and risk of myocardial infarction: importance of the glycemic index. *Am J Clin Nutr*. 2010;91:1764–1768.
- Grau K, Tetens I, Bjornsbo KS, Heitman BL. Overall glycaemic index and glycaemic load of habitual diet and risk of heart disease. *Public Health Nutr*. 2011;14:109–118.
- Sieri S, Krogh V, Berrino F, et al. Dietary glycemic load and index and risk of coronary heart disease in a large Italian cohort: the EPICOR study. *Arch Intern Med*. 2010;170:640–647.
- Das UN. Is insulin an endogenous cardioprotector? *Crit Care*. 2002;6:389–393.
- Spranger J, Kroke A, Mohlig M, et al. Inflammatory cytokines and the risk to develop type 2 diabetes: results of the prospective population-based European Prospective Investigation into Cancer and Nutrition (EPIC)–Potsdam Study. *Diabetes Care*. 2003;52:812–817.
- Liu S, Manson JE, Buring JE, et al. Relation between a diet with a high glycemic load and plasma concentrations of high-sensitivity C-reactive protein in middle-aged women. *Am J Clin Nutr*. 2002;75:492–498.
- Liu S, Willett WC, Stampfer MJ, et al. A prospective study of dietary glycemic load, carbohydrate intake, and risk of coronary heart disease in US women. *Am J Clin Nutr*. 2000;71:1455–1461.
- Qi L, Rimm E, Liu S, et al. Dietary glycemic index, glycemic load, cereal fiber, and plasma adiponectin concentration in diabetic men. *Diabetes Care*. 2005;28:1022–1028.
- Mantzoros CS, Li R, Manson JE, et al. Circulating adiponectin levels are associated with better glycemic control, more favorable lipid profile and reduced inflammation in women with type 2 diabetes. *J Clin Endocrinol Metab*. 2005;90:4542–4548.
- Chrysoshoou C, Panagiotakos DB, Pitsavos C, et al. Adherence to the Mediterranean diet attenuates inflammation and coagulation process in healthy adults: the ATTICA Study. *J Am Coll Cardiol*. 2004;44:152–158.
- Augustin L, Gallus S, Negri E, La Vecchia C. Glycemic index, glycemic load, and risk of gastric cancer. *Ann Oncol*. 2004;15:581–584.
- Higginbotham S, Zhang ZF, Lee IM, et al. Dietary glycemic load and risk of colorectal cancer in the Women's Health Study. *J Natl Cancer Inst*. 2004;96:229–233.
- Augustin L, Gallus S, Franceschi S, et al. Glycemic index and load and risk of upper aero-digestive tract neoplasms. *Cancer Causes Control*. 2003;14:657–662.
- Folsom A, Demissie Z, Harnack L. Glycemic index, glycemic load, and incidence of endometrial cancer: the Iowa Women's Health Study. *Nutr Cancer*. 2003;46:119–124.
- Michaud D, Liu S, Giovannucci E, et al. Dietary sugar, glycemic load, and pancreatic cancer risk in a prospective study. *J Natl Cancer Inst*. 2002;94:1293–1300.
- Michaud DS, Fuchs CS, Liu S, et al. Dietary glycemic load, carbohydrate, sugar, and colorectal cancer risk in men and women. *Cancer Epidemiol Biomarkers Prev*. 2005;14:138–147.
- Dong JY, Qin LQ. Dietary glycemic index, glycemic load, and risk of breast cancer: meta-analysis of prospective cohort studies. *Breast Cancer Res Treat*. 2011;126:287–294.
- Ludwig DS. The glycemic index: physiological mechanisms relating to obesity, diabetes, and cardiovascular disease. *JAMA*. 2002;287:2414–2423.



# The Antiinflammatory Diet

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## Role of Inflammation in Disease

Chronic diseases affect more than 90 million Americans, accounting for 70% of all deaths<sup>1</sup> and about 75% of the nation's medical care costs.<sup>2</sup> In 2005, nearly one of every two American adults had at least one chronic illness.<sup>3</sup> It is now widely recognized that inflammation is the pathophysiologic mechanism underlying most chronic diseases—heart disease, diabetes, chronic pain, asthma, inflammatory gut disorders, degenerative diseases, obesity, cancer, and Alzheimer's disease. Inflammation is a natural response to acute injury; however, when it becomes chronic or systemic, the inflammatory process itself becomes a disease. A new term, *meta-inflammation*, has been coined to describe chronic, low-grade, metabolically induced inflammation that uses the same molecules and signaling pathways as classic inflammation.<sup>4</sup>

In allopathic medicine, medications are often prescribed to suppress the symptoms of inflammation, such as antipyretics for fever control, nonsteroidal antiinflammatory drugs (NSAIDs) for pain, and steroid inhalers for asthma. However, by the time the body signals the presence of inflammation, disease has already begun and medications may reduce symptoms but not necessarily address the root cause. To promote health and *prevent* inflammation, integrative physicians must promote lifestyle change and foremost learn to use food as medicine.

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## Markers of Inflammation

Markers of inflammation include C-reactive protein (CRP), interleukin-6 (IL-6), tumor necrosis factor (TNF), E-selectin, prostaglandin E<sub>2</sub> (PGE<sub>2</sub>) and most of the even-series prostaglandins (series 2, series 4), adhesion molecules, and transcription factors; research is revealing many others. These factors play important roles in the balance between proinflammatory and antiinflammatory responses. CRP

is a commonly used marker of inflammation, and elevated CRP levels are a known independent risk factor for diabetes and cardiovascular disease.<sup>5</sup> (Low-risk level is 1.0 mg/dL.) Many studies on inflammation in humans also explore the role of the endothelium and genetic expression of inflammatory mediators and related markers. In general, free radicals (reactive oxygen species), often the byproduct of unhealthy intake and aberrant cell signaling, are considered markers of inflammation as well.<sup>6</sup>

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## What Role Does Diet Play in Inflammation?

It is estimated that at least 60% of chronic disease could be prevented by eating a healthy diet.<sup>7</sup>

Adherence to an antiinflammatory diet is critical if one expects to win the war on inflammation and chronic disease. On average, Americans ingest 4.7 pounds of food per day,<sup>8</sup> which the body burns as fuel, uses for cell synthesis, or, in the too-common case of excess, stores as fat deposits. We *can* take a more proactive, preventive approach by investing our 4+ pounds of daily food in healthy choices that decrease inflammation and thus chronic disease.

Of note, an antiinflammatory lifestyle also includes managing stress, limiting alcohol intake, smoking cessation, increasing exercise, and ensuring adequate sleep.<sup>9</sup>

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## How Do Foods Cause (or Inhibit) Inflammation?

Several mechanisms by which foods influence inflammation have been proposed.

- *Modulation of amount and types of eicosanoid activity.* Certain foods and spices contain compounds that,

like medications, inhibit inflammation by acting on specific chemical pathways in the body. Our polyunsaturated fat intake profoundly affects the eicosanoid balance. Culinary spices such as turmeric contain compounds that suppress cyclooxygenase-2 expression, and nutmeg inhibits TNF-alpha release in animal studies.<sup>10</sup>

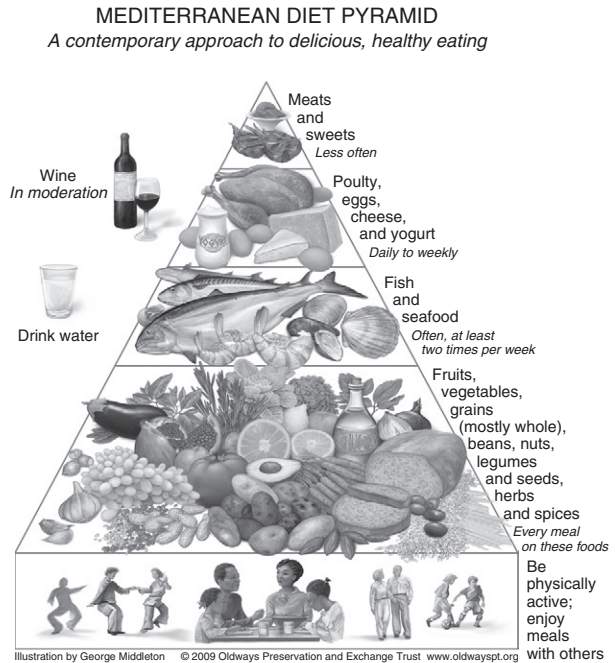
- *Pro-oxidant and antioxidant effects.* Some foods lead to the production of free radicals that help fight infection but in excess can also lead to significant inflammation and tissue damage. Whereas the use of high-dose, single antioxidant supplements has been called into question,<sup>11</sup> a healthy diet with a mix of antioxidant-rich foods can potentially protect against free radical-induced damage. Increased overall antioxidant capacity in the diet correlates with lower CRP levels,<sup>12</sup> and in one study, increased dietary intake of two antioxidant carotenoids correlated well with a lower incidence of joint inflammation.<sup>13</sup>
- *Effects of insulin and glucose levels.* Research has revealed links between elevated glucose and insulin levels with inflammation. Liu et al<sup>14</sup> found a strong link between high dietary glycemic load and elevated CRP concentrations in middle-aged women. CRP and nitrotyrosine (a marker of immediate antioxidant stress) double within 2 to 4 hours of a high-glucose, fatty beverage.<sup>15</sup> Type 2 diabetes seems to be preceded by elevations in inflammatory markers<sup>16</sup> (see Chapter 85, The Glycemic Index/Load).
- *Intracellular signaling, transcription factor activity, and gene signaling.* The food we eat can also alter gene signaling and influence the function of our cells. Omega-3 fats, in particular, can modulate gene expression related to inflammation.<sup>17</sup> Hypoxia, toxins, viruses, excessive calories, and oxidative stress can affect intracellular inflammatory responses.<sup>4</sup>
- *Gastrointestinal dysbiosis.* Another postulated mechanism for inflammation is alteration of gut bacterial flora<sup>18</sup> and disruption of the synergism with our commensal 10 trillion-plus gut microflora inhabitants.

## What Is an Antiinflammatory Diet?

The antiinflammatory diet is founded on evidence-based principles of sound eating to promote health and to prevent and reduce inflammation in the body. There is no one antiinflammatory diet. Like other healthy plans, it emphasizes minimally processed whole foods; it is rich in beneficial fats, vegetables, and fruit, with appropriate amounts of whole grains and plant-based and healthy proteins.

Conversely, the standard American diet—higher in red meat, high-fat dairy, and refined carbohydrates and lower in magnesium—is more inflammatory, as measured by CRP levels.<sup>19</sup> The traditional Mediterranean and Okinawan diets are exemplary antiinflammatory diets built of many natural antiinflammatory foods and spices, with established track records of their health and longevity benefits.<sup>20–22</sup> The Mediterranean diet pyramid is presented as an example of a well-researched, healthy, and delicious diet with many antiinflammatory components that will be expounded on here (Fig. 86-1).

**FIGURE 86-1**  
The Mediterranean diet pyramid.



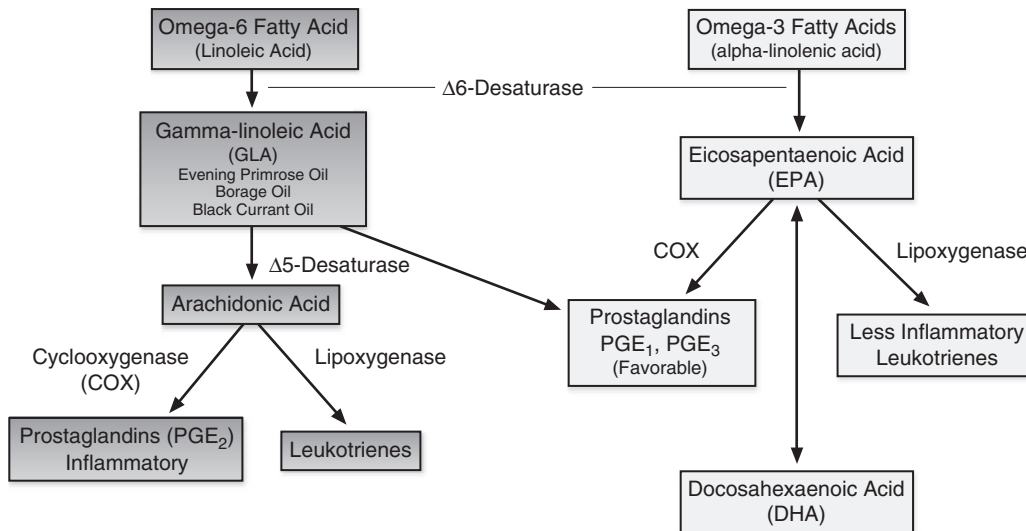
## Components of an Antiinflammatory Diet

### Fats

Fats are the best-known component of the antiinflammatory diet because of their direct and powerful effects on inflammation and the eicosanoid cascades. Fats play many important roles in the human body. Every cell in the human body is surrounded by a phospholipid membrane composed of fatty acids. The fatty acid composition determines membrane fluidity and cellular transport, that is, what nutrients get in and what wastes get out of our cells. Fats are also involved in proper development of the central nervous system, energy production and storage, oxygen transport, and regulation of inflammation.

### The Skinny on Fats

In nature, fats are usually a combination of the three basic fat classifications: saturated, monounsaturated, and polyunsaturated. Saturated fats are solid at room temperature, have hydrogen molecule saturation at every carbon, and have no double bonds. Lard, beef fat, butter, and coconut oil have high saturated fat percentages (41%, 44%, 66%, 92%, respectively).<sup>23</sup> High intake of animal sources of saturated fats has been associated with increased cholesterol and cardiovascular disease.<sup>24,25</sup> Monounsaturated fats are typically liquid at room temperature and have one double bond that imparts both chemical stability and fluidity. Food sources of monounsaturated fats include olive oil, nuts, avocado, and sunflower oil. As the nomenclature implies, polyunsaturated fats have more than one, usually multiple, double bonds that give this class the greatest nutritional benefits but on the other hand make these fats more susceptible to rancidity and chemical conversion to unhealthy fats.



**FIGURE 86-2**  
Influence of omega-6 and  
omega-3 fatty acids on  
inflammation.

Essential fatty acids are fats that we must obtain from our diet because our bodies cannot synthesize them. The two essential fatty acid families, omega-6 and omega-3, are both polyunsaturated fats. However, they have opposing physiologic functions: omega-6 fats are proinflammatory, whereas omega-3 fats are antiinflammatory. On the omega-6 side, arachidonic acid leads to the production of the main proponents of the inflammatory cascade, the even-series prostaglandins ( $\text{PGE}_2$ ) and leukotrienes ( $\text{LTE}_2$ ). In contrast, omega-3 fatty acids have a more beneficial influence on inflammation. Omega-3 fatty acids lead to the production of antiinflammatory prostaglandins of the 1 and 3 series ( $\text{PGE}_1$  and  $\text{PGE}_3$ ) and fewer inflammatory leukotrienes. Because they compete for the same enzymes, the more omega-6 fatty acids we ingest, the less we are able to use the beneficial influences of the omega-3 fatty acids (Fig. 86-2).

Humans still require both omega-6 and omega-3 fats, but the optimal ratio is considered to be 2:1,<sup>26</sup> based on our Paleolithic-era genetics. The problem is that the standard American diet has a ratio of 10:1 to 25:1 omega-6 to omega-3, thus grossly tipping the dietary balance toward inflammation and chronic disease. Diets high in omega-6 fatty acids shift metabolism toward arachidonic acid and its subsequent metabolites that are prothrombotic and proaggregatory with increase in blood viscosity, vasospasm, and vasoconstriction.<sup>27</sup> This unfavorable shift toward the omega-6 cascade is also influenced by excessive alcohol consumption, diabetes, and stress, further exacerbating the risk for inflammatory complications in these diseases. Food sources high in omega-6 fats include corn oil, soy oil, and vegetable oil. The change from a farm-fed, free-range diet in the early 20th century to one of more processed convenience foods and saturated fats and *trans*-fats may play a role in the high incidence of chronic inflammatory conditions we now see in the 21st century.

A truly free-range egg has a favorably low omega-6/omega-3 ratio of only 1:3 compared with a conventionally raised egg with a ratio of 19:4.<sup>27</sup>

### Not All Omega-3 Fats Are Equally Effective

Another important concept to understand with omega-3 fats is that the end product, long-chain omega-3 fatty acids—eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are much more powerfully antiinflammatory than their precursor, alpha-linolenic acid (ALA). ALA is first converted into EPA, then into DHA. However, less than 1% of the original ALA is converted into the physiologically effective EPA and DHA.<sup>28</sup> For this reason, flax oil, which is rich in ALA, is not as effective as fish oil, which has higher amounts of preformed EPA and DHA (usually 18% and 12%, respectively), thus bypassing the rate-limiting conversion step. Higher dietary intake of EPA and DHA, but not of ALA, was associated with lower markers of inflammation.<sup>29</sup> EPA and DHA affect membrane composition and eicosanoid production far more effectively than ALA does. Omega-3 fats, especially EPA and DHA, have been shown in numerous studies to lower  $\text{PGE}_2$ , thromboxane  $\text{A}_2$ , and  $\text{LTB}_4$  and to increase antiinflammatory  $\text{PGI}_3$  and  $\text{LTB}_5$ .<sup>30</sup>

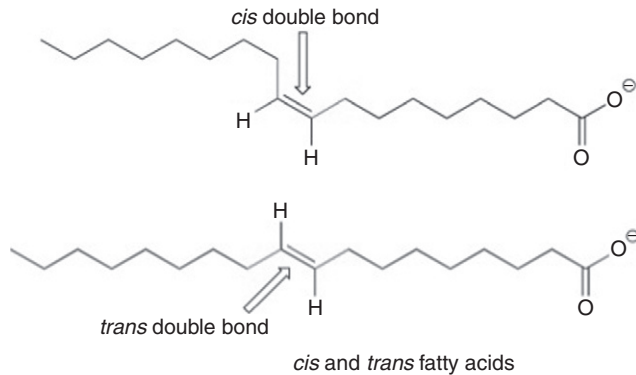
### How Does One Get Omega-3 Fats?

#### ■ Animal Sources

Two servings of fatty, cold-water fish per week provide our minimal omega-3 needs. Eggs fortified with omega-3 are now sold with 100 to 225 mg DHA per egg, depending on whether the chicken feed was supplemented with flax or algae. Plant sources are flaxseed, hemp, chia seeds, and, to a smaller degree, walnuts, soy, and purslane. Plant-source omega-3 fats are largely in the form of ALA, which again must be converted to EPA and DHA to exert antiinflammatory effects.

For the best sources of omega-3 EPA and DHA in cold-water fish, remember the acronym SMASH: salmon (wild Pacific), mackerel (Spanish), anchovies, sardines, and herring.

**FIGURE 86-3**  
Hydrogenation of polyunsaturated fat.



### ■ Supplements

The recommended minimum dose of purified fish oil is 0.5 to 1 g/day of combined EPA and DHA as adult maintenance. An average 1-g oblong-shaped fish oil capsule averages only 30% EPA and DHA; therefore, the correct dosing for 1 g of EPA and DHA is three or four capsules per day. A higher therapeutic dose may be needed (4 or 5 g/day) to treat inflammatory conditions. There are also vegan (non-fish) DHA supplements made from algae.

### The Evil of *trans*-Fatty Acids

When a naturally liquid polyunsaturated fat is chemically converted by hydrogenation to a more solid fat, synthetic *trans*-fats are formed (Fig. 86-3). Although they are more shelf stable, these *trans*-fats (also known as hydrogenated fats or partially hydrogenated fats) wreak havoc in the body, disrupting the native *cis*-alignment of membrane fats<sup>31</sup> and increasing serum levels of lipoprotein(a) and triglycerides<sup>32</sup> as well as inflammatory mediators. Foods containing *trans*-fats should be eliminated from the diet altogether.<sup>33</sup>

### A Word About Other Important Fats

#### ■ Olive Oil

Olive oil, rich in monounsaturated fat, does not upset omega-6/omega-3 balance and has been shown to protect against inflammation.<sup>34,35</sup> Olive oil may also possess some NSAID-like activity.<sup>36,37</sup> A small study showed that extra virgin olive oil, but not regular olive oil or corn oil, reduces leukotrienes (LTB<sub>4</sub>) and thromboxanes (TXB<sub>2</sub>) in human subjects.<sup>38</sup> A healthy diet supplemented with virgin olive oil significantly lowered systolic blood pressure and fasting glucose concentration; CRP was lowered by 0.54 mg/L in this randomized trial.<sup>39</sup> Extra virgin olive oil is less refined and more healthy than regular olive oil because the natural polyphenols that also impart its characteristic color and “bite” remain intact. Extra virgin olive oil contains antioxidants and low-density lipoprotein (LDL)-lowering sterols and favorably affects antiinflammatory mediators.<sup>40</sup> Because of its high monounsaturated content, olive oil is less susceptible to *trans*-fatty acid conversion compared with other vegetable oils.

#### ■ Coconut Oil

Currently, there is much interest in the use of coconut oil for health reasons. Whereas coconut fat is more than 90% saturated fat, 65% of this is specifically in the form of medium-chain fatty acids. Medium-chain fatty acids are readily metabolized in the liver to produce energy and therefore do not behave like other longer chain saturated fats with their adverse effects on cholesterol and fat accumulation.<sup>31</sup> The older scientific literature on coconut oil is mixed about its antiinflammatory effects; much of this is due to use of hydrogenated coconut fat and studies poorly designed to specifically measure the effect of coconut fat. Although it is not as powerful as fish oils, virgin (unprocessed) coconut oil may possess antiinflammatory effects<sup>41</sup> when it is taken in modest amounts; more studies need to be done to confirm its benefits.

### Carbohydrates

A study from NHANES III concluded that grain consumption, especially whole grains, may reduce inflammation. Grain consumption was inversely correlated with elevated CRP levels.<sup>42</sup> Whole grains contain fiber, lignans, magnesium, zinc, B vitamins, and vitamin E that may help control inflammation. Dietary fiber, both soluble and insoluble, effectively slows digestion and reduces oxidant stress and inflammation. A study supports an inverse relationship between dietary fiber and risk of elevated CRP; greater protection was seen at a total fiber level above 22 g/day.<sup>43</sup> One study<sup>44</sup> of 522 diabetic patients showed that inclusion of 15 g of dietary fiber for every 1000 calories consumed daily with lifestyle changes (moderate exercise) significantly reduced CRP level by 27%.

Perhaps the single most important factor that determines the inflammatory potential of a carbohydrate-containing food is its glycemic load (GL; see Chapter 85, The Glycemic Index/Load). Excessive consumption of highly processed carbohydrates (e.g., white flour, refined sugars) with high GL causes abnormal surges in blood glucose and insulin levels and then overloads mitochondrial capacity to metabolize the excess, thus creating free radicals.<sup>15</sup> Immediate increases in CRP and inflammatory cytokines can be seen with a single meal.<sup>45</sup> One study found a strong link between high dietary GL and elevated CRP concentrations in women; CRP levels were more than doubled (3.7 mg/L) in the group consuming the highest GL compared with the lowest GL (1.6 mg/L).<sup>14</sup> Diabetics have elevated levels of glycation end products that have been associated with increased levels of inflammatory markers.<sup>46</sup>

Not surprisingly, diets rich in unprocessed, natural plant foods, such as the Okinawan and Mediterranean diets, have lower GL and substantially lower postprandial glucose levels and are associated with improved cardiovascular health and longevity.<sup>47</sup> Minimally processed low-GL foods (vegetables, fruit, nuts, seeds, whole grains) do not result in adverse postprandial inflammatory effects, but high-GL foods do.<sup>9</sup> Another reason to consume whole grains is that the active phytochemicals are concentrated in bran and the germ; refining wheat with removal of the fiber causes a 200-fold to 300-fold loss in phytochemicals!<sup>48</sup>

Portion control is also important. Overconsumption of even healthy, low-GL foods can trigger a hyperglycemic response and inflammation. Excess calories regardless of source also contribute to obesity, which itself produces inflammation.<sup>5</sup>

## Vegetables and Fruit

Vegetables and fruit, although often classified under the macronutrient carbohydrate, deserve their own stand-alone category because of their natural abundance of nutraceutical benefits. Vegetables contain the highest concentrations of vitamins, minerals, and other protective phytochemicals, with a lower calorie density compared with other foods. Rich in biochemical complexity, whole vegetables and fruit are superior to any single isolated nutrient. Citrus fruit, for example, contains not just vitamin C but some 60 flavonoids, 20 carotenoids, and limonoids. Higher intake of vitamin C from food sources has been associated with lower CRP and tissue plasminogen activator levels.<sup>49</sup>

The lack of adequate consumption of vegetables and fruit in the United States is appalling. It is estimated that Americans consume only 1.5 servings of vegetables per day and only one fruit per day.<sup>50</sup> Only 1 in 11 Americans consumes at least three servings of vegetables and two servings of fruit per day. Even sadder is that up to two thirds of this is fried potato products or iceberg lettuce.<sup>51</sup>

Studies support that people who consume more vegetables and fruit have lower rates of inflammatory disease, such as heart disease, stroke, and cancer.<sup>52,53</sup> High intake of vegetables and fruit, more than five servings per day, has a significant inverse dose-response association with inflammatory markers such as CRP, IL-6, and adhesion factors.<sup>54–56</sup> The more vegetables and fruit one eats, the less inflammation. Blueberries and cherries specifically showed reduced levels of inflammatory cytokines. Estimates from the U.S. Department of Agriculture flavonoid databases also show inverse association with high flavonoid intake (from fruit and vegetables) and lower CRP levels.<sup>57</sup> Flavonoids are responsible for the deep color of fruits and vegetables and often are a proxy marker for high nutritional quality. In epidemiologic studies, higher fruit and vegetable intake was shown to significantly decrease markers of inflammation in adolescents<sup>58</sup> and in adult women.<sup>56</sup>

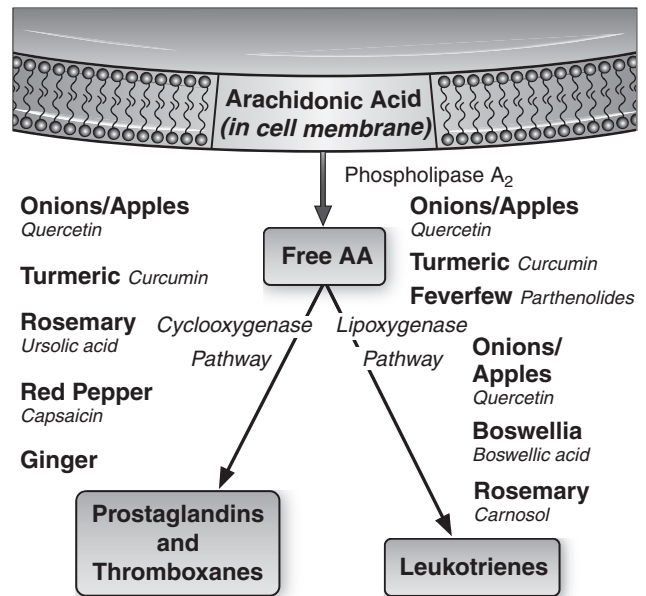
*Reminder:* steer patients away from fruit juice in your fruit recommendations because of its abnormally high sugar concentration and from French fries as a vegetable because of the high content of unhealthy fats and salt.

Avoid or minimize refined sugar. Sadly, more than 16% of daily calories of Americans comes from sucrose, corn syrup, and high-fructose corn syrup.<sup>59</sup> These empty calories from sugar-sweetened beverages and foods add minimal nutritional value and promote obesity. Do choose vegetables and fruits that are deeply colored throughout—carrots, spinach, broccoli, berries, peaches. Aim to eat at least five vegetable and fruit servings per day (Fig. 86-4).

## Proteins

A large body of data supports the health benefits of plant-based proteins,<sup>60–62</sup> and they are a healthy alternative to animal sources of protein. Legumes are high in protein, fiber, iron, folic acid, and B vitamins. Most legumes are deficient in the essential amino acids methionine and tryptophan, but

**FIGURE 86-4**  
Food inhibitors of arachidonic acid (AA).



these are found in sufficient amounts in most grains; 80% of the protein in legumes is digestible, compared with about 90% from animal proteins.<sup>63</sup> Four servings of legumes per week in obese subjects resulted in significant decreases in CRP and complement C3 levels as well as in LDL cholesterol.<sup>64</sup> Nuts and seeds can also be added to an antiinflammatory diet for extra protein. Consumption of five or more servings of nuts and seeds per week was associated with lower levels of CRP, IL-6, and fibrinogen in a multiethnic study including more than 6000 patients.<sup>65</sup>

## Meat

A handful of small studies show that lean, grass-fed, or wild sources of red meat may have less potential to trigger inflammation than does conventionally raised or processed red meat.<sup>66–68</sup> Larger and more conclusive studies need to be conducted to confirm these findings. Processed meats (bacon, hot dogs, salami, luncheon meats) are associated with 42% higher incidence of coronary heart disease and 19% greater incidence of diabetes.<sup>69</sup> For those who do eat meat, studies support trimming of visible fat<sup>70</sup> and avoidance of charring the food to lessen the inflammatory impact.<sup>71</sup>

## Fish

Although it is a source of high-quality protein, fish often swim in waters contaminated with heavy metals, such as mercury, cadmium, and lead, and other pollutants, such as polychlorinated biphenyls. Even taking this into consideration, a review<sup>72</sup> reported that the benefits of fish intake outweigh the potential risks. Avoid those highest in methylmercury: shark, swordfish, golden bass (tilefish), and king mackerel. A serving of albacore tuna contains 0.35 ppm methylmercury; 1.0 ppm is the Environmental Protection Agency's "allowable" upper limit per day. Some of the safest fish are tilapia, anchovies, and wild salmon.

## Other Antiinflammatory Foods, Spices, and Supplements

- **Wine:** A glass of red wine per day can lower plasma fibrinogen and factor VIIc levels.<sup>73</sup> Resveratrol in red wine may down-regulate inflammatory cyclooxygenase mediators.<sup>74</sup>
- **Turmeric (*Curcuma longa*),** the deep yellow spice commonly found in curries, has a long traditional use in Asian countries as a potent antiinflammatory agent. Turmeric has been shown to down-regulate cyclooxygenase-2 and lipoxygenase enzymes; to inhibit production of TNF, IL-6, and other inflammatory cytokines; and to modulate intercellular signaling.<sup>75</sup> Therapeutic doses ranged from 600 mg to more than 2 g/day.
- **Other spices:** Ginger, oregano, rosemary, clove, cumin, and cayenne also possess antiinflammatory properties<sup>76</sup> and add flavor to a wide variety of cuisines.
- **Magnesium** plays an important role in more than 200 critical enzyme reactions in the body, including mitochondrial energy production. Magnesium intake below the recommended dietary allowance (420 mg men, 320 mg women daily) was associated with higher likelihood of elevated CRP ( $\geq 3.0$ ).<sup>77</sup> Ensure adequate intake of magnesium-rich green leafy vegetables, fruits, nuts, legumes, and whole grains or choose to supplement.
- **Chocolate,** one of nature's richest sources of dietary flavonols, has been shown to favorably affect antiinflammatory cytokines, to inhibit platelet aggregation, and to reduce lipoxygenase activity.<sup>78,79</sup> Dark chocolate (more than 70% cocoa mass) especially has been shown in human studies to modulate inflammation biomarkers,<sup>80,81</sup> to improve lipid

profiles, and to decrease CRP in women.<sup>82</sup> A suggested antiinflammatory dose, based on research studies, is 2 to 3 ounces (or one quarter of a standard-sized bar) of dark chocolate per day.

## Whole Fresh Food Nutrition

Many individual components of an antiinflammatory diet have been reviewed, but it would be an injustice to focus solely on the trees (nutrition components), lest we forget the forest of our entire dietary milieu. Maintaining an overall balanced diet with appropriate calorie intake is the key to long-term success. Whole diets, such as the traditional Mediterranean diet, have shown greater health benefits than relying on any single “magic bullet” component. In a study of more than 3000 men and women in Greece, it was found that those who most closely followed the Mediterranean diet had, on average, 20% lower CRP levels, 17% lower IL-6 levels, and 6% lower fibrinogen levels compared with those who did not follow the diet.<sup>83,84</sup> This healthy antiinflammatory diet pattern is characterized by high intakes of vegetables, fruit, legumes, fish, and whole grains; it is suitable for people from many ethnic backgrounds and is economically affordable.<sup>15,85–87</sup>

## Medical Conditions That May Improve With the Antiinflammatory Diet

**Table 86-1** provides a summary of some of the major diseases for which antiinflammatory diet modifications have shown therapeutic promise.

**TABLE 86-1. Medical Conditions That May Improve With the Antiinflammatory Diet**

CONDITION	COMMENTS
Coronary heart disease (CHD)	A review concluded that diets using healthy fats, whole grains, an abundance of fruit and vegetables, and adequate omega-3 fatty acids can offer significant protection against CHD. <sup>88</sup> The American Heart Association recommends the use of omega-3 fatty acids for cardiac risk reduction. <sup>89</sup> A study including more than 10,000 people found that in those consuming a Mediterranean diet, cardiac risk was reduced by half. <sup>83</sup>
Type 2 diabetes mellitus	A rise in inflammatory markers precedes type 2 diabetes. <sup>14,16</sup> Dietary patterns associated with type 2 diabetes also show higher levels of inflammation. <sup>90</sup>
Rheumatoid arthritis (RA)	Vegetarian diets and fish oil decrease numbers of tender and swollen joints. <sup>91</sup> One review noted average symptom scores to be decreased by roughly one third. <sup>92</sup> Patients with RA who consumed 1.8 g/day of EPA were found to have decreased morning stiffness and number of tender joints compared with controls. <sup>93</sup>
Chronic obstructive pulmonary disease (COPD)	There is a strong link between COPD and chronic systemic inflammation. <sup>94</sup> Omega-3 fats lower inflammatory cytokines in COPD patients. <sup>95</sup>
Alzheimer's disease (AD)	The cerebrospinal fluid in patients with AD was found to have four to five times higher levels of inflammatory markers. <sup>96</sup> High carbohydrate diets may correlate with increased Alzheimer's risk. <sup>97</sup> Fish, monounsaturated fats, cereal, and wine consumption seem to protect against cognitive decline. <sup>98</sup>
Inflammatory bowel disease	A supplement rich in vitamin C, vitamin E, selenium, and omega-3 fats improved clinical response and decreased steroid needs. <sup>99</sup> The Cochrane Collaboration found that omega-3 supplementation reduced the 1-year relapse rate from Crohn's disease by half with an absolute risk reduction of 31% and a number needed to treat (NNT) of only 3. <sup>100</sup>

**TABLE 86-1.** Medical Conditions That May Improve With the Antiinflammatory Diet—cont'd

CONDITION	COMMENTS
Atopic disease	Hempseed oil, with its high omega-3 content, decreases atopic dermatitis symptoms. <sup>101</sup> Supplementation with probiotics ( <i>L. rhamnosus</i> GG) prenatally, during pregnancy, and in early infant life may prevent atopy in infants. <sup>101</sup> In a small trial, about half of asthma patients had decrease in airway hyperresponsiveness after consuming omega-3/omega-6 of 1:2 compared with a ratio of 1:10. <sup>103</sup>
Asthma	Hamburger consumption shows a dose-dependent relationship to asthma symptoms. <sup>104</sup> A diet high in polyunsaturated omega-6 fats doubled preschool children's risk for development of asthma. <sup>105</sup> There is promising epidemiologic evidence for omega-3 benefit, but study results have been equivocal. <sup>106</sup> In one study, fish oil supplements decreased symptoms, inflammation, and medication use in exercise-induced asthma. <sup>107</sup>
Cancer	One expert review estimated that 30% to 35% of cancer deaths are due to poor diet and thus preventable. Sulforaphane, carotenoids, and quercetin are fruit- and-vegetable-derived chemopreventive compounds with some anticancer effects in vitro and in vivo. <sup>108</sup> Omega-3 fats have been linked in preclinical studies to decreases in inflammatory mediators involved in cancer cell growth, multiplication, and angiogenesis. <sup>109</sup> High meat and dairy consumption is linked to increased prostate cancer risk, and high tomato and fish consumption to less prostate cancer. <sup>110</sup> There may be a correlation between higher glycemic index diets and breast cancer risk <sup>111</sup> and colon cancer risk, at least in men. <sup>112</sup>
Fibromyalgia and low back pain	A small study showed that a vegan (no milk, meat, or eggs) diet improved fibromyalgia symptoms. <sup>113</sup> An intriguing hypothesis exists: phospholipase A <sub>2</sub> (PLA <sub>2</sub> ) is an enzyme that is at least 20 times more active in lumbar disk tissue. In persons who consume excessive omega-6 fats, PLA <sub>2</sub> may generate more proinflammatory eicosanoids. <sup>6</sup> Although it is difficult to assess because of the multifactorial nature of chronic pain, a diet that fights inflammation is likely one factor that may lessen its impact.
Depression	In a review and meta-analysis, greater positive effects of omega-3 fats were seen especially for the most depressed. <sup>114</sup> Two randomized pilot studies showed potential benefits for children with depression <sup>115</sup> and women with postpartum depression. <sup>116</sup>

## Conclusion

Inflammation is the pathophysiologic mechanism underlying most chronic disease. The antiinflammatory diet is founded on evidence-based principles of sound eating to promote health and to prevent and reduce inflammation in the body. It is whole

food-based nutrition that emphasizes omega-3 fats, vegetables and fruit, high fiber, whole grains, and healthy proteins. It can be recommended as “food as medicine” for a wide variety of common diseases including heart disease, diabetes, Alzheimer's disease, chronic obstructive pulmonary disease, inflammatory bowel disorders, cancer, depression, and pain.

## KEY WEB RESOURCES

Anti-Inflammatory Food Pyramid: see <http://www.drweil.com> and search for “food pyramid”

Dr. Andrew Weil has published a patient-friendly and illustrative antiinflammatory food pyramid. This plan also features berries, Asian mushrooms, soy, tea, and dark chocolate.<sup>116</sup>

<http://www.cfsan.fda.gov/~frf/sea-mehg.html>

This helpful Web site provides information on mercury levels in fish from the Food and Drug Administration and the U.S. Environmental Protection Agency.

<http://tcme.org/>

The Center for Mindful Eating has information on eating mindfully.

<http://www.amazon.com/Eat-Drink-Weigh-Less-Delicious/dp/1401302491>

Great, patient-friendly book is *Eat, Drink, and Weigh Less* by Mollie Katzen and Walter Willett. Included are a Body Score tool and easy, inspiring recipes.

[www.meatlessmonday.com](http://www.meatlessmonday.com)

Check out the “Meatless Monday” campaign online. This Web site encourages all to explore healthy and tasty vegetarian alternatives to meat once a week and includes reader-inspired recipe contests.

## References

References are available online at [expertconsult.com](http://expertconsult.com).



### Patient Handout: The Antiinflammatory Diet

Inflammation in the body is known to contribute to chronic disease such as diabetes, heart disease, asthma, inflammatory gut disorders, arthritis, obesity, cancer, and dementia. Eating an Antiinflammatory Diet may help to lessen inflammation and decrease chronic disease. Here are some simple guidelines:

**Antiinflammatory diet guidelines:**

- 1) Insure adequate omega-3 fat intake.
  - Eat two servings (4 ounces each) of fatty fish per week, or supplement with 1 gram (1000 mg) combined EPA + DHA daily. These will be listed on the supplement facts label.
  - Reduce use of omega-6 fats to keep ratio of omega-6:omega-3 in range of 2:1–4:1.
- 2) Choose healthy fats.
  - Substitute extra-virgin olive oil for other vegetable oils, trans-fats, or butter in your cooking for health benefits.
- 3) Increase vegetable and fruit intake (especially vegetables)
  - Eat 5–9 servings of vegetables and fruit per day, with more than half as vegetables.
  - Color your diet! – deeply colored fruits and vegetables contain higher amounts of protective phytochemicals.
  - Use the plate method – the biggest portion (half the plate) is where the vegetables go (excluding potatoes).
- 4) Choose whole grain carbohydrates and limit the portion sizes.
  - Choose carbs that are whole grain (requires chewing!), and aim for total of 25 grams of fiber per day.
  - Rx: Double your vegetable intake, and half your intake of refined carbohydrates (anything with flour and/or sugar)!
- 5) Get your protein from plant sources such as legumes, nuts and seeds, and/or choose lean, natural animal sources of protein in moderate amounts.
- 6) Spice it up! Include antiinflammatory herbs and spices such as garlic, turmeric, rosemary, ginger, oregano, cumin, and cayenne in your diet.
- 7) Eat mindfully
  - Be mindful of your food portions. Quality AND quantity matters. Regardless of how healthy your food choices are, excess calories from any source can increase inflammation and obesity.
  - Savor your food.
- 8) Adopt the Okinawan philosophy of “*hara hachi bu*” – stopping when nearly 8/10 full and paying attention to your hunger and satiety signals.<sup>22</sup> Remember to focus on the whole diet pattern, not just components. Choose food that is closest to its natural form (ie, less processed). Best dietary advice in 7 words: “Eat food. Not too much. Mostly plants.”<sup>116</sup>
- 9) Adopt an antiinflammatory LIFESTYLE
  - Incorporate regular exercise that you enjoy into your life.
  - Keep weight under control. It is important to prevent and reduce obesity, especially abdominal obesity, as obesity itself sets up chronic inflammation in the body<sup>117,118</sup> Maintain body mass index (BMI) between 18.5–24.9.
  - Be aware of, and find healthy ways to reduce stress.
- 10) Enjoy 1–2 ounces of dark chocolate (at least 70%) as an occasional treat!

Eat More:	Eat Less:
<p>Foods high in omega-3 fats</p> <ul style="list-style-type: none"> <li>• Cold water fish (Salmon, Spanish Mackerel, Anchovies, Sardines, Herring)</li> <li>• Ground flaxseeds or lignin rich flax oil</li> <li>• Walnuts</li> </ul> <p>Vegetables</p> <ul style="list-style-type: none"> <li>• Yellow, orange, and red veggies (peppers, carrots, beets)</li> <li>• Dark leafy greens (spinach, kale, arugula, broccoli)</li> </ul> <p>Deeply-colored fruit</p> <ul style="list-style-type: none"> <li>• Berries, melons, citrus fruit</li> </ul> <p>Whole grains</p> <ul style="list-style-type: none"> <li>• Steel-cut or whole rolled oats</li> <li>• Sprouted-grain breads</li> </ul> <p>Antiinflammatory spices</p> <ul style="list-style-type: none"> <li>• Turmeric</li> <li>• Ginger</li> <li>• Rosemary</li> <li>• Oregano</li> <li>• Cayenne</li> </ul>	<p>Foods high in trans- and omega-6 fats</p> <ul style="list-style-type: none"> <li>• Processed and red meats</li> <li>• Dairy products</li> <li>• Partially hydrogenated oils</li> <li>• Corn, cottonseed, grapeseed, peanut, soy oils</li> </ul> <p>Refined carbohydrates (with a high glycemic load)</p> <ul style="list-style-type: none"> <li>• White breads or bagels</li> <li>• English muffins</li> <li>• Instant or white rice</li> <li>• Rice and corn cereals</li> <li>• Crackers, cookies, cakes</li> </ul> <p>Sodas and juices</p> <ul style="list-style-type: none"> <li>• Including “diet” drinks</li> </ul>

Information in this chart adapted from Raket D and Rindfleisch A. *South Med J.* 98(3):302-10, 2005.

## References

- Centers for Disease Control and Prevention. *Chronic Diseases and Health Promotion*. <http://www.cdc.gov/nccdphp/overview.htm>; Accessed 12.12.10.
- Partnership to Fight Chronic Disease. 2009 *Almanac of Chronic Disease*. <http://www.fightchronicdisease.org/media/statements/pfcd/ChronicDiseaseSpendingEqualsNationalDeficit.cfm>; Accessed 12.12.10.
- Centers for Disease Control and Prevention. *Chronic Disease—Overview*. <http://www.cdc.gov/chronicdisease/overview/index.htm>; Accessed 01.02.11.
- Hotamisligil GS. Inflammation and metabolic disorders. *Nature*. 2006;444:860–867.
- Bulló M, Casas-Agustench P, Amigó-Correig P, et al. Inflammation, obesity and comorbidities: the role of diet. *Public Health Nutr*. 2007;10:1164–1172.
- Seaman DR. The diet-induced proinflammatory state: a cause of chronic pain and other degenerative diseases? *J Manipulative Physiol Ther*. 2002;25:168–179.
- Willett WC. The Mediterranean diet: science and practice. *Public Health Nutr*. 2006;9:105–110.
- U.S. Department of Agriculture. *Current Topics: Selected Issues in American Agriculture Today*. <http://www.usda.gov/factbook/chapter1.htm>; Accessed 15.01.11.
- Egger G, Dixon J. Should obesity be the main game? Or do we need an environmental makeover to combat the inflammatory and chronic disease epidemics? *Obes Rev*. 2009;10:237–249.
- Augustine MB. Integrative approach to nutrition. In: Kligler B, Lee R, eds. *Integrative Medicine: Principles for Practice*. New York: McGraw Hill; 2004.
- Lonn E, Bosch J, Yusuf S, et al. Effects of long-term vitamin E supplementation on cardiovascular events and cancer: a randomized controlled trial. *JAMA*. 2005;293:1338–1347.
- Brighenti F, Valtuena S, Pellegrini N, et al. Total antioxidant capacity of the diet is inversely and independently related to plasma concentration of high-sensitivity C-reactive protein in adult Italian subjects. *Br J Nutr*. 2005;93:619–625.
- Pattison DJ, Symmons DP, Lunt M, et al. Dietary beta-cryptoxanthin and inflammatory polyarthritis: results from a population-based prospective study. *Am J Clin Nutr*. 2005;82:451–455.
- Liu S, Manson JE, Buring JE, et al. Relation between a diet with a high glycemic load and plasma concentrations of high-sensitivity C-reactive protein in middle-aged women. *Am J Clin Nutr*. 2002;75:492–498.
- O'Keefe JH, Gheewala NM, O'Keefe JO. Dietary strategies for improving post-prandial glucose, lipids, inflammation, and cardiovascular health. *J Am Coll Cardiol*. 2008;51:249–255.
- Herder C, Illig T, Rathmann W, et al. Inflammation and type 2 diabetes: results from KORA Augsburg. *Gesundheitswesen*. 2005;67(suppl 1):S115–S121.
- Massaro M, Scoditti E, Carluccio MA, et al. Omega-3 fatty acids, inflammation and angiogenesis: nutrigenomic effects as an explanation for anti-atherogenic and anti-inflammatory effects of fish and fish oils. *J Nutrigenet Nutrigenomics*. 2008;1:4–23.
- Clarke JO, Mullin GE. A review of complementary and alternative approaches to immunomodulation. *Nutr Clin Pract*. 2008;23:49–62.
- Fung TT, Rimm EB, Spiegelman D, et al. Association between dietary patterns and plasma biomarkers of obesity and cardiovascular disease risk. *Am J Clin Nutr*. 2002;73:61–67.
- Mitrou PN, Kipnis V, Thiebaut AC, et al. Mediterranean dietary pattern and prediction of all-cause mortality in a US population: results from the NIH-AARP Diet and Health Study. *Arch Intern Med*. 2007;167:2461–2468.
- Knoops KT, deGroot LC, Kromhout D, et al. Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women. *JAMA*. 2004;292:1433–1439.
- Willcox BJ, Willcox DC, Suzuki M. *The Okinawa Program*. New York: Clarkson Potter/Publishers; 2001.
- Melina V, Davis B, Harrison V. *Becoming Vegetarian*. Summertown, TN: Book Publishing Co; 1995.
- Hu FB, Stamper MJ, Manson JE, et al. Dietary fat intake and the risk of coronary heart disease in women. *N Engl J Med*. 1997;37:1491–1499.
- Hu FB, Manson JE, Willett WC. Types of dietary fat and risk of coronary heart disease: a critical review. *J Am Coll Nutr*. 2001;20:5–19.
- Simopoulos AP. Essential fatty acids in health and chronic disease. *Am J Clin Nutr*. 1999;70(suppl):560S–569S.
- Simopoulos AP. Omega-3 fatty acids in health and disease and in growth and development. *Am J Clin Nutr*. 1991;54:438–463.
- Pawlosky RJ, Hibbeln JR, Novotny JA, et al. Physiological compartmental analysis of alpha-linolenic acid metabolism in adult humans. *J Lipid Res*. 2001;42:1257–1265.
- Pischon T, Hankinson SE, Hotamisligil GS, et al. Habitual dietary intake of n-3 and n-6 fatty acids in relation to inflammatory markers among US men and women. *Circulation*. 2003;108:155–160.
- Simopoulos AP. Omega-3 fatty acids in inflammation and autoimmune diseases. *J Am Coll Nutr*. 2002;21:495–505.
- Erasmus U. *Fats That Heal, Fats That Kill*. Summertown, TN: Alive Books; 1993.
- Mauger JF, Lichtenstein AH, Ausman LJ, et al. Effect of different forms of dietary hydrogenated fats on LDL particle size. *Am J Clin Nutr*. 2003;78:370–375.
- Mozaffarian D, Pischon T, Hankinson SE, et al. Dietary intake of trans fatty acids and systemic inflammation in women. *Am J Clin Nutr*. 2004;79:606–612.
- Fito M, Cladellas M, de la Torre R, et al. Antioxidant effects of virgin olive oil in patients with stable coronary disease: a randomized, crossover, controlled clinical trial. *Atherosclerosis*. 2005;181:149–158.
- Perez-Jimenez F, Alvarez de Cienfuegos G, Badimon L, et al. International conference on the healthy effects of virgin olive oil. *Eur J Clin Invest*. 2005;35:421–424.
- Beauchamp GK, Keast RS, Morel D, et al. Phytochemistry: ibuprofen-like activity in extra-virgin olive oil. *Nature*. 2005;437:45–46.
- Visioli F, Galli C. Antiatherogenic components of olive oil. *Curr Atheroscler Rep*. 2001;3:64–67.
- Bogani P, Galli C, Villa M, Visioli F. Postprandial anti-inflammatory and antioxidant effects of extra virgin olive oil. *Atherosclerosis*. 2007;190:181–186.
- Estruch R, Martínez-González MA, Corella D, et al. Effects of a Mediterranean-style diet on cardiovascular risk factors: a randomized trial. *Ann Intern Med*. 2006;145:1–11.
- Perona JS, Cabello-Moruno R, Ruiz-Gutierrez V. The role of virgin olive oil components in the modulation of endothelial function. *J Nutr Biochem*. 2006;17:429–445.
- Intahphuak S, Khonsung P, Panthong A. Anti-inflammatory, analgesic, and antipyretic activities of virgin coconut oil. *Pharm Biol*. 2010;48:151–157.
- Ford ES, Mokdad AH, Liu S. Healthy Eating Index and C-reactive protein concentration: findings from the National Health and Nutrition Examination Survey III, 1988–1994. *Eur J Clin Nutr*. 2005;59:278–283.
- Ma Y, Griffith JA, Chasan-Taber L, et al. Association between dietary fiber and serum C-reactive protein. *Am J Clin Nutr*. 2006;83:760–766.
- Herder C, Peltonen M, Koenig W, et al. Anti-inflammatory effect of lifestyle changes in the Finnish Diabetes Prevention Study. *Diabetologia*. 2009;52:433–442.
- Monnier L, Mas E, Ginot C, et al. Activation of oxidative stress by acute glucose fluctuations compared with sustained chronic hyperglycemia in patients with type 2 diabetes. *JAMA*. 2006;295:1681–1687.
- Uribarri J, Cai W, Sandu O, et al. Diet-derived advanced glycation end products are major contributors to the body's AGE pool and induce inflammation in healthy subjects. *Ann N Y Acad Sci*. 2005;1043:461–466.
- Lichtenstein A, Appel L, Brands M, et al. Diet and lifestyle recommendations revision 2006: a scientific statement from the American Heart Association Nutrition Committee. *Circulation*. 2006;114:82–96.
- Thompson LU. Potential health benefits of whole grains and their components. *Contemp Nutr*. 1992;17:1–2.
- Wannamethee SG, Lowe GD, Rumley A, et al. Associations of vitamin C status, fruit and vegetable intakes, and markers of inflammation and hemostasis. *Am J Clin Nutr*. 2006;83:567–574.
- Craig W. Phytochemicals: guardians of our health. *J Am Diet Assoc*. 1997;97(suppl):S199–S204.
- Diet wars II: how do the plans measure up? *Harv Mens Health Watch*. 2003;7:1–5.
- Gaziano JM. Antioxidants in cardiovascular disease: randomized trials. *Nutrition*. 1996;12:583–588.
- Block G, Patterson B, Subar A. Fruit, vegetables, and cancer prevention: a review of the epidemiological evidence. *Nutr Cancer*. 1992;18:1–29.
- Nanri A, Yoshida D, Yamaji T, et al. Dietary patterns and C-reactive protein in Japanese men and women. *Am J Clin Nutr*. 2008;87:1488–1496.

55. Gao X, Bermudez OI, Tucker KL. Plasma C-reactive protein and homocysteine concentrations are related to frequent fruit and vegetable intake in Hispanic and non-Hispanic white elders. *J Nutr*. 2004;134:913–918.
56. Esmailzadeh A, Kimiagar M, Mehrabi Y, et al. Fruit and vegetable intakes, C-reactive protein, and the metabolic syndrome. *Am J Clin Nutr*. 2006;84:1489–1497.
57. Chum OK, Chung SJ, Claycombe KJ, et al. Serum C-reactive protein concentrations are inversely associated with dietary flavonoid intake in U.S. adults. *J Nutr*. 2008;138:753–760.
58. Holt EM, Steffen LM, Moran A, et al. Fruit and vegetable consumption and its relation to markers of inflammation and oxidative stress in adolescents. *J Am Diet Assoc*. 2009;109:414–421.
59. Cook AJ, Friday JE. *Pyramid Servings Intakes in the US 1999-2002*. Beltsville, Md: USDA Agricultural Research Service, Community Nutrition Research Group; 2005.
60. Hu FB. Plant-based foods and prevention of cardiovascular disease: an overview. *Am J Clin Nutr*. 2003;78:544S–551S.
61. Campbell TC, Campbell TM. *The China Study*. Dallas, Tex: BenBella Books; 2005.
62. Campbell TC, Parpia B, Chen J. Diet, lifestyle, and the etiology of coronary artery disease: the Cornell China study. *Am J Cardiol*. 1998;82:18T–21T.
63. Sizer F, Whitney F. *Nutrition: Concepts and Controversies*. 11th ed. Stamford, Conn: Wadsworth, Thomson Learning; 2008.
64. Hermsdorff HH, Zulet MA, Abete I, et al. A legume-based hypocaloric diet reduces proinflammatory status and improves metabolic features in overweight/obese subjects. *Eur J Nutr*. 2011;50:61–69.
65. Jiang R, Jacobs DR Jr, Mayer-Davis E, et al. Nut and seed consumption and inflammatory markers in the multi-ethnic study of atherosclerosis. *J Epidemiol*. 2006;163:222–231.
66. Hodgson JM, Ward NC, Burke V, et al. Increased lean red meat intake does not elevate markers of oxidative stress and inflammation in humans. *J Nutr*. 2007;137:363–367.
67. Arya F, Egger S, Colquhoun D, et al. Differences in postprandial inflammatory responses to a “modern” v. traditional meat meal: a preliminary study. *Br J Nutr*. 2010;104:724–728.
68. Azadbakht L, Esmailzadeh A. Red meat intake is associated with metabolic syndrome and the plasma C-reactive protein concentration in women. *J Nutr*. 2009;139:335–339.
69. Micha R, Wallace SK, Mozaffarian D. Red and processed meat consumption and risk of incident coronary heart disease, stroke, and diabetes mellitus, a systematic review and meta-analysis. *Circulation*. 2010;121:2271–2283.
70. Li D, Ng A, Mann NJ, Sinclair AJ. Contribution of meat fat to dietary arachidonic acid. *Lipids*. 1998;33:437–440.
71. Zheng W, Lee SA. Well-done meat intake, heterocyclic amine exposure, and cancer risk. *Nutr Cancer*. 2009;61:437–446.
72. Mozaffarian D, Rimm EB. Fish intake, contaminants, and human health: evaluating the risks and the benefits. *JAMA*. 2006;296:1885–1899.
73. Mezzano D, Leighton F, Martinez C, et al. Complementary effects of Mediterranean diet and moderate red wine intake on haemostatic cardiovascular risk factors. *Eur J Clin Nutr*. 2001;55:444–451.
74. Das S, Das DK. Anti-inflammatory responses of resveratrol. *Inflamm Allergy Drug Targets*. 2007;6:168–173.
75. Jurenka JS. Anti-inflammatory properties of curcumin, a major constituent of *Curcuma longa*: a review of preclinical and clinical research. *Alt Med Rev*. 2009;14:141–153.
76. Rakel DP, Rindfleisch A. Inflammation: nutritional, botanical, and mind-body influences. *South Med J*. 2005;98:302–310.
77. King DE, Mainous AG, Geesey ME, et al. Dietary magnesium and C-reactive protein levels. *J Am Coll Nutr*. 2005;24:166–171.
78. Selmi C, Mao TK, Keen CL, et al. The anti-inflammatory properties of cocoa flavanols. *J Cardiovasc Pharmacol*. 2006;47(suppl 2):S163–S171 discussion S172–S176.
79. Cooper KA, Donovan JL, Waterhouse AL, Williamson G. Cocoa and health: a decade of research. *Br J Nutr*. 2008;99:1–11.
80. Schramm DD, Wang JF, Holt RR, et al. Chocolate procyanidins decrease the leukotriene-prostacyclin ratio in humans and human aortic endothelial cells. *Am J Clin Nutr*. 2001;73:36–40.
81. Monagas M, Khan N, Andres-Lacueva C, et al. Effect of cocoa powder on the modulation of inflammatory biomarkers in patients at high risk of cardiovascular disease. *Am J Clin Nutr*. 2009;90:1144–1150.
82. Hamed MS, Gambert S, Bliden KP, et al. Dark chocolate effect on platelet activity, C-reactive protein and lipid profile: a pilot study. *South Med J*. 2008;101:1203–1208.
83. Barzi F, Woodward M, Marfisi RM, et al. Mediterranean diet and all cause mortality after myocardial infarction: results from the GISSI Prevenzione trial. *Eur J Clin Nutr*. 2003;57:604–611.
84. Chrysoshoou C, Panagiotakos DB, Pitsavos C, et al. Adherence to the Mediterranean diet attenuates inflammation and coagulation process in healthy adults: The ATTICA Study. *J Am Coll Cardiol*. 2004;44:152–158.
85. Nanri A, Yoshida D, Yamaji T, et al. Dietary patterns and C-reactive protein in Japanese men and women. *Am J Clin Nutr*. 2008;87:1488–1496.
86. Esmailzadeh A, Kimiagar M, Mehrabi Y, et al. Dietary patterns and markers of systemic inflammation among Iranian women. *J Nutr*. 2007;137:992–998.
87. Dalziel K, Segal L. Time to give nutrition interventions a higher profile: cost effectiveness of 10 nutrition interventions. *Health Promot Int*. 2007;22:271–283.
88. Hu FB, Willett WC. Optimal diets for prevention of coronary heart disease. *JAMA*. 2002;288:2569–2578.
89. Kris-Etherton P, Harris WS, Appel LJ. Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease. *Circulation*. 2002;106:2747–2757.
90. Schulze MB, Hoffmann K, Manson JE. Dietary pattern, inflammation, and incidence of type 2 diabetes in women. *Am J Clin Nutr*. 2005;82:675–684.
91. Adam O, Beringer C, Kless T, et al. Anti-inflammatory effects of a low arachidonic acid diet and fish oil in patients with rheumatoid arthritis. *Rheumatol Int*. 2002;23:27–36.
92. Mänge H, Hermann J, Schauenstein K. Diet and rheumatoid arthritis: a review. *Scand J Rheumatol*. 1999;28:201–209.
93. Kremer JM, Bigauouette J, Michalek AV, et al. Effects of manipulation of dietary fatty acids on clinical manifestations of rheumatoid arthritis. *Lancet* 1985;1:184–187.
94. Matsuyama W, Mitsuyama H, Watanabe M. Effects of omega-3 polyunsaturated fatty acids on inflammatory markers in COPD. *Chest*. 2005;128:3817–3827.
95. Barranco-Quintana JL, Allam MF, Del Castillo AS, et al. Risk factors for Alzheimer's disease. *Rev Neurol*. 2005;40:613–618.
96. Montine TJ, Sidell KR, Crews BC, et al. Elevated CSF prostaglandin E<sub>2</sub> levels in patients with probable AD. *Neurology*. 1999;53:1495–1498.
97. Henderson ST. High carbohydrate diets and Alzheimer's disease. *Med Hypotheses*. 2004;62:689–700.
98. Panza F, Solfrizzi V, Colacicco AM, et al. Mediterranean diet and cognitive decline. *Public Health Nutr*. 2004;7:959–963.
99. Seidner DL, Lashner BA, Brzezinski A, et al. An oral supplement enriched with fish oil, soluble fiber and antioxidants for corticosteroid sparing in ulcerative colitis: a randomized, controlled trial. *Clin Gastroenterol Hepatol*. 2005;3:358–369.
100. Turner D, Zlotkin SH, Shah PS, Griffiths AM. Omega 3 fatty acids (fish oil) for maintenance of remission in Crohn's disease. *Cochrane Database Syst Rev*. 2007;(2) CD006320.
101. Callaway J, Schwab U, Harvima I. Efficacy of dietary hempseed oil in patients with atopic dermatitis. *J Dermatolog Treat*. 2005;16:87–94.
102. Betsi GI, Papadavid E, Falagas ME. Probiotics for the treatment or prevention of atopic dermatitis: a review of the evidence from randomized controlled trials. *Am J Clin Dermatol*. 2008;9:93–103.
103. Broughton KS, Johnson CS, Pace BK, et al. Reduced asthma symptoms with omega-3 fatty acid ingestion are related to 5-series leukotriene production. *Am J Clin Nutr*. 1997;65:1011–1017.
104. Wickens K, Barry D, Friezema A, et al. Fast foods—are they a risk factor for asthma? *Allergy*. 2005;60:1537–1541.
105. Haby MM, Peat JK, Marks GB, et al. Asthma in preschool children: prevalence and risk factors. *Thorax*. 2001;56:589–595.
106. Wong KW. Clinical efficacy of n-3 fatty acid supplementation in patients with asthma. *J Am Diet Assoc*. 2005;105:98–105.
107. Mickelborough TD, Rundell KW. Dietary polyunsaturated fatty acids in asthma- and exercise-induced bronchoconstriction. *Eur J Clin Nutr*. 2005;59:1335–1346.
108. Anand P, Kunnumakkara AB, Sundaram C, et al. Cancer is a preventable disease that requires major lifestyle changes. *Pharm Res*. 2008;25:2097–2116.
109. Hardman WE. N-3 fatty acids and cancer therapy. *J Nutr*. 2004;134:3427S–3430S.
110. Wolk A. Diet, lifestyle and risk of prostate cancer. *Acta Oncol*. 2005;44:526–528.

111. Silvera SA, Jain M, Howe GR, et al. Dietary carbohydrates and breast cancer risk: a prospective study of the roles of overall glycemic index and glycemic load. *Int J Cancer*. 2005;114:653–658.
112. Michaud DS, Fuchs CS, Liu S, et al. Dietary glycemic load, carbohydrate, sugar, and colorectal cancer risk in men and women. *Cancer Epidemiol Biomarkers Prev*. 2005;14:138–147.
113. Kaartinen K, Lammi K, Hypen M. Vegan diet alleviates fibromyalgia symptoms. *Scand J Rheumatol*. 2000;29:308–313.
114. Appleton KM, Rogers PJ, Ness AR. Updated systematic review and meta-analysis of the effects of n-3 long-chain polyunsaturated fatty acids on depressed mood. *Am J Clin Nutr*. 2010;91:757–770.
115. Nemets H, Nemets B, Apter A, et al. Omega-3 treatment of childhood depression: a controlled, double-blind pilot study. *Am J Psychiatry*. 2006;163:1098–1100.
116. Freeman MP, Hibbeln JR, Wisner KL, et al. Randomized dose-ranging pilot trial of omega-3 fatty acids for postpartum depression. *Acta Psychiatr Scand*. 2006;113:31–35.
117. *Dr. Weil's Anti-Inflammatory Food Pyramid*. <http://www.drweil.com/drw/u/ART02995/Dr-Weil-Anti-Inflammatory-Food-Pyramid.html>; Accessed 14.12.10.



# The DASH Diet

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## What Is the DASH Diet?

DASH stands for Dietary Approaches to Stop Hypertension. This eating plan was initially developed to lower blood pressure,<sup>1</sup> but it has since been found to modify several disease risk factors and outcomes, including improvements in cholesterol levels and insulin sensitivity. This diet favors meals that are low in animal and dairy fat and rich in fruits, vegetables, and whole grains. It is a well-balanced diet that can be followed by everyone, including those in low socioeconomic strata,<sup>2</sup> to help lead a healthy lifestyle (Table 87-1).

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## How Much Can I Expect My Blood Pressure to Come Down?

Two sentinel studies have investigated how adherence to the DASH diet can reduce blood pressure. The original study,<sup>1</sup> which took place among four academic health care centers, divided subjects into three groups; one ate a normal American diet, one ate an American diet but with more fruits and vegetables, and one ate the DASH diet. In those who did not have high blood pressure to begin with, the average systolic value (top number) dropped by 5.5 points and the diastolic value (bottom number) by 3 points for those eating the DASH diet. For those who already had high blood pressure, the systolic value dropped by 11.6 points and the diastolic value by 5.3 points. The blood pressure also dropped for group 2 (increase in fruits and vegetables) but not as much. Furthermore, these changes occurred after just 2 weeks on the diet.

The second DASH trial<sup>3</sup> examined the effect of a reduced dietary sodium intake (at three separate levels: 3300, 2300, or 1500 mg daily) as participants consumed a normal American diet or the DASH eating plan. Results showed that reducing dietary sodium lowered blood pressure for both eating plans (especially the group that consumed 1500 mg of daily sodium), but at each level, blood pressure was lower for those on the DASH eating plan. These studies emphasize the importance of dietary sodium on blood pressure but also

highlight that other nutritional features of the DASH diet may play a role.

In those with high blood pressure, the DASH diet on average lowers the systolic blood pressure 11.6 points and the diastolic blood pressure 5.3 points.

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## Besides Lowering of Sodium, by What Other Means Might the DASH Diet Benefit Our Health?

Oxidative stress represents an imbalance between the production and neutralization of reactive oxygen species or, more simply, one's ability to detoxify the products of cellular damage. Much of this damage is caused by inflammation, which plays a foundational role in many chronic diseases, including obesity. In a small study, investigators found that the DASH diet decreased blood pressure and enhanced antioxidant capacity, especially in obese individuals.<sup>4</sup> In addition, lower levels of proinflammatory markers, including C-reactive protein and interleukin-6, have been found in those consuming this diet.<sup>5</sup> These findings support the important role of inflammation in chronic diseases, including hypertension. More important, they illustrate another way that the DASH diet may lower blood pressure and other cardiovascular risks besides lower salt intake.

The importance of potassium, magnesium, and fiber in the DASH diet's role in lowering blood pressures has also been postulated. However, researchers have conducted a crossover study in which obese and lean individuals consumed a usual diet, the DASH diet, and the usual diet supplemented with specific amounts of potassium, magnesium, and fiber that match the DASH diet; each eating plan was also matched for calcium and sodium. After 3 weeks, only obese individuals adhering to the DASH diet showed an improvement in blood pressure and endothelial function. Nutritional factors other than these five must be contributing to the observed health benefits, and these remain a topic of further investigation.<sup>6</sup>

TABLE 87-1. The DASH Diet

FOOD GROUP	DAILY SERVINGS	SERVING SIZES	EXAMPLES AND NOTES	SIGNIFICANCE OF EACH FOOD GROUP TO THE DASH EATING PLAN
Grains and grain products	7-8	1 slice bread 1 oz dry cereal* ½ C cooked rice, pasta, or cereal	Whole wheat bread, English muffin, pita bread, bagel, cereals, grits, oatmeal, crackers, unsalted pretzels and popcorn	Major sources of energy and fiber
Vegetables	4-5	1 C raw leafy vegetable ½ C cooked vegetable 6 oz vegetable juice	Tomatoes, potatoes, carrots, green peas, squash, broccoli, turnip greens, collards, kale, spinach, artichokes, green beans, lima beans, sweet potatoes	Rich sources of potassium, magnesium, and fiber
Fruits	4-5	6 oz fruit juice 1 medium fruit ¼ C dried fruit ½ C fresh, frozen, or canned fruit	Apricots, bananas, dates, grapes, oranges, orange juice, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, prunes, raisins, strawberries, tangerines	Important sources of potassium, magnesium, and fiber
Low-fat or fat-free dairy foods	2-3	8 oz milk 1 C yogurt 1.5 oz cheese	Fat-free (skim) or low-fat (1%) milk, fat-free or low-fat buttermilk, fat-free or low-fat regular or frozen yogurt, low-fat and fat-free cheese	Major sources of calcium and protein
Meats, poultry, and fish	2 or less	3 oz cooked meats, poultry, or fish	Select only lean; trim away visible fat; broil, roast, or boil instead of frying; remove skin from poultry	Rich sources of protein and magnesium
Nuts, seeds, and dry beans	4-5 per week	1.5 oz or ⅓ C nuts ½ oz or 2 Tbsp seeds ½ C cooked dry beans and peas	Almonds, filberts, mixed nuts, peanuts, walnuts, sunflower seeds, kidney beans, lentils	Rich sources of energy, magnesium, potassium, protein, and fiber
Fats and oils†	2-3	1 tsp soft margarine 1 Tbsp low-fat mayonnaise 2 Tbsp light salad dressing 1 tsp vegetable oil	Soft margarine, low-fat mayonnaise, light salad dressing, vegetable oil (such as olive, corn, canola, or safflower)	DASH has 27% of calories as fat, including that in or added to foods
Sweets	5 per week	1 Tbsp sugar 1 Tbsp jelly or jam ½ oz jelly beans 8 oz lemonade	Maple syrup, sugar, jelly, jam, fruit-flavored gelatin, jelly beans, hard candy, fruit punch, sorbet, ices	Sweets should be low in fat

From the Dietary Approaches to Stop Hypertension study, as published by the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure and the National High Blood Pressure Education Program Coordination Committee. The sixth report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure. *Arch Intern Med.* 1997;157:2413–2446.

\*Equals ½ to 1¼ C, depending on cereal type. Check the product's nutrition label.

†Fat content changes serving counts for fats and oils. For example, 1 Tbsp of regular salad dressing equals 1 serving; 1 Tbsp of a low-fat dressing equals ½ serving; 1 Tbsp of a fat-free dressing equals 0 servings.

## Besides Lowering of Blood Pressure, How Else Does This Diet Affect Cardiovascular Health?

A study of 116 men and women with metabolic syndrome showed that consuming a DASH diet versus a control diet can reduce most of the metabolic risks, including total cholesterol, low-density lipoprotein, weight, triglycerides, and fasting blood glucose concentration while raising high-density lipoprotein. Although the magnitude of the effects varied by sex, they were positive for both groups.<sup>7</sup> An investigation of 31 type 2 diabetic individuals also found favorable changes in these parameters, including hemoglobin A1c (decrease of 1.7),<sup>8</sup> and adherence to this diet may actually have the potential to prevent type 2 diabetes.<sup>9</sup> Interestingly, the lipid- and glucose-lowering effect of the DASH diet seems to be independent of sodium intake, which again supports the notion that this eating plan works through several nutritional mechanisms.<sup>10</sup>

In a retrospective analysis using data from the Nurses' Health Study, a DASH score was composed on the basis of foods that individuals had consumed. In comparing the top and bottom 20% on the basis of this score, the investigators found a nearly 50% decrease in kidney stones, even in participants with lower calcium intake.<sup>11</sup>

As far as cardiovascular disease-oriented outcomes, the DASH eating plan has been shown to lower the rates of stroke,<sup>5</sup> heart failure events (including mortality),<sup>12</sup> and coronary artery disease by 10% to 20% during a 10-year period.<sup>13</sup>

## Does This Diet Reduce the Risk of Cancer?

A prospective study assigning a DASH score to more than 100,000 participants showed an 80% reduction in colorectal cancer between the top and bottom 20% of scores during a 26-year period. Those following a Mediterranean diet had no such decrease in their risk.<sup>14</sup>

## How Does This Diet Affect Bone Health?

Investigators at Duke University found that those who ate a DASH diet had evidence of less bone turnover that over time resulted in a stronger bone structure. This effect was enhanced when the DASH diet group further reduced their intake of sodium.<sup>15</sup>

## What Foods Are Emphasized in This Diet, and How Do They Influence One's Health?

To summarize, the diet is

- High in fruits and vegetables  
These are rich in antioxidants (especially those with vibrant colors), are relatively low in calories, and contain significant fiber.

- Low in dairy, animal meat, and saturated fat  
These fats increase the risk of atherosclerosis.
- High in nuts, seeds, and beans  
These are high in protein and monounsaturated and polyunsaturated fats, which can decrease inflammation and cardiovascular disease.
- Low in snacks and sweets  
Many of these foods contain partially hydrogenated fats that act to preserve shelf life. These types of fats are sources of *trans*-fatty acids that play a significant role in increasing the risk of heart disease. Many common snacks are also composed of simple carbohydrates, which cause a rapid rise in insulin after they are consumed. Over time, elevations in insulin result in the body's becoming less responsive to its effect. In turn, the body will start to produce excessive amounts of insulin, which results in more inflammation and elevates the risk of cardiovascular disease.
- The diet is based on 2000 calories a day.  
Large portion sizes are a major contributor to rising obesity rates worldwide. Combining this diet with a regular exercise routine can lead to even more dramatic decreases in blood pressure and other chronic diseases.

## Could the DASH Diet Be Improved?

### Cooking Oils

The type of fat may prove to be more important than the amount of fat we eat. The DASH diet does not differentiate between the types of cooking oils. Many vegetable oils consist of partially hydrogenated oils that are a major source of *trans*-fatty acids. When possible, use monounsaturated oils such as olive or canola oil for cooking.

### Types of Animal Protein

When eating meat, you may have greater benefit if you try to eat fish more than meat or poultry. Fish (particularly cold-water fish like salmon, herring, mackerel, and tuna) are rich in omega-3 fatty acids. These fats have been found to reduce the incidence of heart disease in part by reducing inflammation that can lead to atherosclerosis. Careful consideration of the sustainability of specific species and avoidance of mercury-containing products can also benefit our personal well-being.

## How Can Someone Get More Information About the DASH Diet?

- The National Heart, Lung, and Blood Institute (NHLBI) is a part of the National Institutes of Health (NIH). You can get free information mailed to you or you may view it over the Internet by visiting <http://www.nhlbi.nih.gov/health/public/heart/hbp/dash>.
- Consulting with a nutritionist can provide valuable information on how to incorporate this diet into one's lifestyle.

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. Appel LJ, Moore TJ, Obarzanek E, et al. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *N Engl J Med*. 1997;336:1117–1124.
2. Young CM, Batch BC, Svetkey LP. Effect of socioeconomic status on food availability and cost of the Dietary Approaches to Stop Hypertension (DASH) dietary pattern. *J Clin Hypertens (Greenwich)*. 2008;10:603–611.
3. Sacks FM, Svetkey LP, Vollmer WM, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. *N Engl J Med*. 2001;344:3–10.
4. Taylor EN, Fung TT, Curhan GC. DASH-style diet associates with reduced risk for kidney stones. *J Am Soc Nephrol*. 2009;20:2253–2259.
5. Levitan EB, Wolk A, Mittleman MA. Relation of consistency with the dietary approaches to stop hypertension diet and incidence of heart failure in men aged 45 to 79 years. *Am J Cardiol*. 2009;15:1416–1420.
6. Chen ST, Maruthur NM, Appel LJ. The effect of dietary patterns on estimated coronary heart disease risk: results from the Dietary Approaches to Stop Hypertension (DASH) trial. *Circ Cardiovasc Qual Outcomes*. 2010;3:484–489.
7. Fung TT, Chiuve SE, McCullough ML, et al. Adherence to a DASH-style diet and risk of coronary heart disease and stroke in women. *Arch Intern Med*. 2008;168:713–720.
8. Al-Solaiman Y, Jesri A, Mountford WK, et al. DASH lowers blood pressure in obese hypertensives beyond potassium, magnesium, and fibre. *J Hum Hypertens*. 2010;24:237–246.
9. Azadbakht L, Mirmiran P, Esmailzadeh A, et al. Beneficial effects of a Dietary Approaches to Stop Hypertension eating plan on features of the metabolic syndrome. *Diabetes Care*. 2005;28:2823–2831.
10. Azadbakht L, Fard NR, Karimi M, et al. Effects of the Dietary Approaches to Stop Hypertension (DASH) eating plan on cardiovascular risks among type 2 diabetic patients: a randomized crossover clinical trial. *Diabetes Care*. 2011;34:55–57.
11. Liese AD, Nichols M, Sun X, et al. Adherence to the DASH Diet is inversely associated with incidence of type 2 diabetes; the insulin resistance atherosclerosis study. *Diabetes Care*. 2009;32:1434–1436.
12. Lin PH, Ginty F, Appel LJ, et al. The DASH diet and sodium reduction improve markers of bone turnover and calcium metabolism in adults. *J Nutr*. 2003;133:3130–3136.
13. Fung TT, Hu FB, Wu K, et al. The Mediterranean and Dietary Approaches to Stop Hypertension (DASH) diets and colorectal cancer. *Am J Clin Nutr*. 2010;92:1429–1435.
14. Harsha DW, Sacks FM, Obarzanek E, et al. Effects of dietary sodium intake on blood lipids: results from the DASH-sodium trial. *Hypertension*. 2004;43:393–398.
15. Lopes HF, Martin KL, Nashar K, et al. DASH diet lowers blood pressure and lipid-induced oxidative stress in obesity. *Hypertension*. 2003;41:422–430.





# Writing an Exercise Prescription

Michael J. Hewitt, PhD

Regular physical activity, whether it is accomplished through recreation, sport, labor, or participation in a structured exercise program, has been demonstrated to enhance function; to reduce, reverse and prevent age-related physiologic decline; and to lower the risks of a sedentary lifestyle.<sup>1</sup> Most physicians recognize the benefit of exercise, and most medical groups recommend regular physical activity.<sup>2</sup> However, because few medical training programs include even an overview of exercise physiology and few clinical rotations address exercise prescription, it is the rare physician who has experience in the decision-making process associated with recommending physical activity. Practically, prescribing exercise is no different from prescribing medication, surgery, or therapy; it is a thoughtful compromise between the potential benefits of the treatment and its potential adverse effects.<sup>3</sup>

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## Basic Principles

Two principles form the framework for making exercise recommendations; the overload principle and the concept of specificity of exercise. The overload principle, based on Hans Selye's general adaptation syndrome model, suggests that a body or physiologic system repeatedly exposed to a stressor of appropriate intensity ultimately adapts to that stressor. To scientists who specialize in exercise, this principle underlies the adaptations that occur after cardiorespiratory conditioning or strength training. In general, there is an inverted J-curve relationship between the volume or intensity of the stimulus and the physiologic adaptation. Infrequent strength training or work with light weights brings about modest increases in muscle strength, but consistent work with heavier loads results in greater strength gains. Too much load and consecutive lifting days, however, are often associated with injury. Cardiorespiratory adaptations follow a similar pattern.

The challenge for physicians and their patients is to determine the appropriate exercise frequency and intensity for safe achievement of optimal functional enhancement.

Specificity of exercise refers to the relationship between the type of physiologic adaptation and the type of activity performed. It is widely accepted that strength training is beneficial, some say essential, to enhanced performance in sport. It is an unusual collegiate athletic team that does not have a strength coach. However, if one wishes to become a competitive swimmer or an Alpine skier, strength training alone is woefully inadequate. One must spend time in the pool or on the mountain. For similar reasons, sprinters train differently from middle- or long-distance runners. The implication for physicians is that cardiorespiratory health concerns, weight loss, and osteoporosis prevention all require different modes of exercise therapy.

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## The Five Components of Fitness

A useful model for exercise programming is one that addresses five components of fitness: cardiorespiratory or aerobic fitness, muscle strength and endurance, flexibility, body composition, and balance and agility. One could make an argument to include muscle power (i.e., the explosive application of strength), but lack of power is rarely a clinical limitation. Measurement of bone mineral content is another important component of body composition assessment. Balance and agility are the most commonly overlooked aspects of physical function, but they have significant implications for fall prevention and mobility and therefore are important to aging patients.<sup>4</sup>

There is typically an age-related decline in each of these components (with the exception of percentage of body fat, which rises with age) that can be attenuated or reversed by appropriate physical activity. In fact, much of the functional decline associated with aging can be more specifically called disuse atrophy.

The five components of fitness are as follows:

- Cardiorespiratory fitness (the ability of the heart, lungs, and vascular network to deliver oxygen to the working muscles)
- Muscle strength (the maximal ability of the musculoskeletal system to move a heavy load) and muscle endurance (the ability to move that load repeatedly)
- Flexibility (an index of joint range of motion)
- Body composition (typically, the level of body fat, but a measure of fat-free body mass is of equal clinical significance)
- Balance and agility

## Body Composition

Body composition is the one component of fitness that does not require a specific exercise recommendation. Body composition changes as a consequence of cardiorespiratory exercise, strength training, and nutrient intake.<sup>5</sup> However, assessment of body composition is a highly useful tool to determine how patients should use their limited exercise time. For instance, a man with more than 25% body fat and a woman with more than 38% body fat are in a group with a statistically greater risk of heart disease, type 2 diabetes mellitus, hyperlipidemia, and hypertension.<sup>6</sup> Exercise programming should attempt to specifically address those risks as well as help reduce the level of body fat.

Quantification of fat-free body mass (FFB) further refines the exercise prescription. Many adults are at an appropriate weight on the weight-to-height scales or body mass index (BMI; weight in kg/height in m<sup>2</sup>) value but are underlean as indicated by a lower than optimal FFB. In general, cardiorespiratory exercise results in a reduction of percentage body fat but has a limited effect on FFB. In contrast, strength training increases FFB (as well as muscle strength) and can modestly raise metabolic rate, ultimately resulting in a reduction in percentage body fat. Most morbidly obese patients have developed adequate FFB simply to transport themselves and gain limited benefit from strength training, but their BMI and percentage of body fat respond favorably to cardiorespiratory activity. Smaller individuals who have acceptable weight-to-height values but who also have excess body fat benefit most from combining cardiorespiratory and strength programs.

The determination of bone mineral content (BMC, g) or bone mineral density (BMD, g/cm<sup>2</sup>) allows a superior level of exercise programming in terms of both efficacy and safety. Dual-energy x-ray absorptiometry (DEXA) is considered the new “gold standard” for simultaneous determination of percentage body fat, FFB, and BMC.<sup>6</sup> Its drawbacks are that the technique requires expensive equipment and patients experience a small radiation exposure. However, DEXA is fast, accurate, and reliable, and it does not depend

on patient skill (as does underwater weighing) or measurer technique (as does anthropometry). If DEXA is not readily available or is cost-prohibitive and BMD data are not essential, bioelectric impedance analysis (BIA) is a practical alternative. As long as hydration status is controlled, BIA can rapidly and inexpensively provide accurate and repeatable measures of percentage fat and FFB. It eliminates measurement technique and patient cooperation errors and provides significantly more data, and a more meaningful assessment of health status, than does the ubiquitous determination of BMI. Several other field techniques can be effectively administered in a physician's office; these provide useful body composition data, but each method has limitations. A discussion of body composition assessment methodology is beyond the scope of this text, but interested readers are referred to three excellent summaries.<sup>6-8</sup>

Dual-energy x-ray absorptiometry (DEXA) determines percentage of body fat, fat-free body mass (FFB), and bone mineral content (BMC).

## The FITT Principle for Exercise Programming

For cardiorespiratory conditioning, strength training, flexibility, and balance-agility training, a simple exercise prescription tool is the FITT principle. FITT is an acronym for the following variables:

- Frequency
- Intensity
- Type
- Time (duration)

These are the four variables of physical activity that must be considered in exercise programming, and physicians should write a prescription specifically addressing each (Fig. 88-1). For example, individuals with elevated risk for heart disease should be encouraged to improve their cardiorespiratory condition. The type of exercise can be walking, jogging, or running, either outdoors or on a treadmill; bicycling, swimming, or hiking; aerobics and use of any of a variety of aerobic machines (stair climbers, rowing machines, cycle ergometers); or dancing, tennis, and many other possibilities. The choice is affected by geographic concerns (cycling in the Midwest United States during January is difficult) and economic limitations (some patients cannot afford a treadmill or the cost of participation in a fitness center), but the primary factor is patient preference. Exercise equipment manufacturers often promote their devices on the basis of efficiency and the effectiveness of the workout they provide. In reality, much of the inherent advantage of one type of exercise device over another is irrelevant when patients miss exercise sessions because they simply do not like the activity. The very best cardiorespiratory exercise is one that the patient will perform. Of course, a patient with knee limitations may not tolerate distance running, and a patient with severe osteoporosis should not be advised to take up ice skating.

**FIGURE 88-1**

Sample of an exercise prescription showing the first three components of fitness, with areas for the prescription to be individualized for the patient.

**EXERCISE PRESCRIPTION**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

COMPONENT OF FITNESS	EXERCISE	FREQUENCY	DURATION	INTENSITY
<b>Cardiorespiratory Fitness</b>	_____ _____ _____	_____ days/week	_____ minutes	_____ beats/minute _____ beats/10 seconds
<b>Strength</b>	Free Weights Machines Elastic bands Floorwork	_____ days/week	_____ minutes _____ sets	_____ repetitions
<b>Flexibility</b>	Static	_____ days/week _____ repetitions	_____ seconds	Hold below pain threshold

Comments/Progression: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

By: \_\_\_\_\_  
Exercise Physiologist

In 2011, the American College of Sports Medicine (ACSM) published a position stand on the recommended quantity and quality of exercise that is an excellent reference and should be in the library of any health professional who recommends physical activity.<sup>9</sup> In this position stand, quantity refers to the frequency and duration and quality to the intensity of physical activity.

**Cardiorespiratory Training**

The frequency of cardiorespiratory training is limited more often by patient compliance than by physiology. It is not inappropriate for one to exercise daily, but few people do. The ACSM recommends a frequency of 3 to 5 days per week for cardiorespiratory fitness and body composition enhancement and a duration of 20 to 60 minutes of continuous or intermittent exercise. Intermittent exercise is described as a minimum of 10-minute bouts accumulated throughout the day. The recommended intensity is 65% to 90% of maximum heart rate (HR<sub>max</sub>) in healthy adults and 55% to 64% in very unfit individuals. The challenge, of course, is to know one's maximal heart rate. Graded exercise tests rarely continue to exhaustion; therefore, they do not provide a true HR<sub>max</sub>, and prediction equations for HR<sub>max</sub> (e.g., 220 – age in years) lack sufficient precision to be clinically useful. A maximal or

submaximal exercise tolerance test performed by an exercise physiologist can provide a useful estimate of HR<sub>max</sub> and a target heart range.

Graded exercise stress tests can identify hypertensive responses to activity and clinically significant electrocardiographic abnormalities with exercise and are thereby highly useful for providing a safe and effective cardiorespiratory exercise intensity range for at-risk patients. In healthy adults, heart rate is not essential for monitoring of exercise intensity. The Borg scale has been demonstrated to be an effective tool to assess cardiorespiratory exercise intensity (Table 88-1).<sup>10</sup> Healthy adults should maintain a subjective rating of perceived exertion (RPE) of “moderate” to “heavy,” or about 13 to 15 on the scale. Beginners can improve compliance by limiting intensity to “light” to “moderate” (RPE 11 to 13). It is not uncommon for athletes to reach “very, very heavy” (RPE 19 to 20) for short bursts, particularly during interval training such as wind sprints and line drills, but there is little reason to recommend these levels for patients. The OMNI RPE scale, which provides illustrations representing exercise intensity as well as a 0 to 10 numerical rating scale, may be more appropriate for children as well as for adults for whom English is a second language.<sup>11</sup>

Another approach to recommendation of appropriate cardiorespiratory exercise intensity is based on the measured energy cost of the activity, reported in metabolic equivalents

**TABLE 88-1.** Borg Scale of Perceived Exertion

NUMBER	EXERTION LEVEL
6	
7	Very, very light
8	
9	Very light
10	
11	Light
12	
13	Moderate
14	
15	Heavy
16	
17	Very heavy
18	
19	Very, very heavy
20	

From Borg GA. Psychophysical bases of perceived exertion. *Med Sci Sports Exerc.* 1982;14:377–381.

(METs). One MET, defined as the energy expenditure of sitting quietly,<sup>12</sup> about 1 kcal • kg body weight<sup>-1</sup> • hr<sup>-1</sup>, requires about 3.5 mL of oxygen • kg body weight<sup>-1</sup> • min<sup>-1</sup>. Level walking on a firm surface at 3.5 mph is rated at 3.7 METs, and running at 7 mph (8.6 min • mile<sup>-1</sup>) is 11.8 METs. A listing of the MET level of more than 400 recreational and occupational activities has been compiled.<sup>12</sup> This compendium provides a simple comparison of the energy costs of the activities, allowing physicians to suggest several equivalent options. Its utility is further enhanced if a graded exercise test has been performed to quantify the patient's sustainable and maximal MET capacities.

Because cardiorespiratory exercise is so critical to disease prevention and longevity, any program that increases participation should be welcomed. A 10,000-step program, *Walk to a Healthy Future*, has been endorsed by health providers and is promoted by the International Longevity Center.<sup>13</sup> Requiring only good walking shoes and an inexpensive digital pedometer, this program encourages participants to accumulate 10,000 steps daily, the equivalent of about 5 to 6 miles. The recommendations are based on research by a Japanese physician, Yoshiro Hatano, who reported that the typical (Japanese) adult takes between 3000 and 5000 steps per day.<sup>14</sup> In contrast, a 7-day study on the walking behavior of an Old Order Amish community in Ontario, Canada, whose members do not use electricity or motorized vehicles, found average daily step totals of 18,425 ± 4685 for adult men and 14,196 ± 4078 steps for adult women.<sup>15</sup> The highest recorded single-day total was 51,514 steps! It is not surprising that

rates of obesity (BMI ≥30) and overweight (BMI ≥25) among Amish adults average only 4% and 26%, respectively; in contrast, these rates are 30.9% and 64.5%, respectively, for the adult U.S. population.<sup>16</sup>

## Resistance Training

A nearly universal physiologic change associated with aging is sarcopenia, the age- or disuse-related loss of muscle and FFB.<sup>4,17–19</sup> A reduction in FFB typically brings about a proportional drop in metabolic rate. In addition, the decline in FFB negatively influences strength, mobility, and balance, ultimately jeopardizing a person's independence.<sup>19</sup> Clinical rates for sarcopenia are 8% to 13% in persons younger than 70 years, about 17.5% in those aged 75 years, and more than 50% in the oldest old.<sup>17,19</sup> Subclinical levels of muscle loss are even more common. As prevalent and as significant as sarcopenia is, few physicians address it, and very few patients have heard the term. Fortunately, sarcopenia is highly preventable, and much of its effects can be reversed with resistance (strength) training. Although cardiorespiratory disease influences morbidity and mortality more than any other factor in our culture and appropriate preventive exercises should be prescribed for it, the prevention of sarcopenia and its long-term effects warrant nearly equivalent attention.

Sarcopenia, the age- or disuse-related loss of muscle and fat-free body mass, reduces strength, mobility, metabolism, balance, and independence in older adults. Its effects can be attenuated or reversed by resistance training.

Resistance training has also been shown to be effective in combating osteopenia and osteoporosis, the bone loss analogues to sarcopenic loss of muscle. The Bone, Estrogen, Strength Training (BEST) study demonstrated that postmenopausal women, when exposed to a sufficient strength challenge with or without estrogen replacement therapy, could achieve small but significant increases in bone mineral density at the trochanter and lumbar spine (L2-4) sites.<sup>20</sup> Although the increases recorded during the 1-year study were modest (+0.77% to +2.00% for resistance training with estrogen; +0.02% to +1.13% for resistance training alone), they were in sharp contrast to the -0.13% and -0.57% losses recorded at the trochanter and L2-4 areas for women in the nonexercise, no-estrogen control group during the same period. The positive outcome in the BEST study can be attributed primarily to the significant and increasing weight challenge (intensity) participants faced during the study as well as to the frequency, time, and types of strength intervention imposed.

Thus, the FITT principle as suggested for cardiorespiratory programming can also be applied to resistance training. The ACSM suggests that one set of 8 to 10 weight exercises that work all major muscle groups be performed 2 or 3 days per week. A weight load that causes muscle fatigue in 8 to 12 repetitions is recommended. Older or frail individuals may find lighter weights that allow 10 to 15 repetitions before fatigue to be more appropriate.<sup>9,19,21</sup> A second or third set may

be advantageous if time and patient interest permit, but the majority of the benefit is derived in the first set.<sup>21</sup> Although many physicians refer patients for an initial session with an exercise physiologist, physical therapist, or personal fitness trainer to learn the specifics of a strength training program, a program can be designed on the basis of general advice.<sup>22</sup> Flexibility and balance-agility recommendations should also follow the FITT principle.

### Levels of Exercise Prescription

When prescribing exercise, the health care provider should determine the patient's desired outcome. Strategies exist to help patients overcome their physical and psychological barriers to exercise compliance.<sup>23</sup> Individuals hoping only to reduce disease risk may have a level of commitment different from that of others who seek true physical fitness or athletic performance. Table 88-2 summarizes exercise recommendations for several levels in the cardiorespiratory, strength, flexibility, body composition, and balance-agility areas. General recommendations for body fat and FFB at each level are also reported; however, body composition standards are subject to significant individual variation. A useful approach is to encourage patients to perform at least the recommended activity for the prevention of disease and to strive to consistently exercise at the "basic health" level. When these patterns

become habitual, the health care provider can encourage physical activity at the level to achieve "enhanced fitness" (see Table 88-2).<sup>3</sup>

The most effective exercise prescriptions provide guidelines for variety and allow a progression of activity. The programs of long-term participants bear little resemblance to those of new exercisers. Compliance is enhanced if the initial program is broad enough and sufficiently challenging to effect measurable improvement but compact enough to fit into a patient's busy schedule. An experienced physician or exercise physiologist will develop a small starting program and suggest a progression during a specific time frame. One may start with a 10-minute walking or bicycle ergometer program three times weekly and progress to 20 minutes four times weekly within 2 or 3 months, ultimately striving for 40 minutes or longer on most days.

### The Key Three Strength Program

In strength work, a simple starting program such as the Key Three<sup>19,24</sup> allows a basic whole-body strength workout to be completed in less than 10 minutes (Fig. 88-2). Few patients have an effective argument for why they cannot find 10 minutes for strength work twice a week. The Key Three can be performed with use of weight machines, inexpensive hand-held dumbbells, or even elastic resistance bands, making

TABLE 88-2. Basics of Exercise Prescription

EXERCISE/FITNESS COMPONENT	FOR DISEASE PREVENTION	FOR BASIC HEALTH	FOR ENHANCED FITNESS	FOR PERFORMANCE-LEVEL FITNESS
Cardiovascular exercise	Accumulate 30-60 min of physical activity most days	Play or large muscle repetitive activity 20+ min* 3+ times/week	Play or aerobic exercise 40-60+ min* 4-6 times/week	Add interval training or competition
Strength training	Include weight-bearing activity most days	Key Three <sup>†</sup> or equivalent program 1-2 sets 2 times/week Lift to a "challenge" level in 8-12 or 12-15 repetitions	Balanced whole-body machine or free-weight program 2-3 sets 3 times/week. Reach "functional failure" in 8-12 repetitions	Add muscle endurance or power training Add Pilates work Add ascending or descending pyramids
Flexibility	Maintain range of motion by bending and stretching in daily activities	Perform 2-4 limitation-specific stretches after activity, 1 repetition Hold about 20-30 sec	Perform 6-10 whole-body stretches after activity and before competition, 1-2 repetitions	Add yoga, Pilates work, or facilitated stretches with a partner
Body composition	Men	≥ 5% ≤ 25% fat	12%-20% fat	8%-15% fat
	Women	≥ 14% ≤ 38% fat	20%-30% fat	17%-25% fat
		Maintain fat-free (lean) body mass at 125 to 150lb. or more		
		Maintain fat-free (lean) body mass at 90 to 110lb. or more		
Balance and agility	—	Act "like a child" Walk a balance line "Don't step on a crack ..." Brush teeth while standing on one foot	Recreational sports: tennis, bicycle, tai chi Social dancing Stability ball training	High-level sports: skiing, skating, surfing Yoga Martial arts Performance dancing Agility drills

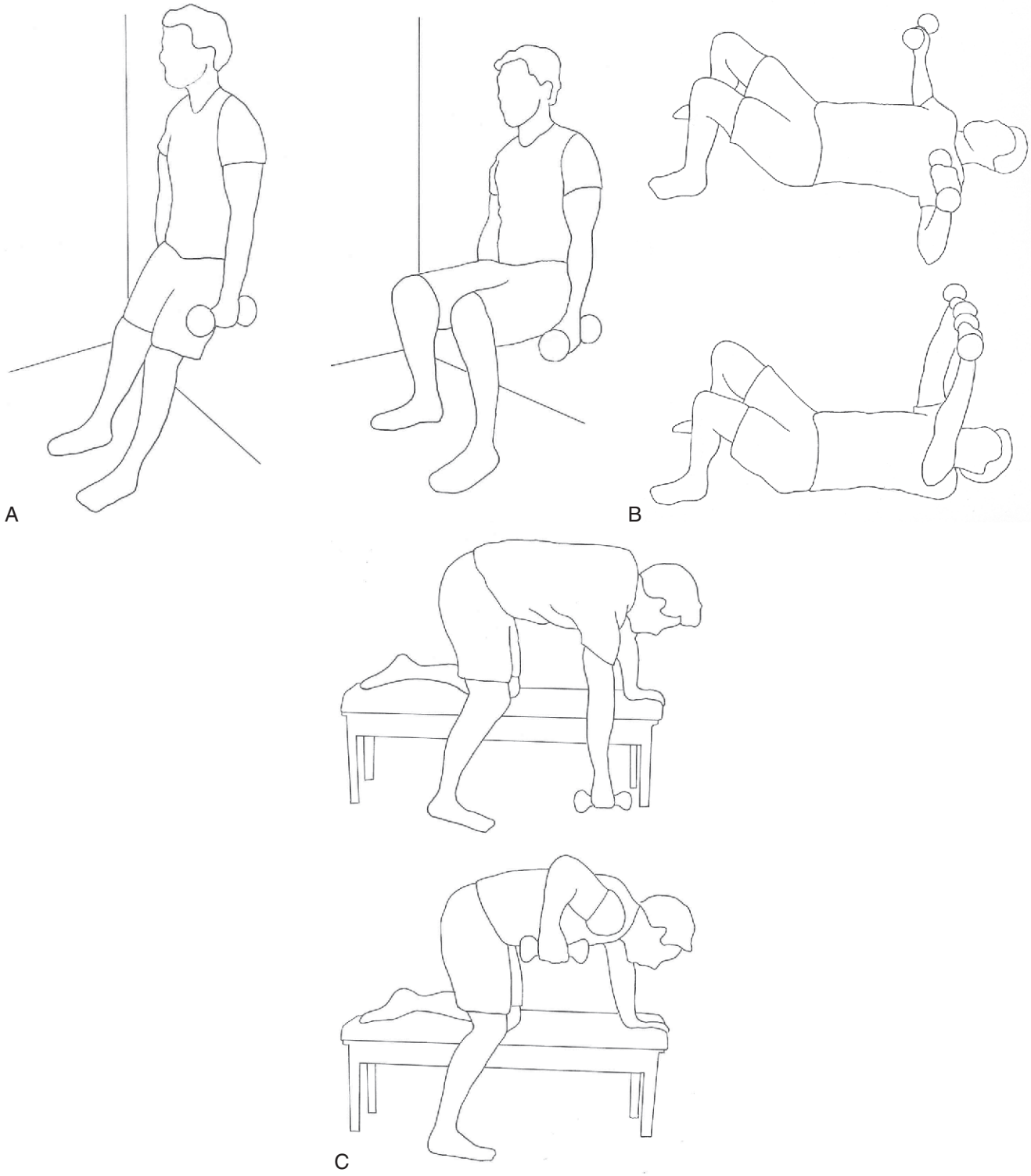
Modified from Hewitt MJ. *Basics of Exercise Prescription*. Tucson, AZ: Canyon Ranch Health Resort; copyright © 2002.

\*At a challenging intensity.

<sup>†</sup>Key Three consists of a double-leg press or squat, chest press, and lat pulldown or single-arm row.

**FIGURE 88-2**

Key Three exercises. **A**, Dumbbell squat (quadriceps, hamstrings, and gluteals). **B**, Supine bench press (pectoralis major and minor, anterior deltoid, and triceps). **C**, Single-arm dumbbell row (trapezius, latissimus dorsi, and biceps). (From Hewitt MJ. *The Key Three Strength Program*. Tucson, AZ: Canyon Ranch Health Resort; 2002. Illustration by Karen T. Wylie.)



equipment and space limitations moot. The three exercises are the double-leg press machine or dumbbell squat, which can be performed against the wall for additional support (quadriceps, hamstrings, gluteals); the chest press machine or supine dumbbell bench press (pectoralis major and minor, anterior deltoid, triceps brachii); and either the lat pulldown or seated row machine or the single-arm dumbbell row (trapezius, latissimus dorsi, and biceps brachii). These three exercises challenge approximately 85% of the muscle system. Although bodybuilders might scoff at a basic program such as the Key Three, even smaller series of lifts have been demonstrated to rapidly improve strength, muscle mass, and mobility in older adults,<sup>25-27</sup> and these three core exercises can form the framework for more sophisticated lifting regimens.

## Flexibility Versus Stability

Traditional thinking among exercise professionals and fitness enthusiasts is that more flexibility is preferable to less. Certainly this is true for dancers, gymnasts, and figure skaters, but it is not always the case for healthy adults. More modern thinking recognizes that optimal control of range of motion (ROM) requires an appropriate balance between limb flexibility and joint stability. Stretching programs have been demonstrated to effectively increase ROM, but physicians should use caution in recommending flexibility training regimens to patients exhibiting hypermobility tendencies (e.g., they can extend the thumb to touch the arm or can extend the elbows or knees significantly beyond 180 degrees). Hypermobile patients should be encouraged to preferentially participate in strength training to stabilize their joints. Most adults, however, will respond favorably to a modest flexibility program.

Static stretching, in which a joint is moved to a position eliciting mild tension and is held stationary, is the most commonly practiced method to improve joint ROM. There are places where ballistic stretching (incorporating bouncing movements), proprioceptive neuromuscular facilitation (hold-relax cycles with a partner or against an immobile object), and dynamic stretching (exaggerated movement mimicking sports-related activity) are indicated, but most patients will see safe and effective adaptations to a compact static stretching program.<sup>28</sup> The scientific evidence is equivocal in support for the common claim that improved

flexibility reduces the risk of injury, but enhanced and stable ROM is always desirable. Similarly, recommendations for the optimal time for holding a static stretch vary from as little as 2 or 3 seconds to well above 60 seconds, but most fitness professionals find that patients respond favorably to a hold period of 20 to 30 seconds.<sup>28</sup> Activities like yoga and Pilates also improve joint ROM, although a compact program of two or three static stretches performed daily is often preferable to a larger and more complex program performed only intermittently.

## Balance and Agility

Balance and agility are the most often overlooked components of fitness, yet poor balance and its associated risk of falling are potentially the greatest health concerns for many older adults. Balance and agility require a rapid central nervous system (CNS) response to signals from the inner ears (vestibular signals), eyes (visual signals), postural muscles in the legs and back (proprioceptive signals), and touch (tactile signals). Although some deterioration in the quality of these signals occurs with age, it is primarily a slower rate of integration and response by the CNS that appears to cause the loss of function (disuse atrophy). Function loss is insidious and cyclical. Low function results in reduced confidence, which leads to avoidance of balance challenges; further reduction in function follows in a destructive cycle. Even highly skilled athletes lose function rapidly if they become injured or fail to practice.

Balance and agility can be restored by safe challenges to the system with appropriate exercises. Tai chi, dance, and simple balance exercises such as standing on one foot while brushing the teeth or hair provide effective signals to stimulate CNS adaptation.<sup>29</sup> In severe cases, ai chi, a form of tai chi performed in a swimming pool, provides a no-falling-risk stimulus to the balance control system. Sports such as tennis and bicycling are greater challenges and are associated with both higher risk and greater potential to achieve improvement. High-level activities, including skiing, skating, and martial arts, are appropriate for a select group of patients. Boating, whether on the gently rocking passageways of a ferry or cruise ship or on the heaving deck of an offshore sailboat, can provide a gentle to aggressive challenge to the balance centers.



## THERAPEUTIC REVIEW

The ACSM<sup>4,5,25,30</sup> provides guidelines that illustrate the standard of care and prove invaluable for clinicians and physiologists who make exercise recommendations. This organization also offers a resource manual to support the guidelines, which includes background summaries in applied anatomy, exercise physiology, exercise testing and programming, emergency procedures, terminology, and more.<sup>31</sup>

A comprehensive exercise program has a synergistic effect. Improved strength in the postural muscles is reflected in better balance because those muscles can better respond to signals from the balance centers. Better cardiorespiratory conditioning allows a more challenging strength training program, and improved body composition allows greater range of motion for more effective stretching. Equally important, enhanced function allows greater participation, usually resulting in better compliance. Exercise prescription need not be complicated; virtually any activity has positive effects. The key is to gently challenge each of the physiologic systems in such a way to allow patients to experience enhanced function and then encourage them to modestly increase the stimulus.

## KEY WEB RESOURCES

<a href="http://www.acefitness.org">www.acefitness.org</a>	The Web site for the American Council on Exercise, a not-for-profit organization that trains and certifies health and fitness professionals
<a href="http://www.ilcusa.org/pages/publications/healthy-aging/growing-older-staying-strong-preventing-sarcopenia-through-strength-training.php">www.ilcusa.org/pages/publications/healthy-aging/growing-older-staying-strong-preventing-sarcopenia-through-strength-training.php</a>	An issue brief written by this author and published by the International Longevity Center on the basics of a small strength training program for the prevention of sarcopenia. All ILC-USA issue briefs can be reprinted for patients. Bulk orders can be obtained by contacting the ILC directly.
<a href="http://www.ilcusa.org/pages/publications/healthy-aging/walk-to-a-healthy-future.php">www.ilcusa.org/pages/publications/healthy-aging/walk-to-a-healthy-future.php</a>	Another International Longevity Center issue brief, this one written by Robert N. Butler, MD, Founding Director of the National Institutes on Aging and late CEO and Founder of the ILC. <i>Walk to a Healthy Future</i> introduces the 10,000-step program and can be downloaded and reprinted for patients.
<a href="http://www.acsm.org">www.acsm.org</a>	The American College of Sports Medicine is an international resource for information and certifications for exercise physiologists, sports medicine physicians, physical therapists, and other allied health professionals. The section on position stands provides downloadable documents illustrating the latest recommendations for exercise-based management of diabetes, weight control, and cardiorespiratory health.
<a href="http://www.canyonranch.com/connection">www.canyonranch.com/connection</a>	Canyon Ranch Health Resort's mission is "to inspire people to make a commitment to healthy living, turning hopes and intentions into the highest enjoyment of life." <i>Connection</i> is a periodic paper- and web-based publication featuring recommendations from their professional staff.
<a href="http://www.nscs-lift.org">www.nscs-lift.org</a>	Members of the National Strength and Conditioning Association earn certifications preparing them to be personal trainers and team strength coaches. The NSCA Web site's publications and education sections provide additional information for readers interested in a deeper understanding of this important component of physical activity.

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## References

References are available online at [expertconsult.com](http://expertconsult.com).



## References

1. U.S. Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta: Centers for Disease Control and Prevention; 1996.
2. U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services*. 2nd ed. Baltimore: Williams & Wilkins; 1996.
3. Kligman EW, Hewitt MJ, Crowell DL. Recommending exercise to healthy older adults: the preparticipation evaluation and exercise prescription. *Physician Sportsmed*. 1999;27:42–62.
4. American College of Sports Medicine Position Stand. Exercise and physical activity for older adults. *Med Sci Sports Exerc*. 2009;41:1510–1530.
5. American College of Sports Medicine Position Stand. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc*. 2009;41:459–471.
6. Lohman TG. *Advances in Body Composition Assessment*. Champaign, IL: Human Kinetics; 1992.
7. Lohman TG, Roche AF, Martorell R. *Anthropometric Standardization Reference Manual*. Champaign, IL: Human Kinetics; 1988.
8. Lohman TG, Houtkooper L, Going SB. Body fat measurement goes high-tech: not all are created equal. *ACSM Health Fitness J*. 1997;1:30–35.
9. American College of Sports Medicine. Position Stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Med Sci Sports Exerc*. 2011;43:1334–1359.
10. Borg GA. Psychophysical bases of perceived exertion. *Med Sci Sports Exerc*. 1982;14:377–381.
11. Robertson RJ, Goss FL, Andreacci JL, et al. Validation of the children's OMNI RPE scale for stepping exercise. *Med Sci Sports Exerc*. 2005;37:290–298.
12. Ainsworth BE, Haskell WL, Leon AS, et al. Compendium of physical activities: classification of energy costs of human physical activities. *Med Sci Sports Exerc*. 1992;2:71–80.
13. Butler RN, Estrine J, Nyberg J. *Walk to a Healthy Future. Issue Brief 10*. New York: International Longevity Center; 2003.
14. Hatano Y. Use of the pedometer for promoting daily walking exercise. *Int Council Health Phys Educ Recreation Sport Dance J*. 1993;29:4–8.
15. Bassett DR Jr, Schneider PL, Huntington GE. Physical activity in an old order Amish community. *Med Sci Sports Exerc*. 2004;36:79–85.
16. Flegal JA, Carroll MD, Ogden CL, et al. Prevalence and trends in obesity among US adults, 1999–2000. *JAMA*. 2002;288:1723–1727.
17. Baumgartner RN, Keohler KM, Gallagher D, et al. Epidemiology of sarcopenia in elderly people in New Mexico. *Am J Epidemiol*. 1998;147:744–763.
18. Morley JE, Baumgartner RN, Roubenoff R, et al. Sarcopenia. *J Lab Clin Med*. 2001;137:231–243.
19. Hewitt MJ. *Growing Older, Staying Strong: Preventing Sarcopenia through Strength Training. Issue Brief 11*. New York: International Longevity Center; 2003.
20. Metcalfe L, Lohman T, Going S, et al. Postmenopausal women and exercise for prevention of osteoporosis. *ACSM Health Fitness J*. 2001;5:6–14.
21. Pollock ML, Abe T, De Hoyos DV, et al. Muscular hypertrophy responses to 6 months of high- or low-volume resistance training. *Med Sci Sports Exerc*. 1998;30:S116.
22. Fleck SJ, Kraemer WJ. *Designing Resistance Training Programs*. Champaign, IL: Human Kinetics; 1987.
23. Dunlap J, Barry HC. Overcoming exercise barriers in older adults. *Physician Sportsmed*. 1999;27:69–75.
24. Hewitt MJ. *The Key Three Strength Program*. Tucson, AZ: Canyon Ranch Health Resort; 2002.
25. American College of Sports Medicine Position Stand. Progression models in resistance training for healthy adults. *Med Sci Sports Exerc*. 2009;41:687–708.
26. Fiatarone MA, Evans WJ. Exercise in the oldest old. *Top Geriatr Rehabil*. 1990;5:63–77.
27. Fiatarone MA, Marks EC, Ryan ND, et al. High-intensity strength training in nonagenarians: effects on skeletal muscle. *JAMA*. 1990;263:3029–3034.
28. Bryant CX, Green DJ, eds. *ACE's Essentials of Exercise Science for Fitness Professionals*. San Diego, CA: American Council on Exercise; 2010.
29. Clark KN. Balance and strength training for obese individuals. *ACSM Health Fitness J*. 2004;8:14–20.
30. Whaley MJ, ed. *ACSM's Guidelines for Exercise Testing and Prescription*. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2005.
31. Kaminsky L, Bonzheim KA, Ewing C, et al. *ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription*. 5th ed. Philadelphia: Lippincott Williams & Wilkins; 2005.



# Breathing Exercises

Geeta Maker-Clark, MD

In ancient China, physicians were expected to keep themselves in excellent health and, by their example, to educate their patients in the correct way of living. It was thought that breath control was crucial to health—the physician learned how to control and regulate breath and was expected to teach patients these breathing techniques.

*Jacqueline Young<sup>1</sup>*

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## Breath as the Life Force

The breath is considered the basic force of life in many cultures. In India, the *prana* (“life,” literally “breathing forth”) of yogic tradition signifies the universal life force as well as the life force as it enlivens the individual being. In Zen tradition, the first 4 of the “112 ways” are instructions for breathing. In Chinese tradition, *qi* is the vital energy of life; a component of *qi* called natural air *qi* is absorbed by the lungs from the air we breathe. The Bible states that God “breathed into Adam’s nostrils the breath of life,” then later used a part of Adam’s respiratory system, a rib, to give life to Eve. A rhythmic process of expansion and contraction, breathing is one example of the consistent polarity we see in nature—night and day, wake and sleep, seasonal growth and decay, and ultimately, life and death. As such, it is a powerful and necessary part of our daily life through which we can access improved mental and physical health.

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## Breathing as a Bridge to the Mind-Body Connection

In yoga, *prana* includes five aspects, or principle breaths, that are referred to as the gatekeepers of the heavenly world.<sup>2</sup> It was this understanding of the close relationship between breath and consciousness that led to the invention of the various techniques of breath control, or pranayama. Whereas

pranayama is also recognized as an essential means of rejuvenating the body, its ultimate purpose is to control the movement of the mind. In Ancient Tibet, it was said that the “breath is the horse and the mind is the rider.”<sup>3</sup> A sigh during times of stress is an example of our mind-body “unconsciously” using the breath to stimulate relaxation. The breath can be considered a bridge to the mind-body connection; through regulation of our breathing, we can stabilize the nervous system, transcend the brain-dependent activities of the mind, and consciously stimulate relaxation and emotional harmony. In other words, we can use breathing exercises to achieve a balance between the mind-body, the conscious-unconscious, and the sympathetic-parasympathetic nervous system. One of the most beneficial things that can be done for both short-term and long-term physical and emotional health is to learn and to use proper breathing techniques.

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## An Example of How Life Affects Physiology

During times of emotional stress, our sympathetic nervous system is stimulated and affects a number of physical responses. During this fight-or-flight response, our heart rate rises, we perspire, our muscles tense, our digestion slows, and our breathing becomes rapid and shallow (as does our thinking, according to yogic tradition). Normally, this process is brought back into balance by the parasympathetic nervous system. With chronic stress, the sympathetic branch of the nervous system becomes overstimulated, leading to an imbalance of the autonomic nervous system that can result in inflammation, high blood pressure, muscle pain, and poor digestion, to name a few detrimental effects. Consciously slowing our heart rate, decreasing perspiration, and relaxing muscles is difficult to do voluntarily. Whereas breathing is one of our many involuntary body functions, it is the only one that we can easily influence voluntarily. Thus, the breath is an excellent tool to help facilitate a relaxation response. We can aid our body in regaining homeostasis by slowing and deepening our breathing.

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Acknowledgment: This chapter was updated by the author from Raket D, Mercado MA: Breathing Exercises. In: Raket D, ed. *Integrative Medicine*, 2nd ed. Philadelphia: Saunders; 2007.

By simply changing the rate and volume of our inhalation and exhalation of air, we can directly stimulate the parasympathetic nervous system, resulting in relaxation and a reversal of the physical changes caused by the stimulation of the sympathetic nervous system during the stress response (Fig. 89-1).

## The Breathing Process Can Be Trained

Our breathing can be trained to have both positive and negative influences on health. Chronic stress can cause us to breathe shallowly and erratically, leading to a restriction of the connective and muscular tissue of the thorax, resulting in a decreased range of motion of the chest wall. By causing decreased venous return to the heart during inspiration, this restrictive breathing pattern also decreases the variability of our heart rate.

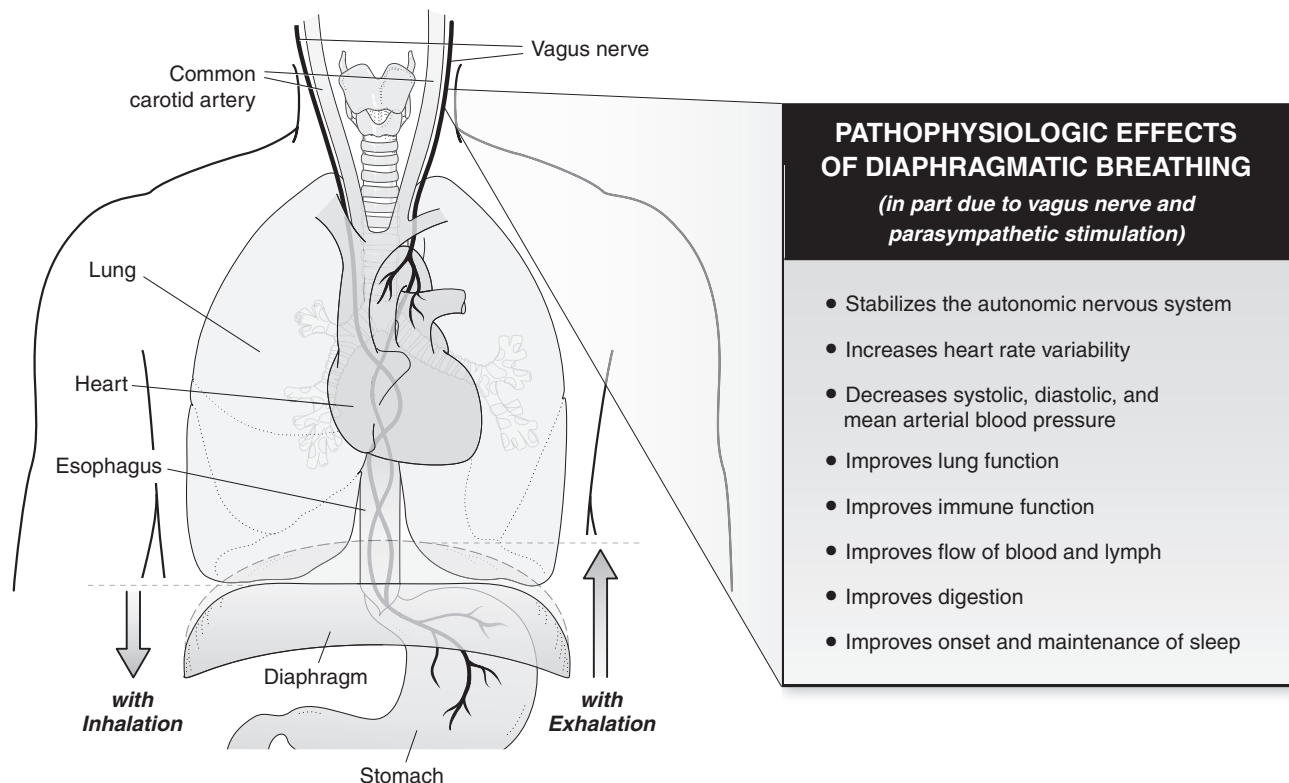
During rapid, shallow breathing, the chest does not expand as much as it would during slower, deeper breaths, which causes the majority of the air exchange to occur at the top of the lung tissue, toward the head. This results in “chest breathing.” Chest breathing is inefficient because the greatest amount of blood flow occurs in the lower lobes of the lungs, areas that have limited air expansion in chest breathers. Rapid, shallow chest breathing results in decreased gas exchange, causing less oxygen transfer to the blood and subsequent poor delivery of nutrients to the tissues as well as less removal of metabolic waste in the form of carbon dioxide from the body. The good news is that similar to learning to play an instrument or to ride a bike, we can train the body to improve the breathing technique. By focusing attention on the breath, we can move toward a sense of calm. It may take

some practice and commitment, but long-term health benefits can be achieved. The relaxation response that is evoked can lead to a body and mind less susceptible to disease.






## The Benefits of Abdominal Breathing

Abdominal breathing is also known as diaphragmatic breathing. The diaphragm is the biggest and most important muscle of respiration. When the diaphragm contracts, it is forced downward, causing the abdomen to expand. This produces a negative pressure within the thoracic cage, forcing air into the lungs. The negative pressure also pulls blood into the chest, increasing venous return to the heart. This leads to improved cardiac output, which results in improved stamina in both disease and athletic activity. Like blood flow, the flow of lymph, which is rich in immune cells, is also improved. By expanding the lungs' alveoli and improving the flow of blood and lymph, abdominal breathing helps prevent infection of the lungs and other tissues. Abdominal breathing can also decrease anxiety and depression by helping the mind-body to relax and reconnect. By practicing breathing exercises on a regular basis, we can improve our heart rate variability (which has been associated with increased longevity), blood pressure, digestion, sleep, and stability of our nervous system as well as stimulate a generalized relaxation response that results in emotional balance and an overall sense of well-being. Deep diaphragmatic breathing results in improved vital capacity by increased aeration of the alveoli. Refer to Table 89-1 for the scientific evidence supporting the physiologic benefits of breathing exercises on specific disease states.





**FIGURE 89-1**  
Pathophysiologic effects of diaphragmatic breathing.



**TABLE 89-1.** A Review of the Literature on the Beneficial Effects of Breathing Exercises on Specific Disease States





DISEASE	STUDY	STUDY CHARACTERISTICS	RESULTS AND CONCLUSIONS	QUALITY*	GRADE†
Autonomic instability (e.g., poor heart rate variability)	Bernardi et al <sup>4</sup>	Italian study of 23 healthy adults comparing effects of recitation of the Ave Maria or a mantra on breathing rate, spontaneous oscillations in R-R interval, blood pressure, and cerebral circulation	"Baroreflex sensitivity . . . increased significantly. . . Rhythm formulas that involve breathing at six breaths per minute induce favourable psychological and possibly physiological effects."	2	
	Pal et al <sup>5</sup>	Indian randomized controlled study of 60 men aged 17 to 19 years; either slow breathing or fast breathing exercises were practiced for 3 months	". . . regular practice of slow breathing exercise for three months improves autonomic functions [i.e., increased parasympathetic activity and decreased sympathetic activity], while practice of fast breathing exercise for the same duration does not affect the autonomic functions."	1	
	Sydorchuk and Tryniak <sup>6</sup>	Ukrainian study of 48 healthy adults; participants were observed to determine the influence of individually and differentially prescribed specific respiratory exercises on the vegetative nervous system state	". . . respiratory exercises . . . restore reliably a functional state of the vegetative nervous system [and] enable the sympathetic and parasympathetic nervous systems to regain the balance."	2	
	Oneda et al <sup>7</sup>	Brazilian study of 27 mild hypertensive patients; used slow breathing with interactive music (device-guided breathing) or listening to calm music to determine which decreased sympathetic nerve activity	"Only device-guided slow breathing was able to reduce peripheral sympathetic nerve activity" as measured by lowered blood pressure, decreased respirations and heart rate.	2	
Depression or anxiety	Han et al <sup>8</sup>	Chinese clinical study investigating the efficacy of breathing retraining on complaints, anxiety, and breath-holding in patients with medically unexplained dyspnea	"Breathing retraining profoundly improved . . . symptoms and decreased the level of state and trait anxiety. Breathing retraining turns out to be an effective therapy for those 'difficult to treat patients'."	2	
	Hibbert and Chan <sup>3</sup>	British controlled clinical study of patients who experienced panic attacks; the treatment group received training in controlled breathing, the control group received no training	"Observer ratings of anxiety showed a greater improvement for the group that received breathing training. . . . These findings suggest that training in controlled breathing . . . may have a non-specific effect in the treatment of patients with panic attacks."	2	
	Tweeddale et al <sup>9</sup>	Scottish controlled clinical study of 22 patients investigating the effectiveness of breathing retraining on hyperventilation, depression, and anxiety	". . . breathing retraining is of benefit, not only in restoring more normal patterns of breathing but also in reducing anxiety."	2	
	Feldman et al <sup>10</sup>	U.S. study comparing mindful breathing to progressive muscle relaxation and loving kindness meditation on negative reactions to repetitive thoughts; 190 novice meditators were assigned to complete one of the three 15-minute exercises and then completed measures of decentering, repetitive thought frequency, and negative reaction to thoughts	"Mindful breathing participants reported greater decentering . . . may help reduce reactivity to repetitive negative thoughts."	2	
	Brown and Gerbarg <sup>11</sup>	U.S. review article providing clinical evidence for the use of yoga breathing ( <i>pranayama</i> ) in the treatment of depression, anxiety, posttraumatic stress disorder, and victims of mass disasters	"By inducing stress resilience, breath work enables us to rapidly and compassionately relieve many forms of suffering."	2	

**TABLE 89-1.** A Review of the Literature on the Beneficial Effects of Breathing Exercises on Specific Disease States—cont'd

DISEASE	STUDY	STUDY CHARACTERISTICS	RESULTS AND CONCLUSIONS	QUALITY*	GRADE†
Hypertension	Grossman et al <sup>12</sup>	Israeli randomized controlled study of 33 adults aged 25 to 75 years; the effect of breathing exercises with interactive music on blood pressure was compared to control treatment (quiet music alone)	"... average blood pressure [improved] by $-5.0/-2.7$ mm Hg in the active treatment group. Thus, breathing exercise ... for 10 minutes daily is an effective non-pharmacological modality to reduce blood pressure."	1	
	Schein et al <sup>13</sup>	Israeli randomized controlled study of 65 adults with hypertension; participants received self-treatment that guided slow and regular breathing using musical sound patterns or quiet music alone for 10 minutes daily for 8 weeks	"... [slow, regular breathing] reduced systolic blood pressure, diastolic blood pressure, and mean arterial pressure by 15.2, 10.0 and 11.7 mm Hg respectively. Breathing pattern modification appears to be an important component in this reduction."	1	
	Viskoper et al <sup>14</sup>	Israeli multicenter clinical study of 17 patients with resistant hypertension; participants exercised device-guided slow breathing for 15 minutes daily for 8 weeks and self-monitored blood pressure	"Significant reductions in both office BP ( $-12.9/-6.9$ mm Hg, $P < .001$ ) and home BP ( $-6.4/-2.6$ mm Hg, $P < .01/P < .05$ ) [occurred] without side effects with 82% responders and good compliance. Resistant hypertensives can benefit from and are compliant with self-treatment by device-guided slow breathing."	2	
	Kaushik et al <sup>15</sup>	Indian clinical trial comparing mental relaxation to slow breathing (6 breaths/min) as adjunctive treatment of 100 patients with essential hypertension by observing effects on heart rate, respiratory rate, peripheral skin temperature, and electromyographic activity of frontalis muscle	"Even a single session of mental relaxation or slow breathing can result in temporary fall in blood pressure. Slow breathing caused a significantly higher fall in heart rate ( $p < 0.05$ ), respiratory rate ( $p < 0.001$ ), systolic blood pressure ( $p < 0.05$ ) and diastolic blood pressure ( $p < 0.01$ )."	2	
	Mourya et al <sup>16</sup>	Indian randomized controlled trial comparing slow breathing (5-6 /min) and fast breathing (30/min) in 60 patients with stage 1 essential hypertension. Outcomes on autonomic functions of blood pressure (BP), standing-to-lying ratio (S/L), Valsalva ratio, heart rate variation with respiration (E/I), hand-grip testing, and cold pressor response were then measured.	"Slow breathing had stronger effect than fast breathing. S/L ratio, E/I ratio, and BP response in hand grip and cold pressor test showed significant change only in patients practicing the slow breathing exercise. BP decreased longitudinally over a 3-month period with both interventions"	2	
Insomnia	Choliz <sup>17</sup>	Spanish randomized controlled study of 46 patients with insomnia; participants were trained in the breathing process in the active group or received no breathing training in the control group.	"Increase in CO <sub>2</sub> has a sedative effect upon the central nervous system, and the beginning of sleep coincides with modifications in breathing. ... Latencies to sleep for the insomniacs confirmed that the breathing process was useful in producing drowsiness."	1	
	Manjunath and Telles <sup>18</sup>	Indian randomized controlled study of 69 nursing home residents; participants were randomly allocated to three groups: Yoga (including voluntarily regulated breathing), Ayurveda (an herbal preparation), and Wait-list control (no intervention).	"The Yoga group [whose practice included regulated breathing] showed a significant decrease in the time taken to fall asleep, an increase in the total number of hours slept, and in the feeling of being rested in the morning. The other groups showed no significant change."	1	
	Tsai <sup>19</sup>	Chinese controlled clinical study of 100 cardiology patients observed for 1 year; audiovisual relaxation training including deep breathing was compared with routine nursing care.	"Relaxation training [including deep breathing] significantly improved anxiety, sleep, and relaxation in the treatment group as compared to the control group."	2	

Continued

**TABLE 89-1.** A Review of the Literature on the Beneficial Effects of Breathing Exercises on Specific Disease States—cont'd

DISEASE	STUDY	STUDY CHARACTERISTICS	RESULTS AND CONCLUSIONS	QUALITY*	GRADE†
Pulmonary diseases (e.g., pneumonia, chronic obstructive pulmonary disease, asthma)	Chumillas et al <sup>20</sup>	Spanish randomized controlled study of 81 patients after upper abdominal surgery; the effectiveness of respiratory rehabilitation involving breathing exercises in preventing postoperative pulmonary complications was compared with no treatment.	"The incidence of postoperative pulmonary complications was 7.5% in the rehabilitation group [treated with breathing exercises] and 19.5% in the control group; the control group also had more radiologic alterations (p = .01)."	1	
	Vraciu and Vraciu <sup>21</sup>	Clinical study of 40 patients undergoing open heart surgery; the effectiveness of breathing exercises in high-risk and low-risk patients in preventing pulmonary complications was compared with routine postoperative care.	"Breathing exercises reduced the incidence of pulmonary complications . . . in the high-risk group. These results justify the use of breathing exercises with the high-risk open-heart surgical patient [to prevent postoperative pulmonary complications]."	2	
	Yan et al <sup>22</sup>	Chinese multicenter, randomized controlled study of 324 patients with stable chronic obstructive pulmonary disease (COPD); the effectiveness of breathing exercises in preventing progression of COPD was compared with placebo medicine.	"It is shown preliminarily that breathing exercises had potent and lasting effect on respiratory muscle contraction [which is a key factor in preventing progression of COPD]."	1	
	Thomas et al <sup>23</sup>	U.K. multicenter randomized controlled trial comparing breathing training with asthma education; 94 subjects with asthma received three sessions of therapist-supervised breathing training, and 89 subjects received asthma nurse-delivered education. Outcome was measured by Asthma Quality of Life Questionnaire and secondary outcomes including spirometry, exhaled nitric oxide, and induced sputum eosinophil count.	"Breathing training resulted in improvements in asthma-specific health status and other patient-centered measures, but not in asthma pathophysiology."	1	
	Raupach et al <sup>24</sup>	European study investigating whether there is sympathetic activation in COPD patients in the absence of hypoxia and whether slow breathing has an impact on sympathoexcitation and baroreflex sensitivity, in 15 COPD patients and 15 controls	"Sympathovagal imbalance is present in normoxic COPD patients. Slow breathing significantly enhanced baroreflex sensitivity in both groups."	2	
	Genc et al <sup>25</sup>	Turkish study investigated respiratory and hemodynamic responses to deep breathing exercise (DBE) in the intensive care unit after major head and neck surgery; 35 patients were instructed to perform DBE every hour for 3 consecutive hours after surgery	"DBE improves oxygenation after major head and neck surgery, without causing additional harmful hemodynamic effects."	2	

\*Quality: quality of study based on SORT criteria.

†Grade: evidence (letter) versus harm (number).

## KEY WEB RESOURCES

<a href="http://www.holisticonline.com/yoga/hol_yoga_breath_home.htm">http://www.holisticonline.com/yoga/hol_yoga_breath_home.htm</a>	Sites that teach about breathing exercises and how to perform them
<a href="http://www.drweil.com/drw/u/ART00521/three-breathing-exercises.html">http://www.drweil.com/drw/u/ART00521/three-breathing-exercises.html</a>	
<a href="http://www.fammed.wisc.edu/our-department/media/618/complete-breath">http://www.fammed.wisc.edu/our-department/media/618/complete-breath</a>	
<a href="http://www.fammed.wisc.edu/our-department/media/618/balanced-breathing">http://www.fammed.wisc.edu/our-department/media/618/balanced-breathing</a>	
<a href="http://www.fammed.wisc.edu/our-department/media/618/brief-introduction-yogic-breathing">http://www.fammed.wisc.edu/our-department/media/618/brief-introduction-yogic-breathing</a>	Introduction to yogic breathing
<a href="http://www.fammed.wisc.edu/our-department/media/618/kapalabhati-breath">http://www.fammed.wisc.edu/our-department/media/618/kapalabhati-breath</a>	The energizing breath (Kapalabhati Breath)
<a href="http://www.yogajournal.com/practice/pranayama">http://www.yogajournal.com/practice/pranayama</a>	Information on pranayama yoga breathing from <i>Yoga Journal</i>

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## References

References are available online at expertconsult.com.

## Patient Handout: Breathing Exercises

### Why is breathing well important?

Obviously, breathing is essential to life. However, breathing is even more important than you might think. How deeply you breathe, how rapidly you breathe, and whether you breathe from your chest or from your abdomen profoundly affect your body and mind. Learning and using proper breathing techniques is one of the most beneficial things that you can do for both your short-term and long-term physical and emotional health. Since breathing is something that we can control, it can be a very useful tool for achieving a relaxed state of mind and body. The regularity of practice is more important than the amount of time.

### How does breathing affect health?

During times of emotional stress, our nervous system is stimulated and affects a number of physical responses. During this process our heart rate rises, our muscles tense, our digestion slows, we start to sweat, and our breathing becomes rapid and shallow. Normally, our nervous system is able to bring itself back into balance. However, with chronic stress, our nervous system becomes over-stimulated, leading to an imbalance of the system that can result in inflammation, high blood pressure, and muscle pain, to name a few detrimental effects.

We can aid our nervous system in regaining balance by voluntarily slowing and deepening our breathing. By simply changing our breathing, we can directly stimulate a reversal of the physical changes caused by our nervous system during the stress response. By practicing breathing exercises on a regular basis, we can improve our heart rate, blood pressure, digestion, sleep, and the stability of our nervous system, as well as stimulate a generalized relaxation response that results in less tension and an overall sense of well-being.

### What are the side effects of breathing exercises?

Breathing exercises are easy, free, don't require any equipment, and can be done anywhere at any time. In general, breathing exercises are very safe. There is a risk of hyperventilation that can result in dizziness and/or loss of consciousness if breathing exercises are done too rapidly or if the Bellows Breathing Technique (see below) is done too much at the beginning of your breathing practice.

### How are breathing exercises done?

There are many different breathing exercises. Listed here are two simple, yet very beneficial breathing techniques. To achieve the greatest benefit, breathing exercises should be practiced on a daily basis, preferably not immediately after eating or on an empty stomach.

#### Abdominal Breathing Technique

Breathing exercises such as this one should be done twice a day or whenever you find yourself under stress, your mind dwelling on upsetting thoughts, or when you are experiencing pain. Abdominal breathing is just one of the many breathing exercises, but it is the most important one to learn before exploring other techniques. The more it is practiced, the more natural it will become, improving your mind and body's internal balanced rhythm.

- Place one hand on your chest and the other hand on your abdomen. When you take a deep breath in, the hand on the abdomen should rise higher than the one on the chest. This ensures that the diaphragm is pulling air into the bases of the lungs.
- Place your tongue at the ridge of tissue behind your upper teeth, keeping it there through the entire exercise.
- After completely exhaling through your mouth, take a slow deep breath in quietly through your nose for a count of 4, imagining that you are sucking in all of the air in the room.
- Hold it for a count of 7 (or as long as you are able, not exceeding 7).
- Slowly exhale through your mouth for a count of 8. As all the air is released with exhalation, gently contract your abdominal muscles to completely evacuate the remaining air in your lungs. It is important to remember that we deepen respirations by completely exhaling air, rather than inhaling more of it.
- Repeat the cycle four more times for a total of five deep breaths. Do not do more than 5 at one time for the first few months of practice.

#### Tip

- In general, exhalation should be twice as long as inhalation.
- If you have trouble with the exercise, you can speed it up but maintain the 4:7:8 ratio. With practice you will be able to slow it down and breathe in and out more deeply.
- A rate of one full breath (inhalation and exhalation) every 10 seconds (for a total of 6 breaths per minute) has been found to have the most beneficial effect on stabilizing the nervous system and reducing blood pressure.
- The use of the hands on the chest and abdomen is needed only to help you train your breathing. Once you feel comfortable with your ability to breathe into your abdomen, you no longer need to do the hands placement of the exercise.
- Once you feel comfortable with this technique, you may want to incorporate words that can enhance the exercise. Examples are to say to yourself, "relaxation" (with inhalation) and "stress" or "anger" (with exhalation), so that you are breathing "in with the good and out with the bad." The idea is that you bring in the feeling/emotion that you want with inhalation and release those you do not want with exhalation.

#### The Bellows Breathing Technique (The Stimulating Breath)

If practiced over time, the abdominal breathing exercise can result in improved energy throughout the day, but sometimes we are in need of a quick "pickup." You can use the bellows breathing exercise (also called the stimulating breath or *kapalabhati*) during times of fatigue that may result from driving long distances or when you need to be revitalized at work. It should not be used in place of abdominal breathing, but in addition as a tool to increase energy when needed. It is a good thing to use instead of reaching for a cup of coffee.

The bellows breathing exercise is opposite to that of abdominal breathing. Short, fast rhythmic breaths, which are similar to the chest breathing we do when under stress, are used to increase energy. The bellows breath re-creates the nervous system's response to stress and results in release of energizing chemicals such as epinephrine. As with most bodily functions, this stimulation serves an active purpose, but overuse results in adverse effects, as discussed previously.

- Sit in a comfortable upright position with your spine straight, shoulders relaxed
- Place your hands at the base of the neck and the diaphragm to get a feel of where the breath should be
- With your mouth gently closed, breath in and out of your nose as fast as possible. To give an idea of how this is done, think of someone using a bicycle pump (a bellows) to quickly pump up a tire. The upstroke is the inspiration and the downstroke is exhalation, and both are equal in length.
- While doing the exercise, you should feel effort at the base of your neck, chest, and abdomen. The muscles in these areas will increase in strength the more this technique is practiced. This is truly an exercise!
- Do this breathing technique no more than 15 seconds when first starting. With practice, slowly increase the length of the exercise by 5 seconds each time. Do it as long as you are comfortably able, not exceeding 1 full minute.
- There is a risk for hyperventilation that can result in dizziness and/or a loss of consciousness if this exercise is done for too long or too much in the beginning. For this reason, it should be practiced in a safe place, such as a bed or a chair.
- This exercise can be used each morning on awakening or when needed for an energy boost.

#### HOW CAN I LEARN MORE?

The reader is encouraged to enroll in a yoga (particularly a hatha or pranayama yoga) class at a local community or fitness center. Most well-trained instructors will educate students about various breathing techniques and how the breath is used to enhance well-being with yoga practice.

An excellent book to help explore more advanced breathing techniques is *Conscious Breathing* by Gay Hendricks (New York, Bantam, 1995).

An excellent audiotape, *Breathing: The Master Key to Self Healing*, by Andrew Weil, discusses the health benefits of breathing and directs the listener through eight breathing exercises (Sounds True, 1999).



## References

- Young J. *The Healing Path*. London: Thorsons; 2001.
- Bhargava R, Gogate MG, Mascarenhas JF. Autonomic responses to breath holding and its variations following pranayama. *Indian J Physiol Pharmacol*. 1988;32:257–264.
- Hibbert GA, Chan M. Respiratory control: its contribution to the treatment of panic attacks. *Br J Psychiatry*. 1989;154:232–236.
- Bernardi L, Sleight P, Bandinelli G, et al. Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: comparative study. *BMJ*. 2001;323:1446–1449.
- Pal GK, Velkumary S, Madanmohan. Effect of short-term practice of breathing exercises on autonomic functions in normal human volunteers. *Indian J Med Res*. 2004;120:115–121.
- Sydorchuk LP, Tryniak MH. Effect of the special breathing exercises on the autonomic regulation of the functional state of respiration and muscular systems. *Lik Sprava*. 2005;3:44–47.
- Oneda B, Ortega KC, Gusmao JL, et al. Sympathetic nerve activity is decreased during device-guided slow breathing. *Hypertens Res*. 2010;33:708–712.
- Han JN, Zhu YJ, Li SW, et al. Medically unexplained dyspnea: psychophysiological characteristics and role of breathing therapy. *Chin Med J (Engl)*. 2004;117:6–13.
- Tweeddale PM, Rowbottom I, McHardy GJ. Breathing retraining: effect on anxiety and depression scores in behavioural breathlessness. *J Psychosom Res*. 1994;38:11–21.
- Feldman G, Greeson J, Senville J. Differential effects of mindful breathing, progressive muscle relaxation, and loving-kindness meditation on decentering and negative reactions to repetitive thoughts. *Behav Res Ther*. 2010;48:1002–1011.
- Brown RP, Gerbarg PL. Sudarshan Kriya yogic breathing in the treatment of stress, anxiety, and depression: part I—neurophysiologic model. *J Altern Complement Med*. 2005;11:189–201.
- Grossman E, Grossman A, Schein MH, et al. Breathing-control lowers blood pressure. *J Hum Hypertens*. 2001;15:263–269.
- Schein MH, Gavish B, Herz M, et al. Treating hypertension with a device that slows and regularises breathing: a randomised, double-blind controlled study. *J Hum Hypertens*. 2001;15:271–278.
- Viskoper R, Shapira I, Priluck R, et al. Nonpharmacologic treatment of resistant hypertensives by device-guided slow breathing exercises. *Am J Hypertens*. 2003;16:484–487.
- Kaushik RM, Kaushik R, Mahajan SK, Rajesh V. Effects of mental relaxation and slow breathing in essential hypertension. *Complement Ther Med*. 2006;14:120–126.
- Mourya M, Mahajan AS, Singh NO, Jain A. Effect of slow and fast breathing exercises on autonomic functions in patients with essential hypertension. *J Altern Complement Med*. 2009;15:711–717.
- Choliz M. A breathing-retraining procedure in treatment of sleep-onset insomnia: theoretical basis and experimental findings. *Percept Mot Skills*. 1995;80:507–513.
- Manjunath NK, Telles S. Influence of Yoga and Ayurveda on self-rated sleep in a geriatric population. *Indian J Med Res*. 2005;121:683–690.
- Tsai SL. Audio-visual relaxation training for anxiety, sleep, and relaxation among Chinese adults with cardiac disease. *Res Nurs Health*. 2004;27:458–468.
- Chumillas S, Ponce JL, Delgado F, et al. Prevention of postoperative pulmonary complications through respiratory rehabilitation: a controlled clinical study. *Arch Phys Med Rehabil*. 1998;79:5–9.
- Vraciu JK, Vraciu RA. Effectiveness of breathing exercises in preventing pulmonary complications following open heart surgery. *Phys Ther*. 1977;57:1367–1371.
- Yan Q, Sun Y, Lin J. A quantitative study on the effect of breathing exercises in improving respiratory muscle contraction. *Zhonghua Nei Ke Za Zhi*. 1996;35:235–238.
- Thomas M, McKinley RK, Mellor S, et al. Breathing exercises for asthma: a randomised controlled trial. *Thorax*. 2009;64:55–61.
- Raupach T, Bahr F, Herrmann P, et al. Slow breathing reduces sympathoexcitation in COPD. *Eur Respir J*. 2008;32:387–392.
- Genc A, Ikiz AO, Gunerli EA, Gunerli A. Effect of deep breathing exercises on oxygenation after major head and neck surgery. *Otolaryngol Head Neck Surg*. 2008;139:281–285.

## Additional Reading

- Baldwin DL, Suki B, Pillow JJ, et al. Effect of sighs on breathing memory and dynamics in healthy infants. *J Appl Physiol*. 2004;97:1830–1839.
- Bernardi L, Porta C, Spicuzza L, et al. Slow breathing increases arterial baroreflex sensitivity in patients with chronic heart failure. *Circulation*. 2002;105:143–145.
- Björkqvist M, Wiberg B, Bodin L, et al. Bottle-blowing in hospital-treated patients with community-acquired pneumonia. *Scand J Infect Dis*. 1997;29:77–82.
- Borovikova LV, Ivanova S, Zhang M, et al. Vagus nerve stimulation attenuates the systemic inflammatory response to endotoxin. *Nature*. 2000;405:458–462.
- Boron WF, Richerson GB. The respiratory system. In: Boron WF, Boulpaep EL, eds. *Medical Physiology*. Philadelphia: Saunders; 2003.
- Brown RP, Gerbarg PL. Yoga breathing, meditation, and longevity. *Ann N Y Acad Sci*. 2009;1172:54–62.
- Cohen L, Warneke C, Fouladi RT, et al. Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. *Cancer*. 2004;100:2253–2260.
- Elliot WJ, Izzo JL Jr, White WB, et al. Graded blood pressure reduction in hypertensive outpatients associated with use of a device to assist with slow breathing. *J Clin Hypertens (Greenwich)*. 2004;6:553–559.
- Feuerstein G. *The Shambala Encyclopedia of Yoga*. Boston: Shambala Publications; 2000.
- Hewitt JH. *The Complete Yoga Book*. New York: Schocken Books; 1977.
- Lee JS, Lee MS, Lee JY, et al. Effects of diaphragmatic breathing on ambulatory blood pressure and heart rate. *Biomed Pharmacother*. 2003;57(suppl 1):87s–91s.
- Patel C, Marmot MG, Terry DJ, et al. Trial of relaxation in reducing coronary risk: four year follow up. *Br Med J (Clin Res Ed)*. 1985;290:1103–1106.
- Patel C, North WR. Randomised controlled trial of yoga and bio-feedback in management of hypertension. *Lancet*. 1975;2:93–95.
- van Dixhoorn J. Cardiorespiratory effects of breathing and relaxation instruction in myocardial infarction patients. *Biol Psychol*. 1998;49:123–135.



# 90

## Prescribing Movement Therapies

Patrick B. Massey, MD, PhD

The body of man is a machine which winds its own springs.

*J. O. De La Mettrie, French physician, 1709-1751*

Physical movement is crucial to ensure health as well as to treat disease. There are few illnesses that cannot be improved, and sometimes cured, with regular exercise. Indeed, exercise is the most effective health maintenance tool in the medical armamentarium, albeit underprescribed. In all of the programs described here, there is a recurrent motif of establishing and maintaining “balance.” It seems to be a common theory that once the body is “in balance,” good health is the result. Exercise, when it is done properly, may be the definition of “mind-body” medicine.

There are many exercise programs. However, the precise health benefits of most are unknown. For a small number of exercise programs, the growing data can steer us in the direction that could be, for the most part, beneficial to our patients. Some exercise approaches, like tai chi and yoga, for which there is more robust research, hold great potential as therapeutic tools and are increasingly incorporated into allopathic medicine (Table 90-1).

Not all exercise approaches may be appropriate for all patients. Some may be too demanding, whereas others may not be challenging enough. It is important to match the most appropriate movement therapy to the unique needs and beliefs of the individual patient. Regardless of the exercise therapy, movement is crucial to health.

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### Alexander Technique

#### History

Frederick Matthias Alexander (1869-1955), an actor and Shakespearean orator, at some point during his early career experienced chronic laryngitis. The traditional medical

approaches proved to be insufficient, compelling him to develop a program that would enable him to regain his ability to speak loudly and clearly.

After exhaustive self-observations of his neck and facial muscles, he noted that greater tension with speaking resulted in laryngitis. He discovered that when he relaxed his neck muscles, his speech was better and he felt his spine “lengthen.” Alexander hypothesized that there was a discrepancy between his kinesthetic senses of what he was doing and what he was actually doing. As a result, he sought to retrain his body and kinesthetic sense.

#### Theory

Alexander believed that tonic muscle activity, kinesthetic perception, and reactivity to contextual stimuli are interrelated fundamental aspects of an individual. He collectively referred to these as the “use of the self.”<sup>1</sup> Alexander believed that automatic responses to stimuli could become habitual and lead to long-term adaptations of tonic muscle activity. Sometimes these adaptations are inefficient and may decrease the accuracy of kinesthetic self-perception. In other words, thought can set habitual patterns of action.

Alexander thought that these adaptations, in turn, reinforce excessive automatic responses and underlie numerous psychophysiologic conditions, such as anxiety disorders and back pain. Practicing specific postural adjustments of the head, spine, and other parts of the body, Alexander devised a method designed to readjust the kinesthetic sense and bring the body into balance. One of the benefits of the Alexander technique is that it may help uncover areas of imbalance, such as head position, spine movement, and arm and leg swing with walking.

#### Clinical Application

Although the Alexander technique does not specifically address pain, it does address underlying imbalances and disturbances in kinesthetic sense (Table 90-2).<sup>2,3</sup> A few clinical

**TABLE 90-1. Quality of Evidence**

GRADE	DEFINITION
A	Well-controlled and randomized studies showing benefit for specific medical conditions with statistical power
B	Clinical trials with statistical power to show benefit for specific medical conditions
C	Case studies and small clinical trials showing benefit or positive trend
D	Occasional case study, testimonial, and personal experience

**TABLE 90-2. Summary of Alexander Technique**

Evidence for effectiveness	C; limited studies or case reports and reported clinical experience
Risk of harm	Low
National licensure	No
State license	No
Alexander certification	Yes; Alexander
Continuing education	Yes, every 3 years; 24 hours of training in movement education, private practice, group presentation, group leadership
Medical conditions that Alexander technique may benefit	Limited movement Balance disorders Muscle spasms Parkinson's disease Sports injuries Back pain
Contact information	Society for Teachers of the Alexander Technique (STAT, United Kingdom): <a href="http://www.stat.org.uk/">www.stat.org.uk/</a> American Society for the Alexander Technique (AmSAT): <a href="http://www.amsatonline.org/">www.amsatonline.org/</a> Email: <a href="mailto:info@amsatonline.org">info@amsatonline.org</a> PO Box 2307 Dayton, OH 45401-2307 Phone: 800-473-0620 or 937-586-3732 Fax: 937-586-3699

studies have demonstrated benefit of this technique in the gait and balance disturbances associated with Parkinson's disease and low back pain.<sup>4-8</sup> Interestingly, in a case study of low back pain, as the balance deficits improved, so did the pain.<sup>7</sup> These results were confirmed in a larger, randomized clinical trial comparing usual medical care, massage, and Alexander technique. At 1 year, Alexander technique was more effective for back pain than usual care and massage.<sup>9</sup>

### Quality of Medical Research: C

As with many nontraditional movement therapies, large, randomized clinical trials are rare even though personal experience and testimonials abound. The Alexander

technique, however, is not specifically disease oriented and focuses on correction of underlying postural disturbances.

## Feldenkrais Method

### History

Moshe Pinhas Feldenkrais (1904-1984), an electrical engineer, was a recognized expert in the martial arts, judo, and jujitsu. As a result of his own injuries, he combined his training in martial arts with a number of relaxation techniques to devise his therapeutic approach, the Feldenkrais method. Like the Alexander technique, the Feldenkrais method is a learning process and not a specific medical or therapeutic technique.

### Theory

Feldenkrais presumed that humans can learn at any age. He also presumed that the nervous system and musculoskeletal system are intertwined. Distortion or trauma in the development or function of the nervous system can have physical manifestations in the form of patterns of dysfunction. Over time, the result of this dysfunction may be pain and disability. Feldenkrais believed that this dysfunction can be unlearned through proper movement and education.

Therefore, the Feldenkrais method is a reeducation process using physical movement as the teaching tool. Increasing pain-free range of motion is the goal in the therapy, in addition to reeducating the interaction between the body and mind.

### Clinical Application

The Feldenkrais method has been applied to a number of medical conditions, including chronic pain, gait disturbance, muscle spasm, and stress-related conditions (Table 90-3). It achieves its "reeducation" of the mind and body through two programs, Awareness Through Movement and Functional Integration.

Awareness Through Movement consists of verbally directing physical movement and is primarily offered to groups of people. Many sessions are available and are focused on specific physical functions or conditions. Each session may last between 30 and 60 minutes.

Functional Integration is a hands-on approach usually performed with the participant on a table. In this way, the practitioner can direct how the specific movements are done. This approach is done without the forceful techniques sometimes found in traditional physical therapy. The practitioner develops a tailored exercise program for the participant. Each session in this approach may also last between 30 and 60 minutes.

It is not unusual for licensed physical therapists to become qualified in these methods and to incorporate the Feldenkrais method into their clinical therapeutic approach to pain and dysfunction.

### Quality of Research: C

As with many other movement therapy systems, the number of clinical studies of the Feldenkrais method published in the medical literature is limited. As a result, it is impossible to draw any firm conclusions as to its effectiveness.

**TABLE 90-3.** Summary of Feldenkrais Method

Evidence for effectiveness	C; limited studies or case reports and reported clinical experience
Risk of harm	Low
National licensure	No
State license	No
Feldenkrais certification	Yes; locations nationally and internationally
Training and continuing education	Yes; professional training program lasts 3 to 4 years All practitioners must complete 800 to 1000 hours of training; participate in Awareness Through Movement and Functional Integration lessons, lectures, discussions, group process, and videos of Dr. Feldenkrais' teaching Students are supervised for a period before receiving their certificate
Medical conditions that Feldenkrais method may benefit	Back and neck pain Stress Muscle spasms Pain Multiple sclerosis and Parkinson's disease (symptoms) Fibromyalgia
Contact information	Feldenkrais Educational Foundation of North America: <a href="http://www.feldenkrais.com/">www.feldenkrais.com/</a> 5436 N Albina Ave. Portland, OR 97217 Toll-free phone: 800-775-2118 Phone: 503-221-6612 Fax: 503-221-6616

One well-designed crossover study claimed no benefit for Feldenkrais method over a sham exercise for the symptoms of multiple sclerosis.<sup>10</sup> This study looked at the effects of the Feldenkrais method and sham exercise on a number of parameters, including hand dexterity, anxiety and depression, self-efficacy, symptoms, performance, and perceived stress. The Feldenkrais method seemed to improve stress and anxiety. Although both Feldenkrais and sham exercise improved self-efficacy, there were no significant improvements in function and performance. There were two drawbacks to this study, however. Only 20 people were enrolled, and each arm of the study lasted only 8 weeks.

In another study by James et al,<sup>11</sup> the Feldenkrais method was not found to be better than relaxation techniques and the control group's experience for improving hamstring flexibility. This study was flawed by the small number of sessions (14 total) and the fact that the Feldenkrais method is not specifically designed to increase flexibility, especially in otherwise healthy volunteers.

In a 2010 study, the use of Awareness Through Movement in an elderly population demonstrated significant improvements in balance and mobility and a decrease in the fear of falling compared with a wait-listed control.<sup>12</sup>

Given the international use of the Feldenkrais method, one would have to presume that there is some measurable benefit. Other published research suggests some potential

for clinical benefit, but additional, well-planned studies are needed before firm conclusions can be reached and recommendations can be made.<sup>13-16</sup>

## Martial Arts, Tai Chi, and Qi Gong

### History

The basis of martial arts, be it tai chi, kung fu, or others, has always been development of the body, mind, and spirit. In Asia, martial arts and medicine have intertwined for thousands of years.<sup>17</sup> Unfortunately, in the United States, martial arts are commonly associated with pugilistic applications.

The histories of most martial arts are vague, given the tradition of passing knowledge orally from master to student.<sup>17</sup> According to these legends, however, martial arts have probably been practiced for thousands of years. A few, like tai chi, aikido, and tae kwon do, were systematized within the past few hundred years.<sup>18</sup> Although their lineage is clearer, it is likely that these disciplines may have developed as a synthesis from earlier martial art styles.

Some people believe that martial art movements originated from observation of the movements of animals, plants, and even water, focusing on the balance of flexibility, strength, and speed found in nature. Others believe that some martial arts, like kung fu, have their origins in yoga-type exercises.<sup>17</sup>

Although being flexible, strong, and fast has obvious benefits in self-defense, health has always been the driving force in martial arts. Throughout history in Asia, many famous physicians have also been experts in the martial arts, and martial art experts become physicians.<sup>17</sup>

### Theory

Martial arts are commonly divided into two broad categories (with extensive overlap). "External" martial arts, like karate and tae kwon do, are those whose movements and exercises tend to be more ballistic and to use linear snapping motions. "Internal" martial arts, like tai chi, kung fu, and bagwa, emphasize circular movements, often at a slower pace. Qi gong (chee gong) breathing is a specific pattern of breathing and is often coupled with specific, repetitive movements. In Oriental medicine, the flow of qi (life energy) is believed to be vital for health. Qi gong is the foundation of most martial arts and, in this discussion, is considered to be part of the internal martial arts.

External martial arts primarily affect the muscles, creating strength and speed. As a therapeutic tool for the elderly and infirm, external martial arts may be limited.

The internal martial arts, it is believed, enhance the production and flow of qi. When the flow of energy is good, the body is healthy. Therefore, internal martial arts are effective not only for strength and speed but also for promoting health in the internal organs and joints, improving balance, and reducing stress.

### Clinical Applications

Both categories of martial arts (internal and external) are exceptional sources of physical movement not commonly found in other types of exercise (Table 90-4). Tai chi has commanded the greatest amount of allopathic medical research. The exercises

**TABLE 90-4.** Summary of Martial Arts and Tai Chi

Evidence for effectiveness	A; randomized controlled clinical trials, meta-analysis, case studies, clinical trials
Risk of harm	Low
National licensure	No
State license	No
Martial arts and tai chi certification	Yes; locations nationally and internationally; however, no standardization of teaching
Continuing education	No; no set requirements for maintaining standards of training
Medical conditions that martial arts and tai chi may benefit	Balance, strength, fall prevention Stress relief Osteoporosis Cardiac disease, high blood pressure Parkinson's disease Back and neck pain
Contact information	No recognized, central governmental bodies for martial arts or tai chi Many hospitals, medical centers, and health clubs offer tai chi and other martial arts lessons and classes

or movements involved in tai chi encourage the body to move smoothly, without effort, through ranges of motion not commonly reached in activities of daily living.

### Quality of Research: A

The majority of the medical research on the martial arts that has been published in the allopathic literature has focused on improved functioning in the elderly. Initial studies demonstrated improved balance and strength in the elderly who practiced tai chi.<sup>19,20</sup> These studies have been confirmed and expanded on to suggest an important role for tai chi in the prevention of falls in the elderly.<sup>21,22</sup> In these studies, the participants, elderly patients who were at substantial risk of falling, showed significant improvements in a number of balance and strength parameters as well as an increased feeling of security with daily activities. The potential benefits of tai chi and martial arts also include improvements in cardiovascular and pulmonary parameters, flexibility, immune function, osteoarthritis, arthritis pain, fibromyalgia, function, and strength as well as a better sense of well-being.<sup>23-26</sup> For more than a decade, a pioneer physical therapy program has been exclusively using martial art–based exercises to increase range of motion and strength in patients with therapy-resistant back and neck pain.<sup>27</sup>

A 2012 study of Tai chi for Parkinson disease showed that when compared with stretching and resistance exercise, tai chi was better for improving balance, control, walking and reducing falls after 6 months of training.<sup>28</sup>

Tai chi and other martial arts are finding their way into traditional therapy programs,<sup>29,30</sup> cancer centers, and hospital-based fitness programs. The research for incorporation of tai chi into mainstream medicine is strong, and some have suggested that it be included in broader health strategies including diabetes, cancer, and even osteoarthritis.<sup>31-34</sup>

## Pilates

### History

Joseph Pilates (1880-1965) was the creator of the Pilates exercise method. As a child, Pilates had asthma and rickets and had survived rheumatic fever. By his mid-teens, however, through exercise, he was able to achieve good health. As a young athlete, he became accomplished in skiing, gymnastics, boxing, and other self-defense techniques.

During World War I, Pilates lived in England and was interned with other German nationals. It was during this time that he developed the foundations for Pilates training tables by using springs attached to hospital beds for the bedridden patients to perform resistance exercise.

In the 1980s, the Pilates method of exercise became popular in fitness studios. Today, it is not uncommon for Pilates methods to be offered in hospital-based fitness programs and health clubs.

### Theory

Pilates believed that with conventional exercise, such as weightlifting, specific muscle groups are favored. As a result, the weak muscles tend to become weaker and the strong muscles to become stronger. In addition, weightlifting tends to create short, bulky muscles. This type of muscle, Pilates believed, results in an imbalance in the musculoskeletal system and raises the risk of injury and even of susceptibility to illness.

The Pilates approach emphasizes the core muscles in the abdomen and back. Breathing and body position are also important. Correct breathing and spinal-pelvic position enhance the mind-body connection and control of movement. The quality of movement is more important than adding weight or increasing the number of repetitions.

The Pilates method does not make any claims of treating specific pain conditions or illnesses. It emphasizes that a body in balance is resistant to injury and disease.

### Clinical Applications

The Pilates method is taught in classes, small groups, or individually (Table 90-5). Its focus is not on treating a specific medical condition but on strengthening the body. There are no data to indicate the optimal amount of time for the lessons or the duration of training needed.

Specific apparatus may be used to help accelerate the strengthening and flexibility process. The apparatus can be expensive and is not always part of a health club Pilates program. In addition, use of the apparatus requires training and carries some risk if it is not done correctly.

Some physical therapists have incorporated the Pilates methods and apparatus into their own therapy programs. The effectiveness of this type of approach is unknown because there are no clinical trials comparing traditional physical therapy with Pilates methods.

Overall, however, like many other movement therapies, the Pilates method seems to be safe. There are no reports in the medical literature of adverse reactions to Pilates methods.

**TABLE 90-5. Summary of Pilates Method**

Evidence for effectiveness	C–; very limited studies or case reports and reported clinical experience
Risk of harm	Low; one case study of diaphragm rupture <sup>64</sup>
National licensure	No
State license	No
Pilates certification	Yes; no specific national or international governing body Certification requirements vary by location
Training and continuing education	Yes; Professional training programs vary significantly; some programs require >400 hours of training and supervision, and others confer a certification after 60 hours of training
Medical conditions that Pilates may benefit	Toning and strengthening Sports-related musculoskeletal injury
Contact information	The Pilates Method Alliance: <a href="http://www.pilatesmethodalliance.org/">www.pilatesmethodalliance.org/</a> Email: <a href="mailto:info@pilatesmethodalliance.com">info@pilatesmethodalliance.com</a> PO Box 370906 Miami, FL 33137-0906 Phone: 1-866-573-4945 Fax: 305-573-4461

### Quality of Research: C–

Although the Pilates method is not considered a medical therapy, there is some limited information on its use for specific medical conditions. Mallery et al<sup>35</sup> evaluated the Pilates method as prevention of severe deconditioning in elderly, hospitalized patients. In a controlled study, these researchers randomly assigned 39 elderly (average age of 82 years), hospitalized patients to either a Pilates program with resistance exercises or a control group who experienced similar exercises done passively, with a physiotherapist moving their extremities. At the end of 4 weeks, the Pilates group seemed to have better endurance.

In a nonrandomized, noncontrolled study, health club participants performing Pilates exercises 1 hour per week for 24 weeks demonstrated improved flexibility.<sup>36</sup> In a similar type of study, trained gymnasts were able to increase their vertical leap by 16.2% and explosive power by 220% after 1 month of Pilates training.<sup>37</sup> Research has suggested that Pilates may be beneficial for chronic low back pain<sup>38</sup> and fibromyalgia.<sup>39</sup>

## Trager Technique

### History

The Trager approach was developed by Milton Trager, MD (1908-1997). As a young man, Dr. Trager became interested in how his body coordinated its physical movement while curing his chronic back pain. Dr. Trager held that physical

**TABLE 90-6. Summary of Trager Technique**

Evidence for effectiveness	C; limited studies or case reports and reported clinical experience
Risk of harm	Low
National licensure	No
State license	No
International Trager certification	Yes; Trager International
Continuing education	Yes; four levels of training before practitioner certification, comprising 409 hours of supervised (226 hours) and unsupervised training Senior practitioner certification requires 500 supervised hours
Medical conditions that Trager technique may benefit	Back and neck pain <sup>33</sup> Stress <sup>33</sup> Muscle spasms Depression Multiple sclerosis, post-poliomyelitis status, cerebral palsy, Parkinson's disease (muscle tightness) <sup>35</sup> Tension headaches <sup>36,37</sup> Fibromyalgia
Contact information	United States Trager Association (USTA): <a href="http://www.trager-us.org/">www.trager-us.org/</a> 13801 W Center St, Suite C Burton OH 44021 Phone: 440-834-0308 Fax: 404-834-0365

restriction and stiffness, repeated over time, could become a habitual response. His belief was that the central nervous system is intimately involved with learned tautness and inflexibility, which over time results in pain.

### Theory

Many movement therapies emphasize that misuse of soft tissues and improper function of joints result in inhibition of movement and, ultimately, inflammation and pain. Trager therapy focuses on reducing “un-natural” neuromuscular patterns of movement. It employs gentle, rhythmic movements to facilitate the release of mental and physical stress patterns manifested as tightness of muscles, ligaments, and other connective tissue. The aim is to achieve integration between the body and mind processes.

### Clinical Application

A Trager work session takes between 1 and 1½ hours (Table 90-6). The patient usually lies on a massage table in loose-fitting clothes. The practitioner uses gentle rocking and vibrating movements to invoke a relaxed and supple feeling in the body.

Meditation can be incorporated and is referred to as a hook-up state. It is believed that in this increased state of relaxation, the results are more profound. After treatments, simple exercises, called Mentastics, are encouraged for home use.

The Trager technique has been recommended for back and neck pain as well as for pain in other joints and soft tissues. It may also have application in conditions such as fibromyalgia, chronic fatigue, and stress-related depression.

## Quality of Medical Research: C

Trager therapy has been endorsed by leading practitioners in complementary and alternative medicine. However, vital medical research on the efficacy of the technique is lacking.<sup>40</sup> Although there is no paucity of case studies and reported clinical experiences, there are no quality studies in the allopathic literature.<sup>41–45</sup> Therefore, disproportionate claims of its effectiveness for specific diagnosis must be weighed against the available evidence.

The Trager technique appears to be safe as a therapeutic approach. No adverse results have been reported with the use of this therapy.

## Yoga

### History

Yoga, like martial arts, is not a therapy. It is a way to live one's life in harmony with nature, and good health is a result. Yoga may have been practiced for more than 5000 years. It was believed to be a path by which one could transcend the human. It later became a way to develop the self, mentally, physically, and spiritually, and thus through mental and physical discipline to achieve spiritual enlightenment. Yoga consists of the following five principles:

- Proper relaxation (savasana)
- Proper exercise (asanas)
- Proper breathing (pranayama)
- Proper diet (vegetarian)
- Meditation (dhyana)

In the United States, yoga is exemplified by the practice of postures (gentle stretching exercises), breathing exercises, and meditation. The body of research into the health benefits of yoga-based exercises and stress reduction is growing.

A number of different styles of yoga exist (Table 90-7). No style has been proved to have greater health benefits, and the style practiced may be personal preference or simply what is locally available.

### Theory

Balance in all things leading to health is an idea common to many cultures. In allopathy, we know that excesses raise the risk for development of disease. Yoga emphasizes a three-pronged approach: practicing postures strengthens the body; controlling breathing creates a chemical and emotional balance; and meditation is a form of prayer. It is believed that the combination of these three aspects powerfully stimulates the inherent healing properties of each person.

### Clinical Application

Despite its use for thousands of years, does yoga work? The medical literature contains hundreds of research and review articles debating yoga's benefits. As in much of the movement

**TABLE 90-7.** Styles of Yoga

STYLE	DESCRIPTION
Ananda	Classical style of hatha yoga that is gentle Not athletic or aerobic
Anusara	Spiritually oriented, using asanas with a mind-body emphasis
Ashtanga	Physically demanding, as participants jump from one posture to another Strength, flexibility, and stamina
Bikram	Practiced in a room at 100°F, performing a series of 26 asanas Cleansing the body and increasing flexibility
Kundalini	Believed to release Kundalini (serpent power) energy, at the base of the spine Involves asanas, but emphasis is on chanting and breathing
Iyengar	Strict attention to posture and alignment May use belts and blocks to help alignment

therapy research, there are more questions than answers. For yoga, however, a large body of evidence suggests benefit for a variety of chronic medical conditions (Table 90-8).

Solid medical research shows that exercise and stress reduction can reduce the risk of many diseases, including diabetes mellitus, heart disease, cancer, and even Alzheimer's disease.<sup>46–50</sup> Yoga may be a good way to modify some of the risk factors for a number of medical conditions.

Yoga and its rhythmic pranayama breathing techniques may help reduce the symptoms of asthma.<sup>51–53</sup> The exercise (asanas) and stress reduction techniques in yoga have also been shown to be beneficial in reducing medication use and improving nerve function.

Incorporation of yoga into a lifestyle can have almost immediate effect on reducing risk factors for heart disease and diabetes.<sup>54,55</sup> In one study, Bijlani et al<sup>56</sup> found that 9 days of exercise (asanas), stress reduction (including pranayama breathing), and proper nutrition resulted in significant reductions in low-density lipoprotein cholesterol, very-low-density lipoprotein cholesterol, and fasting serum glucose values as well as an increase in high-density lipoprotein cholesterol levels in patients with heart disease and diabetes.

The exercises and stress reduction techniques in yoga may also be effective for people with uncomplicated back and neck pain. Although high-quality studies have not yet been done, the available data do show that there is some benefit in the practice of yoga for chronic back pain.<sup>57,58</sup>

A number of studies suggest that yoga may be beneficial as an adjunctive therapy for cancer and the side effects of therapy (stress, pain, insomnia, and mood). Both exercise and meditation have been shown to be easily incorporated and beneficial.<sup>59–61</sup> Many cancer centers across the nation offer yoga to their patients for stress relief and mood enhancement and as a form of mild to moderate exercise.

The role of yoga in osteoarthritis, rheumatoid arthritis, and carpal tunnel syndrome is limited but promising. Use of yoga exercises has been shown to improve pain and function, with a decrease in the use of medications and other therapies.<sup>62,63</sup>

**TABLE 90-8.** Summary of Yoga

Evidence for effectiveness	B; large number of medical studies and clinical trials
Risk of harm	Low
National licensure	No
State license	No
Yoga certification	Yes and no; no specific national or international governing body Training from specific yogic masters a plus
Training and continuing education	Yes; professional training programs vary significantly Yoga is a process of continual learning but not structured; however, Iyengar yoga instructors must complete a 2- to 5-year training program
Medical conditions that yoga may benefit or prevent	Chronic disease Asthma Coronary artery disease Diabetes mellitus Stress-related disorders Menopause Cancer, side effects Musculoskeletal pain Carpal tunnel syndrome
Contact information	International Association of Yoga Therapists: <a href="http://www.iayt.org/">www.iayt.org/</a> Email: <a href="mailto:mail@iayt.org">mail@iayt.org</a> 115 S McCormick St, Suite 3 Prescott, AZ 86303 Phone: 928-541-0004 Fax: 928-541-0182

## Quality of Research: B

A search on the PubMed Web site using “yoga” yields more than 800 research and review articles on the use of yoga as a medical therapy. Not all of the medical study results are positive, but the majority of research shows benefits, especially in chronic disease.

The credibility of yoga as an important medical therapy suffers from a lack of high-quality, randomized, controlled studies. However, as the research continues to grow, it is certainly probable that those medical conditions improved by exercise, stress reduction, nutritional changes, and meditation will be shown also to benefit from yoga exercises and stress reduction techniques. Given the nature of chronic disease, yoga may play a role in treatment and, more important, prevention.

## References

References are available online at [expertconsult.com](http://expertconsult.com).



## References

- Alexander FM. *The Use of the Self*. New York: EP Dutton; 1932.
- Dennis RJ. Functional reach improvement in normal older women after Alexander technique instruction. *J Gerontol A Biol Sci Med Sci*. 1999;54:M8–M11.
- Austin JH, Ausubel P. Enhanced respiratory muscular function in normal adults after lessons in proprioceptive musculoskeletal education without exercises. *Chest*. 1992;102:486–490.
- Stallibrass C, Sissons P, Chalmers C. Randomized controlled trial of the Alexander technique for idiopathic Parkinson's disease. *Clin Rehabil*. 2002;16:695–708.
- Stallibrass C. An evaluation of the Alexander technique for the management of disability in Parkinson's disease: a preliminary study. *Clin Rehabil*. 1997;11:8–12.
- Jones F, Gray F, Hanson J, O'Connell D. An experimental study of the effect of head balance on patterns of posture and movement in man. *J Psychol*. 1959;47:247–258.
- Jones F. The influence of postural set on pattern of movement in man. *Int J Neurol*. 1963;4:60–71.
- Ernst E, Canter PH. The Alexander technique: a systematic review of controlled clinical trials. *Forsch Komplementarmed Klass Naturheilkd*. 2003;10:325–329.
- Little P, Lewith G, Webley F, et al. Randomised controlled trial of Alexander technique lessons, exercise, and massage (ATEAM) for chronic and recurrent back pain. *BMJ*. 2008;337:a884. doi:10.1136/bmj.a884.
- Johnson SK, Frederick J, Kaufman M, et al. A controlled investigation of bodywork in multiple sclerosis. *J Altern Complement Med*. 1999;5:237–243.
- James M, Kolt G, McConville J, Bate P. The effects of a Feldenkrais program and relaxation procedures on hamstring length. *Aust J Physiother*. 1998;44:49–54.
- Ullmann G, Williams HG, Hussey J. Effects of Feldenkrais exercises on balance, mobility, balance confidence, and gait performance in community-dwelling adults age 65 and older. *J Altern Complement Med*. 2010;16:97–105.
- Buchanan PA, Ulrich BD. The Feldenkrais method: a dynamic approach to changing motor behavior. *Res Q Exerc Sport*. 2001;72:315–323.
- Maher CG. Effective physical treatment for chronic low back pain. *Orthop Clin North Am*. 2004;35:57–64.
- Liptak GS. Complementary and alternative therapies for cerebral palsy. *Ment Retard Dev Disabil Res Rev*. 2005;11:156–163.
- Gard G. Body awareness therapy for patients with fibromyalgia and chronic pain. *Disabil Rehabil*. 2005;27:725–728.
- Massey PB. Medicine and martial arts: a brief historical perspective. *Altern Complement Ther*. 1998;4:438–444.
- Sugawara T, Lujian X. *Aikido and Chinese Martial Arts: Its Fundamental Relations*. Tokyo: Sugawara Martial Arts Institute; 1996.
- Wolf SL, Kutner NG, Green RC, et al. The Atlanta FICSIT study: two exercise interventions to reduce frailty in elders. *J Am Geriatr Soc*. 1993;41:329–332.
- Wolf SL, Barnhart HX, Kutner NG, et al. Reducing frailty and falls in older persons: an investigation of Tai chi and computerized balance training. Atlanta FICSIT Group. Frailty and Injuries: Cooperative Studies of Intervention Techniques. *J Am Geriatr Soc*. 1996;44:489–497.
- Li F, Harmer P, Fisher KJ, et al. Tai chi and fall reductions in older adults: a randomized controlled trial. *J Gerontol A Biol Sci Med Sci*. 2005;60:187–194.
- Sattin RW, Easley KA, Wolf SL, et al. Reduction in fear of falling through intense tai chi exercise training in older, transitionally frail adults. *J Am Geriatr Soc*. 2005;53:1168–1178.
- Wang C, Collet JP, Lau J. The effect of tai chi on health outcomes in patients with chronic conditions: a systematic review. *Arch Intern Med*. 2004;164:493–501.
- Massey PB, Thorner E, Preston W, et al. Increased lung capacity through Qigong breathing techniques of the Chung Moo martial art style. *J Asian Martial Arts*. 1993;2:70–77.
- Wang C, Schmid CH, Roncs R, et al. A randomized trial of tai chi for fibromyalgia. *N Engl J Med*. 2010;363:743–754.
- Qin L, Au S, Choy W, et al. Regular tai chi chuan exercise may retard bone loss in postmenopausal women: a case-control study. *Arch Phys Med Rehabil*. 2002;83:1355–1359.
- Massey PB, Perlman A. Lasting resolution of chronic thoracic neuritis through a martial art–based physical therapy approach. *Altern Ther Med*. 1999;5:104–105.
- Li F, Harmer P, Fitzgerald K, et al. Tai chi and postural stability in patients with parkinson's disease. *N Engl J Med*. 2012;366:511–519.
- Taylor-Piliae RE. Tai chi as an adjunct to cardiac rehabilitation exercise training. *J Cardiopulm Rehabil*. 2003;23:90–96.
- Taylor-Piliae RE, Froelicher ES. Effectiveness of tai chi exercise in improving aerobic capacity: a meta-analysis. *J Cardiovasc Nurs*. 2004;19:48–57.
- Jones AY, Dean E, Scudds RJ. Effectiveness of a community-based tai chi program and implications for public health initiatives. *Arch Phys Med Rehabil*. 2005;86:619–625.
- Sun GC, Lovejoy JC, Gillham S, et al. Effects of Qigong on glucose control in type 2 diabetes: a randomized controlled pilot study. *Diabetes Care*. 2008;33:e8.
- Oh B, Butow P, Mullan B, Clarke S. Impact of medical Qigong on quality of life, fatigue, mood and inflammation in cancer patients: a randomized controlled trial. *Ann Oncol*. 2010;21:608–614.
- Chen KW, Perlman A, Liao JG, et al. Effects of external qigong therapy on osteoarthritis of the knee. A randomized controlled trial. *Clin Rheumatol*. 2008;27:1497–1505.
- Mallery LH, MacDonald EA, Hubley-Kozey CL, et al. The feasibility of performing resistance exercise with acutely ill hospitalized older adults. *BMC Geriatr*. 2003;3:3.
- Segal NA, Hein J, Basford JR. The effects of Pilates training on flexibility and body composition: an observational study. *Arch Phys Med Rehabil*. 2004;85:1977–1981.
- Hutchinson MR, Tremain L, Christiansen J, et al. Improving leaping ability in elite rhythmic gymnasts. *Med Sci Sports Exerc*. 1998;30:1543–1547.
- da Fonseca JL, Magini M, de Freitas TH. Laboratory gait analysis in patients with low back pain before and after a Pilates intervention. *J Sports Rehabil*. 2009;18:269–282.
- Altan L, Korkmaz N, Bingol U, Gunay B. Effect of Pilates training on people with fibromyalgia syndrome: a pilot study. *Arch Phys Med Rehabil*. 2009;90:1983–1988.
- Vanderbilt S. Searching for comfort: alternative therapies and multiple sclerosis. *Massage Bodywork*. 2004; Aug/Sept: 50–57.
- Blackburn J. Trager-2: Hooking up: the power of presence in bodywork. *J Bodywork Movement Ther*. 2004;8:114–121.
- Duval C, Lafontaine D, Hebert J, et al. The effect of Trager therapy on the level of evoked stretch responses in patients with Parkinson's disease and rigidity. *J Manipulative Physiol Ther*. 2002;25:455–464.
- Vanderbilt S. Headache remedy: results of Trager approach research. *Massage Bodywork*. 2005; June/July: 132–136.
- Foster KA, Liskin J, Cen S, et al. The Trager approach in the treatment of chronic headache: a pilot study. *Altern Ther Health Med*. 2004;10:40–46.
- Mehling WE, DiBiasi Z, Hecht F. Bias control in trials of bodywork: a review of methodological issues. *J Altern Complement Med*. 2005;11:333–342.
- Wagh A, Stone NJ. Treatment of metabolic syndrome. *Expert Rev Cardiovasc Ther*. 2004;2:213–228.
- Stone NJ, Saxon D. Approach to treatment of the patient with metabolic syndrome: lifestyle therapy. *Am J Cardiol*. 2005;96:15E–21E.
- Orchard TJ, Temprosa M, Goldberg R, et al. The effect of metformin and intensive lifestyle intervention on the metabolic syndrome: the Diabetes Prevention Program randomized trial. *Ann Intern Med*. 2005;142:611–619.
- Kiraly MA, Kiraly SJ. The effect of exercise on hippocampal integrity: review of recent research. *Int J Psychiatry Med*. 2005;35:75–89.
- Regan C, Katona C, Walker Z, et al. Relationship of exercise and other risk factors to depression of Alzheimer's disease: the LASER-AD study. *Int J Geriatr Psychiatry*. 2005;20:261–268.
- Jaber R. Respiratory and allergic diseases: from upper respiratory tract infections to asthma. *Prim Care*. 2002;29:231–261.
- Blazek-O'Neill B. Complementary and alternative medicine in allergy, otitis media, and asthma. *Curr Allergy Asthma Rep*. 2005;5:313–318.
- Nayak NN, Shankar K. Yoga: a therapeutic approach. *Phys Med Rehabil Clin North Am*. 2004;15:783–798.
- Jain SC, Uppal A, Bhatnagar SO, et al. A study of response pattern of non-insulin dependent diabetics to yoga therapy. *Diabetes Res Clin Pract*. 1993;19:69–74.
- Malhotra V, Singh S, Tandon OP, et al. Effect of Yoga asanas on nerve conduction in type 2 diabetes. *Ind J Physiol Pharmacol*. 2002;46:298–306.
- Bijlani RL, Vempati RP, Yadav RK, et al. A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. *J Altern Complement Med*. 2005;11:267–274.
- Williams KA, Petronis J, Smith D, et al. Effect of Iyengar yoga therapy for chronic low back pain. *Pain*. 2005;115:107–117.

58. Galantino ML, Bzdewka TM, Eissler-Russo JL, et al. The impact of modified hatha yoga on chronic low back pain: a pilot study. *Altern Ther Health Med.* 2004;10:56–59.
59. Shannahoff-Khalasa DS. Patient perspectives: Kundalini yoga meditation techniques for psycho-oncology and as potential therapies for cancer. *Integr Cancer Ther.* 2005;4:87–100.
60. Wolsko PM, Eisenberg DM, Davis RB, et al. Use of mind-body medical therapies. *J Gen Intern Med.* 2004;19:43–50.
61. Cohen L, Warneke C, Fouladi RT, et al. Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. *Cancer.* 2004;100:2253–2260.
62. Garfinkel M, Schumaker HR Jr. Yoga. *Rheum Dis Clin North Am.* 2000;26:125–132.
63. Michlovitz SL. Conservative interventions for carpal tunnel syndrome. *J Orthop Sports Phys Ther.* 2004;34:589–600.
64. Yang YM, Yang HB, Park JS, et al. Spontaneous diaphragmatic rupture complicated with perforation of the stomach during Pilates. *Am J Emerg Med.* 2010;28:259.e1–259.e3.



# 91

## Low Back Pain Exercises

Brian Degenhardt, DO and Coleen Smith, DO

The management of patients who seek treatment for low back pain can be difficult for any practitioner. The cause of low back pain can be the skin, soft tissue, or skeletal components. Low back pain can be referred from other sources, even visceral structures, or it can be secondary to postural decompensation.

History and physical findings should guide the practitioner to further evaluation and a treatment plan. Multidisciplinary treatment approaches are often necessary to facilitate healing for the patient with low back pain. Understanding of the patient's belief system about his or her low back pain may be an important component of recovery.<sup>1</sup> A treatment plan may include an exercise prescription. Movement, strengthening, and flexibility in patients with chronic lumbar back pain has demonstrated benefit.<sup>2</sup>

The traditional exercise prescription is a written description of the exercise, including the number of repetitions per set, number of sets per session, and frequency of sessions. This format is specific for strength exercises and has been applied to flexibility exercises. Many traditional exercise routines are assigned and performed too literally, without recognition of the subtle changes the patient experiences day to day in a healing exercise program. The goal of any complementary exercise recommendation is to encourage a dynamic interchange between the patient's awareness and the body. With appropriate education, the patient can become more sensitive to information being generated from the body and perform the exercise program in a much more precise, safe, and effective manner. Attention to the body's feedback mechanisms should be encouraged to allow the patient to modify any portion of the exercise prescription. This enables the patient to achieve optimal outcomes from the rehabilitation program. The outcomes of an exercise plan are to enhance flexibility, to minimize or to eliminate pain by reducing muscle tension, and to improve strength, thereby encouraging joint stability. A complementary exercise plan for a person with lumbar back pain should include the following approaches:

- Breathing and relaxation training
- Flexibility training
- Strength training
- Coordination training

The National Institute of Health and Clinical Excellence (NICE) has reviewed the evidence of therapies that have been found to be most useful for low back pain. Of all therapies used for low back pain, the evidence for benefit with least harm supported an exercise program, manual therapy, and acupuncture.<sup>3</sup>

The Patient Handout at the end of this chapter contains examples of the exercises and approaches discussed here.

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### Breathing and Relaxation Training

Flexibility and relaxation techniques are often great starting points in a patient's exercise prescription. They calm the patient and foster awareness of information from the body that helps guide and individualize the exercise prescription. These exercises enhance diaphragmatic function and improve oxygenation, lymphatic flow, and autonomic nervous system regulation. To begin this component of the exercise prescription, the patient should choose a comfortable position and minimize distraction, perhaps by listening to soothing background music. The patient must use the abdominal diaphragm while taking a slow, deep breath and both the diaphragm and the rib cage as inspiration continues (see Chapter 89, Breathing Exercises). The number of repetitions is likely to vary from day to day because stress and tightness also change daily. The patient needs to learn to recognize when the body is relaxed and ready to move on to other components of the exercise prescription. Once relaxation and focus have been obtained, participants should use deep breathing throughout all cycles of the exercise plan.

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### Flexibility Training

The flexibility portion of an exercise plan uses stretching to promote greater range of motion in all planes. Properly performed, stretching allows better neuromusculoskeletal function, promoting less pain and more motion. To stretch properly, the patient must move to the point of tension and then perform deep breaths to gently stretch the tight tissue. It is important to move slowly and gently in and out of stretches. Other models describe how to stretch, but this

approach minimizes the chance of exacerbating a patient's back pain by overstretching. Although an outline of a stretch gives the patient a guide to promote flexibility of specific areas of the body, the patient listens each day to the information the body is generating to determine where the tightness is. This approach allows the patient to modify a stretch and to maximize its effectiveness each day. The stretch is considered complete only after the patient appreciates a change in the tension while holding the stretch. This change can occur after only one or two repetitions, or it may need more repetitions, as determined by the patient through attention to the body's feedback system. Patients must stay within their pain limitations to prevent reflex muscle tightening and injury.

In most patients with chronic low back pain, specific instruction is necessary for hip flexors and extensors. For recovery from muscle tightness and to decrease pain, it is also important to achieve greater flexibility as well as a balance of flexibility between the same muscles on the two sides of the body and between reciprocal muscles, particularly with the hamstring, iliopsoas, and piriformis muscles.

## Strength Training

Strengthening exercises encourage active use of muscle groups, leading to better muscle tone and greater strength. It is important not to sacrifice flexibility for strength; the two are equally important for proper lumbar mechanics in patients with low back pain. The clinician can evaluate the patient's strength clinically by having the patient perform isometric contractions against the physician's resistance to determine whether there is gross asymmetry of strength. Asymmetry of strength may lead to or be secondary to hypertonicity in one muscle group and weakness in the opposing muscle groups. Once strength asymmetry or weakness has been diagnosed, specific instructions must be given first to stretch the hypertonic muscles and then to motivate the patient to exercise the weakened muscles. Patients are often unaware of this local muscle weakness. In many exercise programs, patients focus

on rote repetition of exercises, strengthening hypertonic muscles rather than conditioning weakened muscle groups. It can be beneficial for the patient with hypertonic lumbar extensors to perform abdominal curl-ups to strengthen weakened antagonistic abdominal muscles after stretching the lumbar erector spinae muscles. Both exercises decrease hypertonicity in the lumbar extensor muscle group.

In many cases of lumbar back pain, strengthening activities must start out as isometric exercises instead of the typical isotonic exercises because isometric exercises are safer. Isometric exercises allow the origin and insertion of the involved muscle to remain in constant position while the patient presses against a resisting force that is equal to the patient's force.

An example of an isometric exercise is pushing against a solid wall without moving. Isometric exercises are often useful for patients who have arthritis, in which joint movement causes pain and limitation.

## Coordination Training

Differences in proprioception exist in individuals with and without back pain. Coordination training in patients with low back pain is based on the observation that the response of a patient's spine to stress causes the postural muscles to tighten and the antagonist muscles to react with inhibition, weakness, and atrophy.<sup>4</sup> Coordination training is imperative for improvement of overall postural balance in the patient with lumbar back pain. Proprioceptive education in patients with low back pain begins with improving ankle, knee, and pelvis coordination, perhaps through the use of a wobble board or fitness ball. The physician must remind the patient of safety precautions at the start of coordination training. Basic coordination exercises can usually be taught in the office and then performed by the patient independently. Advanced proprioceptive training usually requires supervision to ensure correct technique and safety.

### KEY WEB RESOURCES

[http://www.nlm.nih.gov/medlineplus/tutorials/backexercises/htm/\\_yes\\_50\\_no\\_0.htm](http://www.nlm.nih.gov/medlineplus/tutorials/backexercises/htm/_yes_50_no_0.htm)

<http://www.acatoday.org/pdf/BackPainExercise.pdf>

<http://video.about.com/backandneck/Back-Stretches-for-Back-Pain.htm>

<http://www.egoscue.com/>

<http://www.fammed.wisc.edu/our-department/media/618/feldenkrais-low-back-pain>

MedlinePlus slideshow on back exercises from The Patient Education Institute.

Handout from the American Chiropractic Association on back pain exercises.

Video of a back exercise and stretching routine to be done each day to prevent back pain from About.com.

The Egoscue technique addresses strengthening and balancing of the whole body unit to reduce back pain. A book that includes back stretching exercises from this method is Escogue P, Gitnes R: *Pain Free: A Revolutionary Method for Stopping Chronic Pain*. New York: Bantam Books; 2000.

Video on how Feldenkrais therapy can be used for low back pain from the University of Wisconsin Integrative Medicine Program.

## References

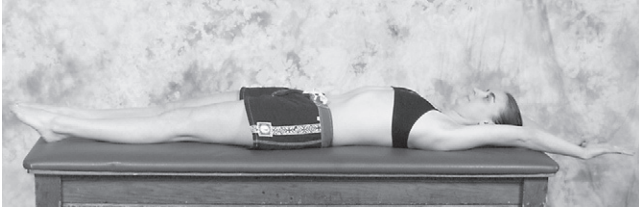
References are available online at [expertconsult.com](http://expertconsult.com).

### Patient Handout: Exercise Program for Low Back Pain

1. Listen to your body signals; the amount of exercise may vary from day to day. Always stay within pain limitations when performing any exercises.
2. It is important to breathe properly. While performing all aspects of your stretching program, breathe into your abdomen and feel the sides of your rib cage expand.
3. Move slowly and gently during stretching exercises. Do not bounce!
4. If you experience pain during or after a specific exercise, decrease the duration and intensity of the exercise. If the pain reoccurs, eliminate that exercise from your routine and consult with an exercise professional.

#### Breathing and Relaxation Exercises

##### Breathing and Body Stretch



1. Lie on your back. Place your hands on your abdomen. Relax. This is your time to focus on yourself.
2. Breathe deeply into your abdomen so that your hands rise and fall with each breath. Feel the sides of your rib cage expand.
3. Hold your breath in for 3 to 5 seconds, and then exhale slowly.
4. Repeat steps 2 and 3 slowly and gently for 2 minutes.
5. Place your arms above your head and reach upward as you point your toes downward.
6. Hold the stretch for 5 slow, deep breaths.
7. Slowly return to the starting position, and repeat the stretch until the tissue tension experienced during the first stretch has resolved (often 2 times).

#### Stretching Exercises

##### Pelvic Tilt Exercise



1. Lie on your back. Bend your knees, placing your feet flat on the floor and allowing your knees to touch.
2. Roll your pelvis backward by pushing your belly button toward your spine.
3. Hold this position for 20 to 40 seconds or until fatigued, while breathing slowly and deeply.
4. Release slowly. Repeat.

##### Low Back Flexion Exercise



1. Sit. Curl your spine forward one vertebra at a time, from the head, to the neck, chest, and low back. Stop at and hold at any area of muscle tightness.
2. Hold position for 3 deep breaths or until the tissue relaxes.
3. Gently return to a sitting position.
4. Repeat at least 2 times, likely curling farther than the time before, until the tissue tension experienced along the spine has resolved, or if soreness has developed. Be patient with this stretch. It may take weeks before you can easily stretch all the way down the back.

#### Low Back Extension Exercise



1. Lie on your stomach with your feet shoulder-width apart and your toes pointing downward.
2. Bring your elbows under your shoulders to support your weight.
3. Gently raise your head and slowly arch your back, letting your belly relax forward toward the floor. Go only as far as is painless until your muscles are more flexible.
4. Hold position and breathe into your abdomen for at least 3 deep breaths or until the tightness in your back releases.
5. Repeat until the tissue tension experienced during first stretch has resolved (often 2 times).

#### Cat/Dog Stretch Exercise



1. Kneel on the floor with your knees hip-width apart. Place your hands on the floor shoulder-width apart and palms down.
2. Slowly arch your back from your tailbone to your upper back like a cat stretches. Allow your head to lower comfortably. Hold position for 3 slow breaths.
3. Slowly release the stretch in the reverse order.
4. Once in the starting position, lift your buttocks upward, let your belly relax forward toward the floor, and slowly look toward the ceiling.
5. Hold this position for 3 breaths and gradually return to the starting position.
6. Repeat until the tissue tension experienced during the first stretch has resolved (often 2 times).

### Hip Flexor Stretch Exercise



1. Kneel on one knee. Bend your other knee to 90 degrees and place your hands on it for balance.
2. Lean your trunk forward while keeping your low back straight.
3. Hold this position for 3 slow breaths, and then slowly return to the starting position.
4. Repeat until the tissue tension experienced during the first stretch has resolved (often 2 times).

### Piriformis Exercise



1. Lie on your back with your legs straight. To stretch the left side, bend your left knee and place your left ankle over your right knee with the left foot on floor.
2. Place your left hand on the left side of the pelvis and your right hand on your left knee.
3. Slowly pull your left knee across the right leg, feeling the stretch in your left buttock. Keep your pelvis from rotating off the floor with your left hand.
4. Hold this position for at least 3 slow deep breaths.
5. Slowly and gently return to the resting position.
6. Repeat steps 1 thru 6 until the tissue tension experienced during the first stretch has resolved (often 2 times).
7. Repeat with the right leg.

### Hamstring Exercise



1. Lie on your back with your legs straight.
2. Gently bend one knee and grasp behind the thigh. Do not lift your pelvis or other knee off the floor during this exercise.
3. Straighten your knee. Go only as far as your flexibility will comfortably allow, and hold for 3 slow breaths.
4. Slowly lower your leg to the floor, and repeat for the other leg.
5. Repeat each side until the tissue tension experienced during the first stretch has resolved (often 2 times).

### Strength Exercises

#### Abdominal Curl-Up Exercise



1. Lie on your back with your knees comfortably bent and your arms placed across your chest.
2. Keeping your neck and shoulders relaxed, lift your rib cage from the floor. Move only as far as your body will allow without pain. Hold position for 1 or 2 deep breaths.
3. Slowly and gently return to resting position.
4. Repeat until your abdominal muscles weaken or you notice that you are using your neck and shoulder muscles to perform the exercise.

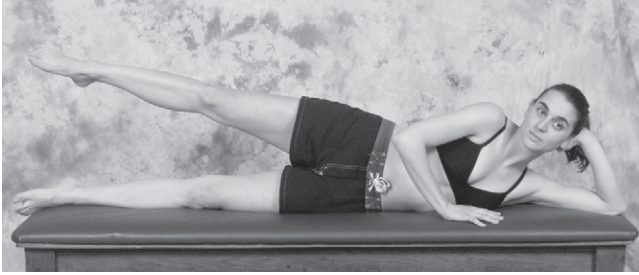
#### Gluteus Maximus Exercise



1. Lie on your stomach with your toes pointing downward and your legs straight.
2. Slowly raise one leg as far as is comfortable. Keep your pelvis flat on the floor and the buttock on that side tight.
3. Hold position for 3 deep breaths, or until muscles feel fatigued.
4. Gently return to the resting position. Repeat with the other leg.
5. Repeat with both legs until your muscles feel fatigued.



### Gluteus Medius Exercise



1. Lie on one side, keeping the leg that is on the floor straight or bent at the hip and knee and your top hand on the floor in front of you to maintain stability.
2. Raise your upper leg as far as is comfortable and painless, using your hip muscles only.
3. Hold this position for 3 slow breaths, and slowly return the leg to the resting position.
4. Repeat until fatigued or until you are using other than your hip muscles, and increase repetitions as tolerated.
5. Turn to your other side and repeat steps 1 through 4.

### Coordination Exercises

#### Standing-on-One-Leg Exercise



1. Stand on one leg and maintain your balance. Keep your back straight and your arms across your upper chest.
2. Hold this position for 1 minute while continuing slow, deep breaths.
3. Gently return to resting position and repeat 2 times on each leg.
4. After mastering this exercise, perform step 2 with your eyes closed.

## References

1. Pflugsten M, Hildebrandt J, Leibing E, et al. Effectiveness of a multimodal treatment program for chronic low-back pain. *Pain*. 1997;73:77–85.
2. van Tulder M, Malmivaara A, Esmail R, Koes B. Exercise therapy of low back pain: a systematic review within the framework of the Cochrane collaboration back review group. *Spine*. 2000;25:2784–2796.
3. Savigny P, Watson P, Underwood M. Guideline Development Group. Early management of persistent non-specific low back pain: summary of NICE guidance. *BMJ*. 2009;338:b1805.
4. Pollock ML, Wilmore JH. *Exercise in Health and Disease*. 2nd ed. Philadelphia: Saunders; 1990.



# 92

## Self-Hypnosis Techniques

Steven Gurgevich, PhD

Hypnosis is a system or collection of methods that allows us to enhance the communication and sharing of information between and within the mind-body. Because the body “hears” everything that enters the subconscious mind, these methods are a way of accessing and influencing subconscious effects on the body. We can do this entirely by ourselves, with the help of others, or by use of learning materials such as books, videos, and audio programs. Whether someone helps us (such as a trained therapist) or we do it by ourselves, all hypnosis is self-hypnosis.

One of these methods is trance. A hypnotic trance is a state of consciousness in which our focus of awareness allows us to become greatly absorbed in the experience and sensations of our ideas. A daydream is a good example of trance. In a daydream, we are aware of where we are and what we are doing, but at the same time, we are absorbed in the experience and sensations of the daydream—our thoughts, ideas, and images. In other words, a hypnotic trance and a daydream are very similar. Although most daydreams might occur spontaneously when we are bored or have too little to actively think about, a hypnotic trance is a state of consciousness we create deliberately. Learning to use this exquisite tool to enhance mind-body communication for healing, greater performance, comfort, and relaxation is easy and beneficial.

Hypnosis includes many different ways of creating that daydream-like state of mind. Among them are induction techniques, imagery methods, focusing concentration, and forms of passive relaxation and meditation. Once we learn them and discover how to achieve the desired results, we own those abilities for as long as we practice them.

What kinds of abilities might we learn this way? A very short list includes overcoming anxiety on an airplane, relaxing the smooth muscle of the intestines for more comfortable digestion, relieving pain, healing skin conditions, improving sleep patterns, changing habits, improving concentration skills, alleviating nausea associated with chemotherapy, improving surgical outcomes, and unlearning physiologic

stress response systems. Andrew Weil, MD, says, “In general, I believe that no condition is out of bounds for trying hypnotherapy on.”<sup>1</sup>

Although there are many different techniques to access subconscious influence on the body, for practicality this chapter focuses on one tool that primary care providers can easily use and teach their patients. This tool requires the following six main principles:

- Educate to remove preconceived fears and prevailing misconceptions.
- Tailor to match images, ideas, and hypnotic suggestions to the individual.
- Induce trance: thumb-and-finger release technique to trigger trance and staircase technique to help with progressive muscle relaxation and deepening of trance.
- Use trance for a specific purpose (headache, surgery).
- Re-alert to guide the patient out of trance.
- Debrief to develop insight into what worked and how to implement future techniques.

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### The Six Main Principles

#### Educate

To remove any fear and misunderstanding and to achieve a better clinical response, you must take time to educate your patient about hypnosis. Your first task is to dispel the myths and misconceptions. The most predominant misconceptions, and their corrections, are as follows.

- That hypnosis is “done to someone.” Hypnosis is not done to anyone; it may be guided and taught, as all hypnosis is self-hypnosis.
- The subject loses consciousness and conscious control: At all times, the subject is consciously aware of where he is and what he is doing.

- The subject can be made to do things or to reveal things that she ordinarily would not do in a waking state: The subject is very much aware and is always in control of what she is choosing to experience.
- The subject must be gullible or weak-minded to be hypnotized: Again, this concept is false. Research has shown that some of the best subjects are those with greater intellectual capacity, open-mindedness, and creativity.

The next task is to define trance as a heightened state of conscious awareness in which an individual is more prone to suggestion. Emphasize that everyone has experienced trance many times. One example is daydreaming. Another is being absorbed in a good movie, when we are less aware of activities around us and more responsive to suggestions emanating from the screen. We might jump at the sudden appearance of the hideous alien monster, or we might cry at the plight of a character. At the same time, we are always in control and can go get popcorn if we want.

Like a good movie, hypnosis involves three factors: absorption, dissociation, and suggestibility. Through an induction technique, the subject becomes fully absorbed in the matter at hand, resulting in dissociation from various distractions. This creates a heightened state of awareness that allows the subject to be more receptive to suggestions that can influence physical and behavioral change. In addition to these factors, the vital ingredients<sup>2</sup> that enhance therapeutic effectiveness are the patient's motivation, belief, and expectations for success.

Hypnosis requires three key factors: absorption, dissociation, and suggestibility.

## Tailor

The talented therapist tailors the hypnotic technique to the subject's unique needs and beliefs. The more the technique relates to the subject, the more that person will accept hypnosis and find it useful. In contrast, if you use a technique that encourages an image associated with anger or fear or that is simply foreign to the patient, the process is counterproductive. Think of tailoring as your effort to make the hypnotic experience personally familiar to the subject.

Although there are more complex ways of performing this tailoring, here are a few easily remembered questions or suggestions you can use to help personalize the hypnosis to a patient's beliefs and interests:

- Imagine a favorite place, one that brings comfort and a sense of peace.
- What is your favorite color?
- What are some of your favorite activities and pastimes?
- What kinds of events and activities give you the greatest pleasure?

## Testing Hypnotic Talent

In familiarizing yourself and your patients with their current level of hypnotic talent, inform them that you would like to explore their present ability for "mind-body communication" with one or both of these simple procedures.

## ■ The Hand Clasp

- Clasp your hands together and interlace your fingers. Imagine that your hands are glued together. Feel how tight the glue holds them.
- Now imagine that the glue between your hands has grown even stronger, or you can imagine that your hands are in a vise that keeps them together.
- Continue to concentrate on how firmly your hands are stuck together. Perhaps you have felt how strong superglue is. Keeping the "stuckness" firmly in mind, try to pull your hands apart while focusing on the image or idea of your hands stuck together.
- If your hands remain stuck to one another, let yourself play with the idea and how well your body responded to your thoughts.
- Then imagine your hands free of each other and gently pull them apart.
- If your hands did not remain stuck together, even a little, play some more and see what happens. Sooner or later, your subconscious will accept the idea and image in your mind. The key is to make the image in your mind the dominant idea as you do this.

Ask your patient, Were you able to feel as if your hands were stuck together, even momentarily? The greater the ability, the more hypnotic talent.

## ■ Ideosensory Experience

Ideosensory experience refers to the ability or capacity of the mind-body to respond to the idea or imagination of sensory stimuli (idea + sensory = ideosensory), that is, an idea in mind that produces a sensory response. Proceed speaking through each step as you help your patient develop the image as fully as possible in the imagination.

- Imagine that you have a freshly picked lemon in your hand. Imagine holding the lemon, feeling its weight, examining the texture of the skin, the color.
- Imagine scraping the skin enough to release some of the oil from the skin. If you are demonstrating this to your patient, squint or act as if lemon oil is squirting from the rind as you scrape it.
- Imagine the smell of the freshly released lemon scent.
- Now imagine that you are placing the lemon on a cutting board and slicing it slowly into two parts.
- See, in your imagination, the lemon juice released as the knife cuts through the lemon.
- Picture the lemon juice on the cutting board as you pick up one half of the freshly cut lemon.
- Imagine bringing the lemon half to your mouth and licking the juicy surface with your tongue.
- If needed or desired, have the patient close the eyes and repeat the instructions.

Ask the patient, Could you feel the weight of the lemon? Were you able to smell the lemon? Could you see the oil released when the rind was scraped or the juice released when you cut or squeezed it? Could you taste it? The stronger the sensation, the more hypnotic talent.

If the patient is not able to experience either of these sensations, that person may not be an ideal candidate for hypnotherapy.

## Induce Trance

The practitioner performs trance induction for the first hypnosis session so that the patient can become familiar with it. It will be helpful if you can walk the patient through this so he or she feels comfortable doing it himself or herself. Children can do this easily, but adults often need a little practice.

In trance induction, it is helpful to use a trigger (i.e., a conditioned response) to tell the body it is time to relax and focus. Each time the individual uses or rehearses hypnosis with that particular method of induction, the procedure signals the associated responses, and the body “learns” and becomes conditioned. This creates a more automatic response to the trigger, and the more it is used, the easier it becomes to induce trance. It is important to use your voice to convey the message you intend. That is, use inflections, pauses, tone and volume, and accent to emphasize your message. It is also important to embed statements of positive reinforcement during the trance work so patients can develop the ability to do this on their own.

There are many different techniques for trance induction. Two examples are described here.

### ■ Thumb-and-Finger Technique

Instruct the patient to gently press the tips of the thumb and index finger together in the OK sign. Then tell him that when ready, he may close the eyes, take a deep breath, and hold that breath while you count to 5. With each increasing number, tell the patient that he is deliberately increasing some acceptable anxiety and to make it a physical experience by pressing his thumb and finger more tightly together. Let the patient know that he is in control of this form of tension and anxiety, and when you reach 5, he is to exhale the breath and release and relax the thumb and finger. Tell the patient to continue with the eyes closed and to permit the hand to relax and to allow breathing to become calm and regular. You may say that this acts as a cue or signal for him to relax and go into trance. This technique can be used at any time by the patient for self-hypnosis. Again, with repetition, it creates a conditioned response that facilitates a faster and easier induction.

### ■ Imagining a Relaxation Staircase

By imagining a beautiful staircase with 10 steps, the patient can use each step to focus on relaxing a different part of the body as she descends to her favorite place. In the brackets in the following passage, insert the patient's preferences that you learned during tailoring, such as favorite place or color. The relaxation staircase technique, which is also a technique for deepening of the trance, may go something like this:

*Imagine a beautiful [favorite color] staircase that has 10 steps. These 10 steps lead to a peaceful and relaxing [favorite place]. In a moment, I am going to start counting backward from 10 to 1. With each step, you can notice your body relaxing more comfortably, allowing you to gently relax deeper and deeper with each step. It will be so very nice to discover which parts of your body relax more quickly and easily, as tension is automatically released.*

*As you start at the top of the staircase, allow each exhalation to release any tension or strain in your body. Let each breath now be a “relaxing breath.”*

*10 ... Relax your face and jaw, letting your tongue gently rest at the floor of your mouth.*

*9 ... Relax your temples, eyes, and eyelids as we step down to ...*

*8 ... Relax the back of your neck and shoulders, simply letting go.*

*7 ... Relax your arms, knowing that there is nothing for them to do.*

*And sometimes you will notice that your body is already getting ahead of my voice and the numbers, and sometimes it feels so comfortable when your body catches up to your relaxation.*

*6 ... Relax your chest, with each rise and fall of the breath.*

*5 ... Relax your abdomen, setting the muscles free.*

*4 ... Relax your pelvis, allowing it to sink into the chair.*

*Sometimes your body may feel so “heavy” that it feels like you are sinking, and other times you feel so “light” that it may seem that you are floating. Whatever you experience is correct for you ... let it happen.*

*3 ... Relax your legs, giving them the day off with nothing to support.*

*2 ... Relax your toes as we arrive at ...*

*1 ...*

*And continue past zero as you feel comfortable and at ease with this very relaxed form of concentration.*

## Hypnotic Strategies

We distinguish two hypnotic strategies or approaches in using clinical hypnosis in practice. One strategy is symptomatic, in which the emphasis of the hypnotic work is exclusively directed toward altering or removing symptoms. In most cases, the symptomatic approach is simple and effective. However, when symptoms do not respond to the symptomatic approach or when “symptom substitution” follows the removal of the original condition (when one symptom resolves but is replaced by another), then we look for a possible underlying or subconscious origin. That is, we look for underlying emotional conflicts that are being expressed by the body. This other strategy is called psychodynamic, and it more specifically addresses the origins or causes of the symptoms. The metaphor for exploring symptoms psychodynamically might best be thought of as the symptoms are “out of mind, but not out of body.”

An example to illustrate the two strategies might involve a headache, for which the symptomatic approach relies on relaxation and imagery of comfort to relieve tension. The psychodynamic approach for a headache resilient to the symptomatic approach would address metaphorical questions, such as, Who is the pain in the neck? or What is the pain in the neck for you? In later examples, we are exploring the possibility of an underlying psychodynamic process in which emotional stresses are being expressed as physical symptoms. For our purposes in this chapter on self-hypnosis techniques, we will limit our examples and exercises to the symptomatic strategy or symptomatic approach.

## Use

Use is the process of focused attention (trance) for a therapeutic purpose, such as symptom relief. This phase is what distinguishes hypnosis from meditation and relaxation exercises.

This section describes scenarios that may be used for some common problems seen in the primary care setting.

### **Gastrointestinal Disorders: Gentle Movement or Healing Color**

Hypnosis is an excellent tool for unlearning and relieving gastrointestinal conditions such as irritable bowel syndrome, although the imagery you use can be modified to describe healing comfort from upper gastric distress, constipation, or other gastrointestinal symptoms.

One easy method to use with patients is to have them visualize a soothing color as it travels the entire alimentary canal from mouth to rectum, calming and healing as it goes. For example, you might speak as follows to your patient:

*Recognize that your digestive system, your alimentary canal, from mouth to rectum is lined with smooth muscle that functions automatically. And throughout the alimentary canal, the smooth muscle produces a gentle wavelike motion, called peristalsis, which moves food through you in the proper direction from swallowing to elimination. Your thoughts and mental images are messages that slow or speed up this gentle wavelike motion so that you are comfortable and can enjoy natural, healthy, and comfortable digestion.*

*Now imagine that you are swallowing [patient's favorite color] in the form of a gentle light or a soothing liquid that will travel all the way through your digestive system in a comfortable, peaceful, healthy way. Follow that soothing [color] from your mouth and down your esophagus. As the [color] flows downward, let yourself feel a calm inner peace as your digestive tract begins to relax and restore itself, so that you can easily digest a wide variety of foods comfortably and easily and with peace of mind. As the soothing [color] gently moves down your esophagus, it comes to your stomach. Visualize the lining of your stomach as healthy and producing exactly the right amount of digestive juices to easily and comfortably digest your food. And as the soothing [color] begins to move into your intestine, you can know that it helps your food move through at the proper rate so your body absorbs all the nutrients from your food, to provide you with vitality, energy, and resources for healing.*

*The beautiful [color] continues to move through your intestines, easily guided by the gentle wavelike motion of peristalsis, as your body remains calm and relaxed and unaware of this motion. Your body is learning from this experience, and now you have the ability to choose a great comfort, a wonderful soothing comfort throughout your stomach and intestines and colon. Even when your body lets you know there are stresses around you, you can quickly override the bodily stress response by making a conscious decision to give your body the message for comfort as you are doing right now. You can now "let go" of stress. And "let go" is a phrase that will now provide a powerful and soothing message whenever you want to detach from stress around or within you. Let yourself "feel" the calm inner peace and comfort within your digestive tract, the healthy, gentle, calm process by which you easily digest and eliminate your food. Your body has just memorized this experience with you.*

### **Headache: Cool Breeze Technique**

The imagery of cooling the head helps facilitate vasoconstriction. Add the imagery of warming the hands to direct greater circulation to the extremities and to help reduce pressure and pain in the head, particularly for migraines.

This induction technique often also reduces pain by facilitating relaxation. Further time spent on relaxation of the head muscles is warranted because tension is often involved in the pathogenesis of headaches. You might say the following or something similar to your patient:

*Feel the muscles in your temples relax, focus your attention on your eyes and forehead, and let them relax with each breath out. With each breath, let the muscles relax more and more. Now follow the muscles through the scalp to the base of the skull and relax this area, exhale, and feel the whole head relax. Imagine walking along a snowy path in the mountains with a cool breeze blowing across your face, cooling your head, your face, and your eyes. Imagine a cool and soothing sensation across your forehead and above each eye. Your hands are tucked in your pockets, so they are warming, and they are warm. Your hands are warm and comfortable, while a cool breeze and cold air make your head feel cooler, soothing and relaxing every muscle, releasing any tightness, any stress. Just feel a calm sensation flow through your eyes and forehead. You are calm and comfortable and relaxed. Just notice the cool breeze of each breath coming in your nose and softly blowing up and into your forehead, and the air warmed by your hands and body now being exhaled. Cool air in, soothing your head ... warm air out, relaxing your body.*

Repeat if needed.

### **Localized Pain From Injury or Preparation for Painful Procedure: Glove Anesthesia Technique**

The glove anesthesia technique involves creating numbness in one of the patient's hands that then can be transferred from the hand to any part of the body for pain relief. Tailor the technique by asking the patient's favorite color and say something like the following:

*Focus your attention on one of your hands. Direct all of your attention on that hand, and begin to imagine that hand becoming numb. Recall a time your hand fell asleep and how wooden your hand felt. As you numb your hand, imagine it gradually turning [insert favorite color]. Your hand is turning [favorite color], and as it does, there is a tingling in your fingertips, and warmth flows through your hand. Soon all the feeling will drain out of your hand as it turns a deeper [favorite color]. Let it go, let the feeling drain from your hand. That hand is feeling so numb, so very numb. That hand feels heavy, and it feels as if it were made of wood. Let all the feeling drain from your hand, so it now begins to glow a beautiful [favorite color]. Let your hand feel numb; let it feel numb as it glows brighter, glows like a beautiful [favorite color] light bulb. Your hand is now completely numb and filled with [favorite color] light.*

*Now place your numb [favorite color] hand on your [insert part of body ... knee, jaw], place your hand on your [body part], and now let the numbness and the [favorite color] light drain into your [body part]. Feel your [body part] become numb and watch as the numbing [favorite color] light slowly leaves your hand and covers your [body part], making it numb, wooden-like, heavy, numb, numb, thick, as if it were made of wood. When all the [favorite color] light has left your hand numbing your [body part], place your hand back down into a comfortable position [pause]. You can keep your [body part] numb for as long as you need to, as long as you need to. When you have completed this process, just let go and feel the numbness and the [favorite color] light drain away, drain away, and*

your [body part] returns to normal. When you no longer need it to be numb, it returns to normal.

### Warts: Hand Tracing Technique

This technique is best used for children with warts. Proceed as follows:

1. Have the patient trace both hands (or draw other parts of the body that may contain warts) on a piece of paper.
2. Have the patient draw where the warts are located on the tracing (Fig. 92-1).
3. Tailor the technique by asking about his or her favorite place and color.
4. Have the patient go to this favorite place (children are able to do this quickly and easily, but adults may have to use the induction technique discussed previously).

Then say something like the following to the patient:

*Imagine that you are miniaturized. Small enough to get in a beautiful [favorite color] spaceship and travel through your body to where your warts are.*

*Look at the roots of the wart and see what they are like. What would you like to do to prevent the roots from getting any nourishment from your body? Would you like to spray them or paint them with a powerful chemical that only warts can feel? Or would you like to cap them off with a plastic bubble, or cut them off and take them out of your body?*

As the patient invents a method to “treat” the roots of the warts, you might give some brief suggestions that reinforce the patient’s power to do this from within himself or herself.

*Go ahead and do that now and make sure that you treat all your warts.*

*Do you need more time to work on the warts?*

When the patient says that he or she has finished, ask him or her to do “one more thing” to ensure that these warts do not stand a chance.

*Your body will continue to work on these warts, even while you are sleeping.*

*How long do you think it will take your body to remove these warts? I wonder how quickly your body will get the job done for you?*

5. Then have the patient return to normal size and come out of the body. Offer encouragement on how well he or she did, how powerful his or her images seem, and how well his or her body heard everything it needed to do its part of the job.
6. After the patient comes out of trance, have him or her erase the warts on the tracing created previously. Have the patient use an eraser or paint the warts with white correction fluid.
7. Have the patient perform this technique one more time at home. Success with wart resolution has been found with two or three imagery sessions.

### Improving Surgical Outcomes

Much evidence shows that patients can use hypnosis to make surgery a more comfortable experience by lessening pain, blood loss, and nausea and vomiting due to anesthesia and also by speeding up wound healing and overall recovery. Furthermore, studies have shown that hypnotic suggestions to these ends are equally effective if they are delivered by a person or by an audio program.

If at all possible, patients should practice this technique on their own for at least 3 days before surgery. Be sure to emphasize that they are preparing themselves very well for their healing experience by doing so. Postoperatively, they should begin the technique as soon as possible and continue for as long as needed. Overall, the suggestions should indicate that the surgical experience is comfortable and that recovery is rapid, effective, and easy for them.

Before surgery, the following suggestions will be effective:

*You are preparing for a wonderful healing experience. Your body and mind are using only your positive words, images, and expectations for a comfortable and effective healing experience. Each time you practice or rehearse with your self-hypnosis, your body and mind are memorizing the positive messages as special instructions for comfortable healing. Any anxiety is easily replaced now by relaxing thoughts and feelings of comfort. You are in control of your inner comfort and can use any sounds or sensations from the environment around you to deepen your comfort.*

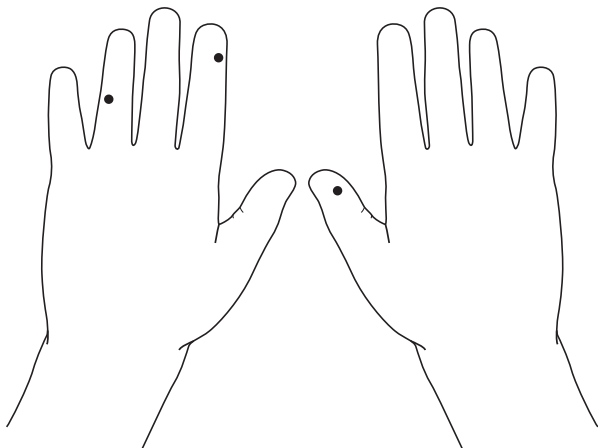
*Whenever you are distracted, you can quickly and easily return to your special place within you, your place of inner peace and confidence that reminds you that you are doing well, all is going well, and that you are preparing for a wonderfully comfortable and effective healing experience. Your body has begun performing its natural function of protecting you from any infection, managing blood flow, and using the procedure to enhance its inner-healing work. During and after the procedure, you will have all the “comfort control” [spoken with emphasis] you need to awaken feeling peacefully at ease with little or no discomfort.*

The following postoperative suggestions will assist in rapid recovery:

*You have done very well, and now your body is concentrating its powerful healing energy to mend the cells and tissues as your immune system maintains a peaceful balance of protection. Your body is releasing an abundance of the natural chemicals of comfort called endorphins, which circulate everywhere within you and concentrate themselves where you need the greatest comfort now. Immediately after the procedure, your body awakens each system and function*

**FIGURE 92-1**

Patient's location of warts on a tracing of the hands.



*to continue the healing process. Your intestines and bowels awaken comfortably and gently begin their natural action. Sensations of hunger and thirst awaken gently, and you welcome the nourishment. Your body is healing rapidly and effectively, and you are feeling confidently in control through this rapid recovery time. You recognize how well you have done, and you deserve to take credit for how well you have done.*

## Re-Alert

Re-alerting the patient out of trance is simply the reversal of the induction technique, such as climbing the staircase with energy coming back into the relaxed muscles, with a suggestion to return to a fully alert, waking state feeling refreshed and at ease. The process of re-alerting involves not only speech but also tone of voice. As you come closer to having the patient open the eyes, the tone of your voice should reflect “refreshment” accordingly. You should reinforce the idea that the patient has done well and can comfortably use this technique as needed in the future.

For re-alerting, say the following or something like it to the patient:

*It is now time to shift over and bring yourself to a fully alert, waking state. As we climb the staircase, counting each step, afterward you will be happy that you have done well with this method and proud because you realize that you can revisit this place whenever you need or desire.*

*As you proceed up the first step, feel the energy awakening your body, starting at your toes ...*

*2 ... And now allow it to flow up your legs ...*

*3 ... into your pelvis and lower back ...*

*4 ... traveling to your abdomen, as you feel your body refreshing itself.*

*5 ... Take in this energy with each rise of your chest.*

Your voice can become stronger as you return to a more normal pattern of speech.

*6 ... as you feel it travel into your arms ...*

*7 ... going up to your shoulders and neck ...*

*8 ... into your temples, eyes and eyelids.*

Your voice should now be normal to waking state.

*9 ... Feel your tongue, jaw, and the muscles of your face energize, and allow your eyes to open when you are ready to feel wonderfully refreshed and energized.*

You want to make sure that your patients are out of trance, and that can be done by taking time to engage in conversation, asking them how they are feeling and ensuring that they are fully reoriented to time, place, and person. The debriefing conversation that follows the trance work is also a good time to make sure that they are fully alert and oriented.

## Debrief

After the procedure, when the patients are alert, engage them in a conversation that allows you to assess their experience during the self-hypnosis. You might ask about physical sensations, nature of any resistance, what they liked, what they did not like, and so on. The time to debrief after the hypnotic trance work lets you gain insight not only into what they experienced but also into what you want to remember to use with them in future sessions. The debriefing is an excellent

opportunity to provide patients with encouragement about what they achieved and how they will continue to improve with these mind-body skills with practice.

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## Homework for the Patient

Your patients should first undergo induction, use, and re-alerting from trance with you as a learning experience in a clinical setting so they can see how to do it on their own. Think of it as a rehearsal for what you want your patients to practice by themselves. With the exception of removing warts (which requires only one or two sessions because further sessions may actually hinder the process), it is important to encourage your patients to practice or rehearse their self-hypnosis method to become more proficient with it. For conditions such as pain, there is no limit to the frequency of use.

Educate your patients to use this tool on their own by practicing at home what they experienced with you in the office. Review from beginning to end the steps the patients took with you; remind them that the body reacts to everything the patient may say, hear, think, and imagine and that it uses the patient's thoughts and ideas as instructions for the inner work to be achieved. Ask your patients to tell you where they plan to practice at home and what they are going to say or think to themselves to make it happen. Provide instructions as necessary to set them in motion for a positive experience at home. You might even give them a handout containing the words you spoke, along with instructions, or recommend an audio CD or audio program specific to them.

Hypnotic induction and suggestion is an art that takes time and practice, yet simple techniques such as those discussed should be used to enhance care in the primary care setting. For more complicated cases, referral should be made to a licensed practitioner.

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## What to Look for in a Consultant

When referring your patient for hypnosis, be sure to review the therapist's qualifications to treat the underlying condition. A good rule of thumb: never refer a patient to a practitioner who does not have the qualifications to treat the specific condition without hypnosis.

There are many so-called certified hypnotherapists advertising their services. Frequently, their certification comes from a lay school of hypnosis that teaches them only the techniques of hypnosis, and they do not possess any education in medicine, psychology, social work, or dentistry. Choose a practitioner licensed in a clinical specialty who is certified by the American Society of Clinical Hypnosis (ASCH). This professional organization provides extensive, comprehensive training and requires supervised practice before granting certification. The American Society of Clinical Hypnosis Web site ([www.asch.net](http://www.asch.net)) provides referrals to qualified practitioners.



## KEY WEB RESOURCES

<a href="http://www.cancer.gov/bcrisktool/Default.aspx">www.cancer.gov/bcrisktool/Default.aspx</a>	National Cancer Institute breast cancer risk calculator
<a href="http://www.asch.net">www.asch.net</a>	The American Society of Clinical Hypnosis offers excellent workshops that lead to certification and provides information for finding certified practitioners in clinical hypnosis. Their number is 630-980-4740.
<a href="http://www.sceh.us/">http://www.sceh.us/</a>	The Society for Clinical and Experimental Hypnosis offers professional training in clinical hypnosis for licensed physicians, psychologists, dentists, clinical social workers, nurses, and counselors. Ample resources are provided for professionals interested in clinical hypnosis.
<a href="http://erickson-foundation.org/">http://erickson-foundation.org/</a>	The Milton H. Erickson Foundation is dedicated to promoting and advancing the contributions made to the health sciences by the late Milton H. Erickson, MD, through training of mental health professionals and health professions worldwide.
<a href="http://www.ijceh.com">http://www.ijceh.com</a>	<i>International Journal of Clinical and Experimental Hypnosis</i>
<a href="http://www.apa.org/divisions/div30/">http://www.apa.org/divisions/div30/</a>	American Psychological Association, Society of Psychological Hypnosis, Division 30
<a href="http://www.HealingwithHypnosis.com">www.HealingwithHypnosis.com</a>	Steven Gurgevich, PhD, Healing with Hypnosis Web site with more than 50 audio, DVD, and book titles of therapeutic applications of clinical hypnosis, including <i>Surgery and Recovery</i> , <i>Cancer Support: Chemotherapy and Radiation Therapy</i> , <i>Immune Booster</i> , and <i>Healing Mind, Healing Body</i>
<a href="http://www.thehealingmind.org/">http://www.thehealingmind.org/</a>	The Healing Mind, books and audios in guided imagery by Martin Rossman, MD
<a href="http://www.healthjourneys.com/">http://www.healthjourneys.com/</a>	Health Journeys, guided imagery audios by Belleruth Naparstek

## References

References available online at [expertconsult.com](http://expertconsult.com).

## References

1. Weil A. Hypnotherapy: the power of suggestion. *Dr. Andrew Weil's Self Healing*. June 1999. [www.drweilselfhealing.com](http://www.drweilselfhealing.com).
2. Gurgevich S. Andrew Weil, foreword. *Hypnosis House Call, A Complete Course in Mind-Body Healing* [book with 2-hour DVD]. New York: Sterling Publishing; 2011.

## Additional Learning Resources

- Crasilneck H, Hall J. *Clinical Hypnosis: Principles and Applications*. 2nd ed. Orlando, FL: Grune & Stratton; 1985.
- Gurgevich S. Clinical hypnosis and surgery. *Altern Med Alert*. 2003;6:115–119.
- Gurgevich S. *The Self-Hypnosis Home Study Course* [16-CD audio]. Louisville, CO: Sounds True; 2005.
- Gurgevich S. Andrew Weil, foreword. *Hypnosis House Call, A Complete Course in Mind-Body Healing* [book with 2-hour DVD]. New York: Sterling Publishing; 2011.
- Hadley J, Staudacher C. *Hypnosis for Change*. 3rd ed. New York: MJF Books; 1996.
- Hammond DC. *Handbook of Hypnotic Suggestions and Metaphors*. New York: WW Norton; 1990.
- Hammond DC. *Hypnotic Induction and Suggestion*. Chicago: American Society of Clinical Hypnosis; 1998.
- Meyer RC. *Practical Clinical Hypnosis: Techniques and Applications*. New York: Lexington Books; 1992.
- Olness K, Kohen DP. *Hypnosis and Hypnotherapy with Children*. 3rd ed. New York: Guilford Press; 1996.
- Spiegel H, Spiegel D. *Trance and Treatment: Clinical Uses of Hypnosis*. 2nd ed. Washington, DC: American Psychiatric Publishing; 2004.
- Temes R. *Medical Hypnosis, An Introduction and Clinical Guide*. Philadelphia: Churchill Livingstone; 1999.
- Weil A, Gurgevich S. *Heal Yourself with Medical Hypnosis* [2-CD audio]. Louisville, CO: Sounds True; 2005.



# Relaxation Techniques

Michael Lumpkin, PhD, and David Rakel, MD

## Historical Perspective

In the early twentieth century, the physiologist Walter Cannon discovered that when subjects were exposed to certain physical and mentally stressful events, they secreted a large amount of epinephrine that prepared them for action. Cannon later coined the term “fight-or-flight response” to describe this physical reaction to stress. In contrast, in the 1930s, the Nobel Prize–winning Swiss physiologist Walter Hess found that by stimulating certain areas of the brain of laboratory animals, he was able to induce a physical reaction opposite to that seen with the fight-or-flight response. Specific areas of the brain triggered signs of relaxation, such as reductions in muscle tone, breathing, and heart rate. Herbert Benson, working from the same laboratory as Cannon had years earlier, helped pioneer this field when he described the relaxation response and how meditation could be used to decrease the response of the sympathetic nervous system. Meditation was found to reduce heart rate, respiratory rate, plasma cortisol, and pulse rate and to increase electroencephalogram alpha waves, which are associated with relaxation.<sup>1</sup> Evidence accumulated to confirm that lifestyle practices can have a direct influence on disease and its prevention.

Relaxation techniques are tools that will help balance the effects of stress but are not substitutes for exploring problems that may be causing the stress.

## Pathophysiology

### The Hypothalamus

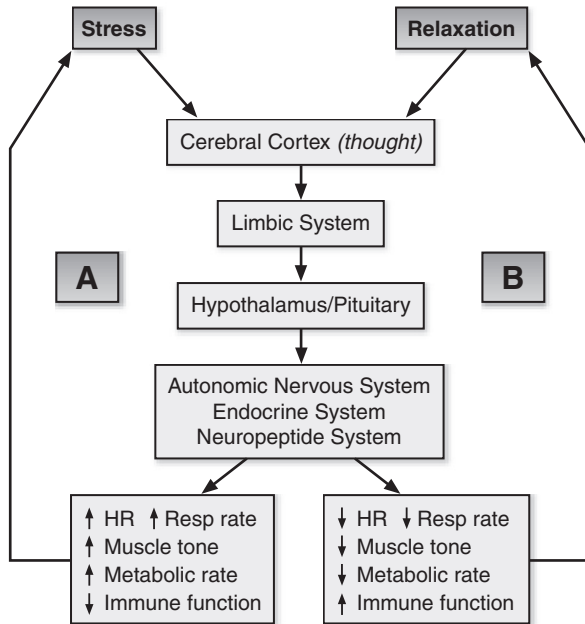
That stress has damaging effects on health through dysregulation of the autonomic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis is well established.<sup>2</sup>

As can be seen in [Figure 93-1](#), stress triggers emotions that release chemicals through these sites to stimulate somatic changes that can lead to poor health. Chronic stress results in a continuous activation of cycle A in the figure, which helps explain the association between chronic stress and increased susceptibility to disease. To understand this link more clearly, it is helpful to outline the mechanisms by which stressors disrupt the mind-body balance, that is, how they perturb homeostasis. Stressors, whether physical, metabolic, psychological, or emotional, fall into one of two broad categories. They can be the acute, short-lived type or they can be chronic and unrelenting. When a person experiences acute stress, a rapid coordination of nervous, endocrine, and immune system responses occurs to promote the immediate survival of the individual. The brain's hypothalamus is the central element in these essential interactive responses. The hypothalamus is the integrative center of the central nervous system because it simultaneously monitors neural, hormonal, metabolic, and immune signals arising from inside the body and compares these inputs with information being sent to it from inside and outside the body by various receptor systems. Further, the state of mind—whether one is fearful, depressed, angry, or happy—is perceived by higher brain centers, and this information is also projected to the hypothalamus for processing and comparison with the baseline activities of the other organ systems as detected by the hypothalamus.

Specific information about the body's stress reactions is transmitted to the hypothalamus, in part, by bloodborne solutes such as glucose, electrolytes, fatty acids, amino acids, hormones, peptides, cytokines, and other compounds that serve as communication molecules. The hypothalamus also receives information through neural inputs from lower brain centers such as the midbrain and spinal cord and from the higher brain structures of the cerebral cortex, hippocampus, and amygdala. This makes the hypothalamus the conversion point for peripheral and central signals that can be integrated in such a way that proper

**FIGURE 93-1**

A simplified chart showing the cyclic mind-body and body-mind influences of stress (A) and relaxation (B) on health. As our body experiences the physical responses to stress and relaxation, our central nervous system remembers them, thus causing a continuation of the cycle, with long-term positive or negative physical consequences. HR, heart rate; Resp, respiratory.



hormonal, autonomic, and behavioral changes are executed in the biologic defense of the individual.

Specifically, the hypothalamus responds to these signals by producing and releasing the “master” neurohormones known as the hypothalamic releasing factors that regulate anterior pituitary hormone secretion that, in turn, govern stress responses, reproductive activity, metabolism, growth, lactation, and fluid balance. To ensure a coordinated stress response, the hypothalamus also governs sympathetic and parasympathetic information flow to the visceral organs, tissues, and blood vessels of the body. The nervous connections of the cortical and limbic structures to the hypothalamus noted earlier form the anatomic basis for the transmission of conscious thoughts, emotions, and memories to the hypothalamus so that it can make appropriate adjustments in hormone secretion and autonomic outflow in an attempt to maintain homeostasis. On perceiving a stressor, the hypothalamus alters visceral organ activity to maximize the activation of critical functions such as increasing blood pressure and heart rate while reducing blood flow to tissues such as the gut and kidneys, where needs are less immediate.<sup>3</sup> This overall arrangement forms the very basis for the mind-body connection and can explain physiologically why relaxation techniques can reduce stress and favorably affect stress-related disorders.

Often, to be motivated to practice relaxation techniques, a person must first become aware that he or she is not at ease and is in need of stress reduction. Neurophysiologically, this may happen because the pathways of connectivity described earlier allow the factual information and conscious thoughts

of the cerebral cortex to arrive at the hippocampus and amygdala, where they are placed into a usable context by attaching memory and emotion. This consolidated information is then projected into the hypothalamus.<sup>4</sup> At this point, the hypothalamus and its various releasing hormone neurons elicit the specific hormonal, autonomic, metabolic, and behavioral changes that are appropriate for the physical or emotional stress being experienced. Most of the time, these autonomic alterations in the body's physiology are not consciously perceived. Because of projection pathways exiting from the hypothalamus that relay this information to the thalamus and from the thalamus back to the cerebral cortex, however, individuals can become aware of changes in their physiologic responses to stress. With this increased perception of stress and agitation, a person may choose to act on or moderate these responses. These neuronal pathways and their linkages to hypothalamic (autonomic) signaling provide the basis for the effectiveness of mind-body relaxation techniques such as biofeedback to address stress-related dysfunction.<sup>5</sup>

## Hypothalamic-Pituitary-Adrenal Axis

### Acute Stress Response

That most stressors stimulate the hypothalamic release of corticotropin-releasing hormone (CRH) and that CRH stimulates adrenocorticotropic hormone (ACTH) from the anterior pituitary gland are well known.<sup>6</sup> ACTH then increases the synthesis and release of the glucocorticoid hormone cortisol, as well as the androgens androstenedione and dehydroepiandrosterone from the adrenal cortex. The stress hormone cortisol is critical during an acute fight-or-flight challenge because it maintains blood glucose concentrations to fuel metabolic processes and supports sodium and water retention to maintain blood volume and perfusion pressures to activated organs. During the healthy and useful acute stress response, the blood concentrations of cortisol increase until they negatively feed back on the hypothalamic-pituitary unit to decrease the elevated levels of CRH and ACTH to their baselines.<sup>7</sup> This action prevents unnecessarily extended elevations in CRH, ACTH, and cortisol after acute stress.<sup>8</sup> In this acute situation, metabolic substrate mobilization, fluid retention, and increased blood volume occur only when a specific need exists.

### Chronic Stress Response

In stark contrast, when an individual experiences chronic stress along with maladaptive responses or a lack of coping, cortisol levels may remain elevated because of ongoing activation of the CRH-ACTH-cortisol axis. The high concentrations of cortisol may cause glucocorticoid receptor desensitization in the hypothalamic-pituitary unit and may result in the loss of negative feedback restraint on CRH, ACTH, and cortisol. The subsequent elevations of cortisol may also damage hippocampal neurons (which also have glucocorticoid receptors) and thereby impair memory functions. Other pathophysiologic changes may include the following: the redistribution of fat (from the buttocks to the abdominal and cervical regions (“buffalo hump”) because of mobilization of free fatty acids; the development of insulin resistance from excessive glucose in the circulation; proteolysis in muscle, bone, and connective tissues; and the

inhibition of peptide and protein hormone formation, especially by the pituitary gland.<sup>9</sup> Ongoing high cortisol levels also suppress immune system function.<sup>10</sup> Rising cortisol levels decrease the proliferation and activity of blood lymphocytes, eosinophils, basophils, monocytes or macrophages, and neutrophils. Chronically elevated glucocorticoids can also decrease antibody and immunoglobulin production. At the same time, increased CRH acts in the brain to stimulate sympathetic outflow and inhibit parasympathetic activity. Because immune tissues such as the thymus gland, spleen, and bone marrow are innervated by sympathetic nerves, and because their immune cells have adrenergic receptors, they are subject to influence by stress-triggered sympathetic outflow.<sup>10</sup> The action of sympathetic catecholamines causes lymphopenia and suppression of natural killer cell activity.<sup>11</sup>

### ■ Chronic Stress and Gastrointestinal Function

Another organ system adversely affected by chronic stress is the gastrointestinal tract. Stress-induced elevations in hypothalamic CRH change the ratio of sympathetic to parasympathetic inputs to gastrointestinal components. The net outcomes for the stomach are inhibition of gastric contractility and decreased emptying that lead to sensations of fullness and bloating. Conversely, at the colon, the movement of material through the lumen is accelerated, and poor absorption of nutrients and water is the result. Diarrhea and inflammation of the bowel can occur if the stress is of sufficient intensity and length. Some investigators believe that this altered autonomic regulation of the gut resulting from persistent stress may account for the development of irritable bowel syndrome and the exacerbation of Crohn's disease.<sup>12</sup> These inflammatory conditions of the bowel may result in the leaky gut syndrome whereby poorly digested food antigens can provoke inappropriate immune responses that manifest as food allergies, as happens in the gluten sensitivity syndrome of celiac disease.

When one considers the impact of chronic stress on the many different organs and tissues discussed earlier, it is not surprising that poorly managed stress reactions may lead to greater susceptibility to chronic disease development, infectious conditions, and cancer cell proliferation.<sup>13</sup> However, the skillful use of relaxation techniques typical of mind-body medicine methods may be able to short-circuit the entire stress cascade that contributes to the development of disease.

### *Corticotropin-Releasing Hormone and Stress-Related Behaviors*

CRH not only directs the neuroendocrine stress response but also acts directly in the brain as a neurotransmitter to drive stress behaviors that correspond to neuroendocrine events. For example, CRH acts in the brain to enhance locomotor activity, the startle response, and anxiogenic behaviors characteristic of the fight-or-flight response just as levels of stress hormones such as epinephrine and cortisol begin to rise to fuel the whole process.<sup>14,15</sup> CRH injected into the brains of experimental animals induces behaviors that closely mimic the signs and symptoms of major clinical depression in humans.<sup>16</sup> Investigators also know that CRH levels are elevated in the brains and cerebrospinal fluid of people with

depression. Not surprisingly, these individuals also demonstrate chronic elevations in the diurnal pattern of cortisol secretion that would then account for some of the hormonal and physiologic disturbances they also endure. In fact, some of these patients may even develop features resembling those seen in Cushing syndrome.<sup>17</sup>

### *Stress Disorders: High Versus Low Hypothalamic-Pituitary-Adrenal Axis Activity*

Whereas certain physical and behavioral disorders of chronic stress are associated with excessive HPA axis activity, some physical and behavioral dysfunctions result from an underfunctioning HPA axis following chronic stress. Clinical investigators Chrousos and Gold sorted out some of the disorders that fall between these two categories of HPA activity.<sup>17</sup>

In addition to chronic stress, long-term activation of the HPA axis is seen in melancholic depression, anorexia nervosa, obligate exercise, diabetes mellitus, metabolic syndrome, and premenstrual syndrome. Some stress-related conditions are so long lasting and severe that the adrenal glands cannot keep up with the added physiologic demands for cortisol. In these situations, a relative deficiency of cortisol (so-called adrenal exhaustion) may result even though the hypothalamus may continue to produce high levels of CRH (and thus may, in fact, drive more depressive behavior). Insufficient cortisol activity is seen in chronic fatigue, fibromyalgia, postpartum depression, posttraumatic stress disorder, and rheumatoid arthritis. Because most or all of these conditions have chronic stress and high states of CRH activation in common, perhaps all could be favorably affected by the use of relaxation techniques that lower stress and thereby lower CRH stimulation and the downstream stress responses it triggers.

In fact, by giving attention to lifestyle changes that reduce stressful triggers and by practicing techniques that activate the relaxation response (cycle B in Fig. 93-1), this approach can have significant health benefits. The relaxation response can be learned, but practice is required for the body to benefit from it. Regular use results in long-term physiologic changes that last throughout the day, not only during the specific time when the relaxation technique is practiced.<sup>18</sup>

With chronic stress, corticotropin-releasing hormone (CRH) levels are elevated and can exacerbate depressed mood. Cortisol becomes less sensitive to CRH effects, and levels start to drop, resulting in more depression and fatigue. This condition is most effectively treated with a change in perception toward a more relaxed state.

## The Evidence for Relaxation

More than 3000 studies show the beneficial effects of relaxation on health. To think that we could cover all of them here would be foolish. Many studies document the value of relaxation exercises such as meditation, breathing, and progressive muscle relaxation. Beneficial effects of relaxation have been shown in tension headaches,<sup>19</sup> anxiety,<sup>20</sup> insomnia,<sup>21</sup>

psoriasis,<sup>22</sup> blood pressure,<sup>23,24</sup> cardiac ischemia and exercise tolerance,<sup>25</sup> cardiac arrhythmia,<sup>26</sup> premenstrual syndrome,<sup>27</sup> infertility,<sup>28</sup> longevity and cognitive function in older adults,<sup>29</sup> use of medical care,<sup>30</sup> medical costs in treating chronic pain,<sup>31</sup> smoking cessation,<sup>32</sup> and serum cholesterol levels.<sup>33</sup> Recommending relaxation therapy is very important in the primary care setting because more than 60% of all visits to physicians are stress related.

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## What Relaxation Exercises Have in Common

It is our mind's thoughts that trigger the physiologic changes that can result in poor health. Working to “get the mind off of it” involves focusing on something other than those thoughts that cause stress. Mental focus is what all relaxation techniques have in common. Meditation may focus on a mantra, yoga may focus on a body posture (asana) or the breath, guided imagery focuses on an image, and progressive muscle relaxation focuses on the muscles. Relaxation does not need to include these traditional mind-body therapies; it may simply involve focusing on a hobby such as painting, playing an instrument, or gardening. Whatever task is used, the mind has a tendency to wander. If this happens, we can simply accept it and bring our attention back to the activity at hand. Using a more structured technique will help stress the importance of this process. Focus frees the mind from its usual stressful thoughts, such as worry, planning, thinking, and reasoning, and dampens the production of adrenergic catecholamines that stimulate the hypothalamus, which in turn inhibits immune activity.

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## Relaxation and Aerobic Exercise

We usually do not associate relaxation with exercise, but Herbert Benson et al<sup>34</sup> found that the relaxation response could also be elicited during aerobic exercise. Compared with a control group, volunteers who focused their thoughts on a word or phrase while riding a stationary bicycle reduced both their oxygen consumption and their metabolic rate, resulting in better efficiency.<sup>34</sup>

Few people may have the time to meditate for 20 minutes twice a day, exercise for 30 minutes, spend good-quality time with their families, and make a living while getting 8 hours of sleep. Combining relaxation and exercise into one activity uses the time more efficiently.

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## Matching the Technique to the Individual

Relaxation techniques are similar to ice cream flavors. Someone who finds a flavor he or she likes thinks everyone else should try it. The important thing is not to have every

patient meditate, but rather to match a technique to each patient's lifestyle. In fact, investigators have shown that various relaxation techniques, such as meditation, biofeedback, hypnosis, guided imagery, and progressive muscle relaxation, induce the same physiologic response.<sup>35</sup> Many different ways are available to arrive at the desired outcome. A technique that is matched to the individual is more successful in inducing relaxation and will be used more often. For example, a body-vigilant woman with breast cancer may not respond well to progressive muscle relaxation because this technique requires focus on specific parts of the body. An anxious, type A individual may do better with this technique because it gives an active mind a focal point. A relaxation exercise should be as individualized as prescribing a medication for hypertension.

Relaxation exercises are low-cost, well-tolerated therapies that can be recommended for many problems seen in the primary care setting. This approach may be most useful in patients suffering from anxiety, heart disease, recurring pain syndromes, and chronic illness, but it also is beneficial in helping patients find a balance, thus leading to the best medicine of all—prevention. [Table 93-1](#) provides brief summaries of various relaxation exercises, as well as resources.

The most important task is for the medical provider to match the relaxation technique to the patient's personality, beliefs, and lifestyle.

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## Growing Beyond the Relaxation Technique

Prescribing relaxation techniques can be a useful tool in helping improve health and reduce symptoms, but exploring our lives and making changes so we do not need to use these tools as often are also important. We are not facilitating deep healing if we maintain a stressful lifestyle and think that it will all be OK if we simply spend 20 minutes each day meditating or doing progressive muscle relaxation. We need to make choices that help us understand how we can live every minute in a more peaceful way. The goal is to require less of these techniques as we learn how to live in a way that resembles how our body feels when practicing one of them.

### Peace

It does not mean to be in a place where there is no noise, trouble or hard work. It means to be in the midst of those things and still be calm in your heart.

*Unknown*

TABLE 93-1. Relaxation Techniques

RELAXATION TECHNIQUE	SUMMARY	FURTHER RESOURCES
Breathing Exercise (see Chapter 89, Breathing Exercises)	The foundation of most relaxation techniques. The subject places one hand on the chest and the other on the abdomen. He or she then takes a slow deep breath, as if sucking in all the air in the room. While doing this, the hand on the abdomen should rise higher than that on the chest. This exercise promotes diaphragmatic breathing, which increases alveolar expansion in the bases of the lungs. The subject holds the breath for a count of 7 and then exhales. Exhalation should take twice as long as inhalation. Repeat for a total of five breaths. Subjects should do this exercise three times a day.	Hendricks G. <i>Conscious Breathing: Breathwork for Health, Stress Release, and Personal Mastery</i> . New York: Bantam; 1995. Lewis D. <i>Free Your Breath, Free Your Life: How Conscious Breathing Can Relieve Stress, Increase Vitality, and Help You Live More Fully</i> . New York: Shambala; 2004. Weil A. <i>Breathing: The Master Key to Self Healing (The Self Healing Series)</i> (audio CD). Louisville, Colo: Sounds True; 2000. Instructional videos on breathing techniques can be found through the University of Wisconsin Integrative Medicine program: <a href="http://www.fammed.wisc.edu/our-department/media/integrative-medicine">http://www.fammed.wisc.edu/our-department/media/integrative-medicine</a>
Meditation (see Chapter 98, Recommending Meditation): Transcendental Meditation (TM) and the Relaxation Response	To prevent distracting thoughts, the subject repeats a mantra (a word or sound) over and over while sitting in a comfortable position. If a distracting thought comes to mind, it is accepted and let go, with the mind focusing again on the mantra.	For information on transcendental meditation: <a href="http://www.tm.org/">www.tm.org/</a>
Mindfulness Meditation	Represents the philosophy of living in the present moment. The body scan is one technique whereby the subject uses breathing to obtain a relaxed state while lying or sitting. The mind progressively focuses on different parts of the body, where it feels any and all sensations intentionally but nonjudgmentally before moving on to another part of the body. A patient with back pain, for example, may focus on the quality and characteristics of the pain, to understand it better and bring it under control.	For full description of this technique, see Kabat-Zinn J. <i>Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness</i> (reprint). New York: Delta; 1990. Mindfulness stress reduction courses are offered throughout the United States. For more information on training programs, go to the Center for Mindfulness through the University of Massachusetts Medical School: <a href="http://www.umassmed.edu/cfm/home/index.aspx">http://www.umassmed.edu/cfm/home/index.aspx</a>
Centering Prayer	A form similar to TM but with a more religious foundation. The subject repeats a "sacred word" similar to a mantra. As thoughts come to mind, they are accepted and let go, thus clearing the mind to become more centered on the spirit within. The subject regards the mind's preoccupied thoughts as the layers of an onion, which are peeled away to allow better understanding of the spirit at the core.	For a nondenominational discussion, go to the centering prayer Web site of Contemplative Outreach: <a href="http://www.centeringprayer.com/">www.centeringprayer.com/</a>
Progressive Muscle Relaxation (PMR)	A form of relaxation in which the subject is attuned to the difference in feeling when the muscles are tensed and then relaxed. In a comfortable position, the subject starts by tensing the whole body from head to toe. While doing this, the subject notices the feelings of tightness. The subject takes a deep breath in and, while letting it out, lets the tension release and the muscles relax. This is then followed by progressive tension and relaxation throughout the body. One may start by clenching the fists, then tensing the arms, shoulders, chest, abdomen, hips, legs, and so on, with each step followed by relaxation.	Helpful Web sites for PMR include A Guide to Psychology and Its Practice ( <a href="http://www.guidetopsychology.com/pmr.htm">www.guidetopsychology.com/pmr.htm</a> ) and the American Medical Student Association ( <a href="http://www.amsa.org/healingthehealer/musclerelaxation.cfm">www.amsa.org/healingthehealer/musclerelaxation.cfm</a> ). Free guided body scans and relaxation exercises are offered by the University of Wisconsin School of Medicine: <a href="http://www.fammed.wisc.edu/our-department/media/mindfulness">http://www.fammed.wisc.edu/our-department/media/mindfulness</a>
Visualization/Self- Hypnosis (see Chapter 95, Guided Imagery, and Chapter 92, Self-Hypnosis Techniques)	The subject uses visualization to recruit images that create a relaxed state. For example, if a person is anxious, visualizing images of a place and time that was peaceful and comforting will help induce relaxation. This approach is best used in conjunction with a breathing exercise.	Many audio tapes and CDs are available that can guide people through a visualization "script" that results in relaxation. Belleruth Naparstek's Health Journeys are good audio guides: <a href="http://www.healthjourneys.com/index.asp">http://www.healthjourneys.com/index.asp</a> Kaiser Permanente offers free downloadable guided relaxation audios through their Healthy Living Audio Library. Search: "Kaiser Permanente Audio Files"

Continued

TABLE 93-1. Relaxation Techniques—cont'd

RELAXATION TECHNIQUE	SUMMARY	FURTHER RESOURCES
Autogenic Training	Induces a physiologic response by using simple phrases. For example, “my legs are heavy and warm” is meant to increase the blood flow to this area, thus resulting in relaxation. The subject performs this process progressively from head to toe with the use of deep breathing and repetition of the phrase. After completion, the subject focuses attention on any body part that may still be tense and then focuses the breath and phrase to that area until the whole body is relaxed.	The British Autogenic Society is a good resource for more information: <a href="http://www.autogenic-therapy.org.uk/">www.autogenic-therapy.org.uk/</a>
Exercise and Movement: Aerobic	While performing an aerobic exercise, the subject focuses attention on a phrase, sound, word, or prayer and passively disregards other thoughts that may enter the mind. Some people focus on their breathing and say to themselves “in” with inhalation and “out” with exhalation. Or they repeat “one two, one two” with each step while jogging. Doing this helps the mind focus and prevents other thoughts that may cause tension.	Benson H, Klipper M. <i>Beyond the Relaxation Response</i> (reissued). New York: Harper/Torch; 1976. This book includes discussion of Benson's research on relaxation response while exercising.
Yoga	Has been practiced for thousands of years. To simplify, yoga is divided into three aspects: breathing (Pranayama yoga), body postures or asanas (Hatha yoga), and meditation to maintain balance and health. Regular practice induces relaxation.	For yoga, tai chi, and qi gong, it is best to encourage your patients to take a class at a local community center or gymnasium and to pick up an introductory book at a library or bookstore.
Tai Chi	This ancient Chinese martial art uses slow, graceful movements combined with inner mindfulness and breathing techniques to help bring balance between the mind and body.	As above
Qi Gong	This traditional Chinese practice uses movement, meditation, and controlled breathing to balance the body's vital energy force, qi (pronounced “chi”).	As above

Adapted from Rakel DP, Shapiro DE. Mind-body medicine. In: Rakel RE, ed. *Textbook of Family Practice*. 6th ed. Philadelphia: Saunders; 2001.

## References

References are available online at [expertconsult.com](http://expertconsult.com)



## References

- Shapiro D. Meditation. In: Stroecker J, Trivieri L, Lewis D, Florence M, eds. *Alternative Medicine: The Definitive Guide*. Fife, WA: Future Medicine; 1995:339–345.
- Stanford SC, Salmon P. *Stress: From Synapse to Syndrome*. London: Academic Press; 1999.
- Wyss JM, vanGroen T, Canning KJ. The limbic system. In: Conn PM, ed. *Neuroscience in Medicine*. Philadelphia: Lippincott; 2002:369–387.
- Isaacson RL. *The Limbic System*. 2nd ed. New York: Plenum Press; 1982.
- Green E, Green A. *Beyond Biofeedback*. New York: Delta; 1977.
- Antoni FA. Hypothalamic control of adrenocorticotropin secretion: advances since the discovery of 41-residue corticotropin-releasing factor. *Endocr Rev*. 1986;7:351–378.
- Grossman A. Corticotropin-releasing hormone: basic physiology and clinical applications. In: DeGroot L, ed. *Endocrinology*. 3rd ed. Philadelphia: Saunders; 1995:341–354.
- Dallman MF, Akama SF, Levin N. Corticosteroids and the control of function in the hypothalamus-pituitary-adrenal (HPA) axis. *Ann N Y Acad Sci*. 1994;746:22–31.
- Orth DN, Kovac WJ. The adrenal cortex. In: Wilson JD, Foster DW, Kronenberg HM, Larsen PR, eds. *Williams Textbook of Endocrinology*. 9th ed. Philadelphia: Saunders; 1998:517–664.
- Munck A, Guyre PM, Holbrook NJ. Physiologic function of glucocorticoids in stress and their relation to pharmacologic actions. *Endocr Rev*. 1984;5:25–44.
- Felten SY, Felten DL. Innervation of lymphoid tissue. In: Ader R, Felten DL, Cohen N, eds. *Psychoneuroimmunology*. 2nd ed. New York: Academic Press; 1991:27–61.
- Tache Y, Martinez M, Million M, Wang L. Stress and the gastrointestinal tract. Part III. Stress-related alterations of gut motor function: role of brain corticotropin-releasing factor receptors. *Am J Physiol*. 2001;280:G6173–G6177.
- Turner-Cobb JM, Sephton SE, Spiegel D. Psychosocial effects on immune function and disease progression in cancer: human studies. In: Ader R, Felten DL, Cohen N, eds. *Psychoneuroimmunology*. 3rd ed. New York: Academic Press; 2001:562–582.
- Sutton RE, Koob GF, LeMoal M. Corticotropin releasing factor produces behavioral activation in rats. *Nature*. 1982;297:331–333.
- Lenz HG. Extrapituitary effects of corticotropin-releasing factor. *Horm Metab Res*. 1987;16(suppl):17–23.
- Nemeroff CB. *Neuropeptides and Psychiatric Disorders*. Washington, DC: American Psychiatric Press; 1991:29.
- Chrousos GP, Gold PW. The concepts of stress and stress system disorders: overview of physical and behavioral homeostasis. *JAMA*. 1992;267:1244–1252.
- Hoffman JW, Benson H, Arns PA, et al. Reduced sympathetic nervous system responsivity associated with the relaxation response. *Science*. 1982;215:190–192.
- Blanchard EB, Nicholson NL, Taylor AE, et al. The role of regular home practice in the relaxation treatment of tension headache. *J Consult Clin Psychol*. 1991;59:467–470.
- Eppley KR, Abrams AL, Shear J. Differential effects of relaxation techniques on trait anxiety: a meta-analysis. *J Clin Psychol*. 1989;45:957–974.
- Jacobs GD, Benson H, Friedman R. Perceived benefits in a behavioral-medicine insomnia program: a clinical report. *Am J Med*. 1996;100:212–216.
- Kabat-Zinn J, Wheeler E, Light T, et al. Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy and photochemotherapy. *Psychosom Med*. 1998;60:625–632.
- Alexander CN, Schneider RH, Staggers F, et al. Trial of stress reduction for hypertension in older African Americans. Part II. Sex and risk subgroup analysis. *Hypertension*. 1996;28:228–237.
- Stuart E, Caudill M, Leserman J, et al. Nonpharmacologic treatment of hypertension: a multiple-risk-factor approach. *J Cardiovasc Nurs*. 1987;1:1–14.
- Zamarra J, Schneider RH, Bessighini I, et al. Usefulness of the transcendental meditation program in the treatment of patients with coronary artery disease. *Am J Cardiol*. 1996;77:867–870.
- Benson H, Alexander S, Feldman CL. Decreased premature ventricular contractions through use of the relaxation response in patients with stable ischemic heart-disease. *Lancet*. 1975;2:380–382.
- Goodale IL, Domar AD, Benson H. Alleviation of premenstrual syndrome symptoms with the relaxation response. *Obstet Gynecol*. 1990;75:649–655.
- Domar AD, Seibel M, Benson H. The mind/body program for infertility: a new behavioral treatment approach for women with infertility. *Fertil Steril*. 1990;53:246–249.
- Alexander C, Chandler HM, Langer EJ, et al. Transcendental meditation, mindfulness, and longevity: an experimental study with the elderly. *J Pers Soc Psychol*. 1989;57:950–964.
- Orme-Johnson D. Medical care utilization and the transcendental meditation program. *Psychosom Med*. 1987;49:493–507.
- Caudill M, Schnable R, Zuttermeister P, et al. Decreased clinic use by chronic pain patients: response to behavioral medicine interventions. *Clin J Pain*. 1991;7:305–310.
- Westbrook C, Creswell JD, Tabibnia G, et al. Mindful attention reduces neural and self-reported cue-induced craving in smokers. *Soc Cogn Affect Neurosci*. 2011 Nov 22 [Epub ahead of print].
- Cooper M, Aygen M. Effect of meditation on blood cholesterol and blood pressure. *Isr Med Assoc*. 1978;95:1–2.
- Benson H, Dryer T, Hartley LH. Decreased VO<sub>2</sub> consumption during exercise with elicitation of the relaxation response. *J Human Stress*. 1978;4:38–42.
- Delmonte MM. Physiological concomitants of meditation practice. *Int J Psychosom*. 1984;31:23–36.



# Enhancing Heart Rate Variability

Malynn L. Utzinger-Wheeler, MD, MA

The human heart does not beat at a steady rate, but rather fluctuates from beat to beat, to create patterns that can be regular, as in respiratory sinus arrhythmia, or irregular, as in atrial fibrillation. These beat-to-beat changes and larger patterns collectively are called heart rate variability (HRV). In general, high HRV is an indicator of health, whereas too little variability is a predictor of disease, as exemplified by research showing that low baselines measures of HRV are predictive of all-cause mortality<sup>1</sup> and *independently* predict cardiovascular death.<sup>2</sup> HRV reflects sympathovagal balance, which, in turn, affects inflammatory pathways common to many illnesses.<sup>3-9</sup> Research reveals strong links between HRV and diseases in the cardiovascular,<sup>10-21</sup> neurologic,<sup>22-28</sup> psychological,<sup>29-36</sup> endocrine,<sup>37-39</sup> rheumatologic<sup>40-42</sup> pulmonary<sup>43,44</sup> gastroenterologic,<sup>45,46</sup> and dermatologic<sup>47,48</sup> systems. Even cognitive capacities<sup>49-53</sup> are associated with HRV. All these links will be explored in this chapter.

The ultimate aim of this chapter is to provide clinicians and patients with practical, meaningful, and effective tools to monitor and improve HRV. Preceding this is a review of basic physiology, followed by a discussion of the associations between HRV and health.

## Background

HRV is driven by a highly dynamic, bidirectional interplay between the heart and the respiratory system, mediated by the two branches of the autonomic nervous system (ANS), the sympathetic and parasympathetic nervous systems.<sup>54</sup> A standard explanation for the association between disease states and lowered HRV is that neural damage from disease impairs vagus nerve functioning and thereby lowers parasympathetic tone. One of the most fascinating alternative considerations to emerge from research on inflammatory reflexes is that loss of normal vagal tone may lead to

diminished functioning of the cholinergic antiinflammatory pathway that may result in downstream immune dysfunction and exaggerated cytokine release triggered by otherwise harmless stimuli.<sup>7</sup> In simple terms, loss of vagal function may *allow* inflammation and disease in the first place.<sup>7</sup> This means that clinicians have a potential opportunity to prevent or slow many conditions by helping people maintain sympathovagal balance.

Down-regulation of vagal function can worsen chronic inflammation by reducing parasympathetic tone and the cholinergic antiinflammatory pathway.

Before exploring HRV physiology, we should look at the heart itself, which plays a more complex role in health than previously appreciated.<sup>49,55-58</sup> Not only does the heart have novel endocrine roles, such as those of the cardiac receptors for oxytocin, the bonding hormone normally associated with reproduction,<sup>59</sup> but also it has an extensive, intrinsic nervous system that allows it to process and respond to certain emotional and physiologic cues even before the brain does.<sup>56,60,61</sup> Moreover, the heart is the body's strongest generator of electric and magnetic signals, which are 60 times and 5000 times stronger, respectively, than those coming from the brain. These signals can be detected throughout the body by electrocardiography (ECG) or even several feet away by magnetocardiography.<sup>62,63</sup> A theory reviewed and developed by McCraty et al at the Institute of HeartMath is that the heart is not merely a pump. Rather, it provides an organizing force throughout the body, especially in the brain, where synchronization has been observed between R waves on the ECG and alpha waves on the electroencephalogram (EEG).<sup>56,64</sup> Pulsatile signals from the heart travel afferent vagal pathways and arrive in the brainstem and thalamus, where pacemaker cells appear to mediate synchronization of millions of

incoming signals from the sensory cortex.<sup>65</sup> In other words, the heart itself may participate in interpreting our experience of the world by synchronizing cortical signals. The positive emotional states and biofeedback tools discussed later appear to increase this synchronization and improve cognitive performance.<sup>29,34,49–51,56,66</sup> In summary, the heart is a pump, a rhythm generator, a sensory organ, and a key node in body-wide communication.

The heart itself may participate in interpreting our experience of the world by synchronizing cortical signals.

## Physiology and Measurement of Heart Rate Variability

As stated earlier, HRV is driven by the ongoing interplay between the sympathetic and parasympathetic nervous systems to keep the body in a state of dynamic balance, or homeostasis.<sup>54</sup> Under conditions of rest, the healthy heart is largely under parasympathetic dominance. Vagal predominance exists during most of the sleep cycle, digestion, and times of quiet, focused attention, such as meditation or prayer. The arousal and erection stages of love-making are also driven by the parasympathetic system.

When a stressor, such as injury, acute illness, pain, or fear, is introduced, sympathetic drive kicks in, increasing catecholamine production necessary in the short run to increase heart rate, cardiac output, muscle strength, and vigilance and thus allowing the body to outrun a real or perceived threat.

In healthy people, sympathetic tone and parasympathetic tone are finely tuned, each rising and falling as demand changes. Unfortunately, daily stress, which can feel threatening, often erroneously triggers increased catecholamines. When this happens on a long-term basis, the body pumps out stress hormones more often than is healthy or necessary. The ANS may try to compensate by turning up parasympathetic control. Ultimately, sympathetic drive that simmers continuously can deplete the reserve needed to meet true challenges. This depletion usually translates into a feeling of being constantly “on edge” yet sluggish and lacking vitality.<sup>56</sup>

When the two systems compete inappropriately, the heart's electrical system can become unstable, causing arrhythmias, platelet aggregation, coronary artery constriction, increased stress on the left ventricular wall, and unhealthy remodeling. Reestablishing proper vagal input antagonizes these sympathetic overcompensations and rebalances the system. This

happens in part through cardiac baroreceptors, or mechanosensory receptors, which are sensitive to stretch and pressure changes and act centrally to restore proper vagal tone and blood pressure.

Baroreceptor sensitivity is a marker of the body's capacity to augment vagal tone reflexively and has a direct link to HRV, observed in respiratory sinus arrhythmia. During inspiration, intrathoracic pressure decreases, and the heart rate increases to compensate. During expiration, intrathoracic pressure rises, and the heart rate drops. In general, with faster breathing, sympathetic tone increases, and the heart rate climbs. With slower breathing, between six and four breaths/minute,<sup>67,68</sup> the balance shifts toward the parasympathetic system, and the heart rate slows.

Therefore, the healthy heart does not beat at a steady rate but rather varies in coordination with the breath and environmental cues. A well-known example of this phenomenon is in obstetrics, in which the fetus is assessed for adequate heart rate accelerations higher than baseline to ensure a favorable response to the challenges of labor (Fig. 94-1).

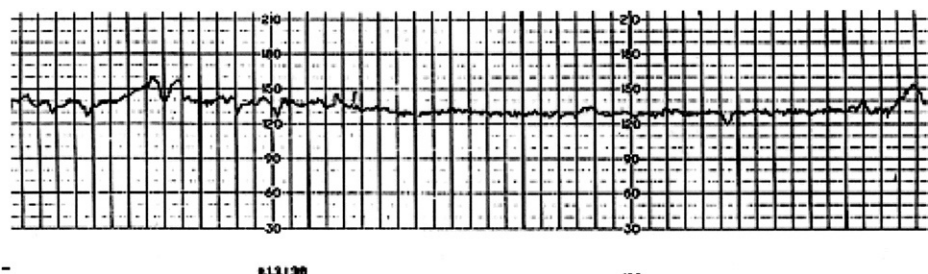
A flexible, well-coordinated ANS helps us respond appropriately to stress, and positive emotions seem to cultivate this dynamic synergy. In the state of appreciation, for example, parasympathetic and sympathetic systems both show moderate output, and they oscillate in relative regularity to produce what is known as a coherent HRV pattern, which is a smooth, sine wave–like curve and an overall shift toward parasympathetic dominance.<sup>56</sup> In contrast, during stress, anger, or chronic illness, the HRV curve becomes more erratic and shallow, thus reflecting the less-coordinated functioning between the two branches of the ANS and a shift toward sympathetic drive.<sup>61</sup>

Figures 94-2 and 94-3 are examples of graphed HRV plots. The tachogram in Figure 94-2, from the HeartMath Institute, demonstrates the use of a biofeedback technique to shift from frustration, shown with the erratic HRV curve, to appreciation, with a smooth curve. Although both graphs demonstrate similar peak-to-nadir differences in heart rate (reflecting the same absolute amount of variability), the patterns of the curves are quite different. Each segment of the frustration tachogram is erratic and shallow, reflecting low coherence. In contrast, the appreciation curve is both higher in amplitude, more regularly oscillating, and smoother. This *pattern* of variability, and not absolute amount of variability, determines coherence and optimal ANS output.<sup>61</sup>

In Figure 94-3, three emotional states are compared: anger, relaxation, and appreciation. Tachograms are displayed along with power spectra analyses, which plot power (variability) distributed as a function of frequency. Short-term power spectra analyses produce peaks or clusters of data points mostly within three main regions<sup>69</sup>:

**FIGURE 94-1**

Fetal heart tones. This fetal heart tone strip shows that the baby's heart regularly rises higher than the baseline of 130 beats/minute.



1. High frequency (HF), from 0.15 to 0.40 Hz, reflects the activity of the parasympathetic system and efferent vagal flow.
2. Low frequency (LF), from 0.04 to 0.15 Hz, most likely reflects both parasympathetic and sympathetic activity.
3. Very low frequency (VLF), from 0.003 to 0.04 Hz, reflects the sympathetic nervous system and factors possibly including input from chemoreceptors, thermoreceptors, and the renin-angiotensin system.

The Ultralow frequency region (ULF) is relevant for long-term measurements, such as 24-hour Holter monitor readings.

The *anger* curve demonstrates a disordered pattern with increasing heart rate. The spike in the VLF range demonstrates sympathetic dominance.

In *relaxation*, the tachogram shows a HF, low-amplitude pattern reflecting an overall *decrease* in ANS outflow. The spike in the HF range correlates with parasympathetic dominance.

In *appreciation*, a smooth, highly ordered (or coherent) sine wave is seen. The large, narrow spike in the LF band at 0.1 Hz is indicative of optimization between the sympathetic and parasympathetic branches of the ANS, as well as an entrainment among heart rate, respiration, and blood pressure.<sup>56,70</sup>

Although appreciation and relaxation share a shift toward parasympathetic dominance, appreciation has higher outflow of both parasympathetic and sympathetic drives (higher amplitude), and the two branches are more highly synchronized, shown by the smoothness of the curve and the spike seen at 0.1 Hz in the LF zone of the power spectrum. These qualities define coherence or resonance in HRV.<sup>56,70</sup> Several studies indicated that coherence leads to even greater improvements in health than does relaxation alone.<sup>49,50,56,57,71,72</sup>

In theory, coherence may be achieved at a higher average heart rate, (e.g., during light exercise), but obtaining accurate

readings is difficult when a subject is moving. Novel technologies including sensors embedded in a T-shirt,<sup>73</sup> a mattress or pillow,<sup>74,75</sup> using wireless ECG,<sup>76</sup> in a Web cam,<sup>77</sup> or using microwave technology<sup>78</sup> soon will make it possible to track HRV coherence under dynamic conditions.

## Advanced and Exploratory Concepts in Heart Rate Variability

In HRV dynamics, some physiologic relationships appear to be linear and predictable, whereas others require more complex, nonlinear modeling. Linear metrics, such as time and frequency domain analysis, have made useful predictions about risk stratification and mortality.<sup>79–80</sup> However, growing numbers of studies show that HRV is better described by nonlinear measures such as “sampling entropy,” “detrended fluctuation analysis,” and “fractal scaling.”<sup>81–83</sup> Although a thorough discussion of this topic is beyond the scope of this chapter, a few key principles are useful in evaluating the literature.

In 2008, the editors of *Chaos* posed the question, “Is the normal heart rate chaotic?” Professor Leon Glass of McGill University in Montreal summarized the results of this ongoing discussion and stated that the dynamics of HRV technically are not chaotic, although they are *complex*, meaning the following: (1) the system is very sensitive to initial conditions or to small perturbations; (2) the number of independent, interacting components is large; and (3) the system’s trajectory may evolve through multiple pathways. Ultimately, researchers have adopted the term multifractal to describe normal HRV. Turbulence, stock market trends, street riots, and embryogenesis are all described through multifractal models.<sup>84</sup>

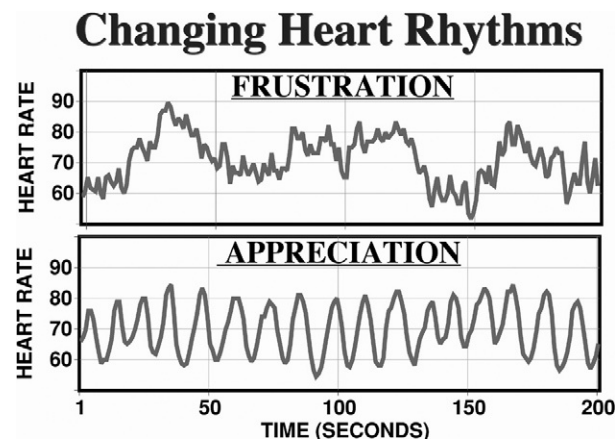
Fractals are (1) self-similar, (2) generated through an iterative process, and (3) look the same at any scale. A good example is a tree or the bronchial tree of the lungs. The largest branches grow similar smaller branches, and so on. The formation of ice crystals, mountain ridges, and geothermal flows all illustrate fractal development. In multifractality, whole series of fractals cluster around one “singularity exponent,” which contains an unknown or erratic variable. Therefore, the heart and respiratory systems are considered bidirectional, nonlinear oscillators.<sup>54</sup>

Researchers have made links between multifractality and human vitality.<sup>55,85</sup> Knowing that fixed, shallow patterns, such as the slow, periodic gasps of Cheyne-Stokes breathing in congestive heart failure, are signs of impending death (Fig. 94-4), researchers probed for patterns linked to vitality. Dr. Irving Dardik theorized that in optimum health, people’s ultradian and circadian rhythms (e.g., hormonal cycles), as well as faster rhythms (e.g., respiration, heart rate, and brain waves), all align as nested or embedded waves, oscillating constructively, without destructive interference.<sup>86</sup> Limited, preliminary data show that heart rate and HRV themselves have both robust, endogenous circadian rhythms and faster, individual rhythms that synchronize with brain waves.<sup>87,88</sup>

An interesting paradox exists, however, in states of deep meditation when heart rate, breath rate, and HRV drop nearly to zero, thus making the meditator appear close to death. Because meditation is associated with several positive health

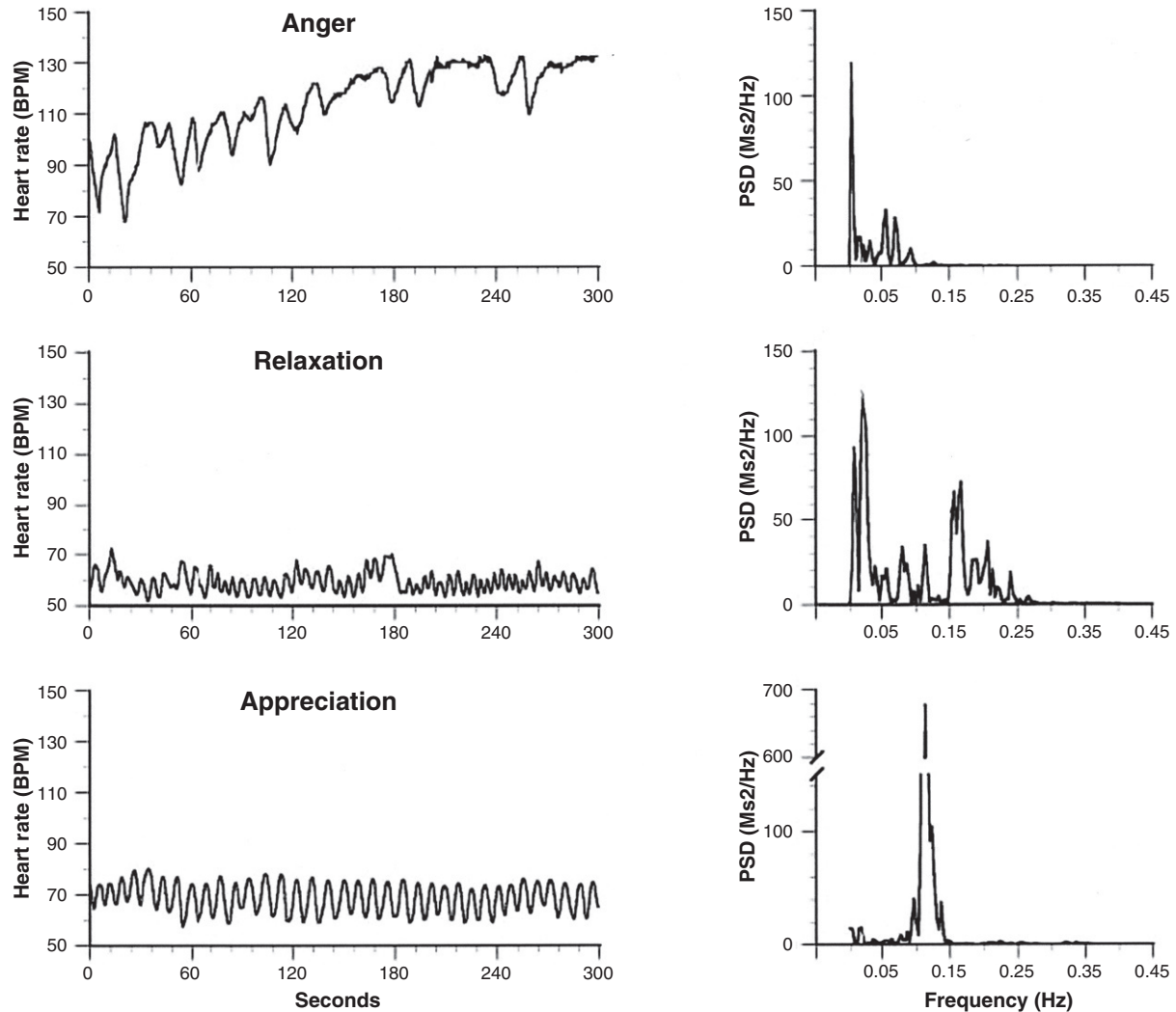
**FIGURE 94-2**

Frustration to appreciation. Here a person’s heart rate variability (HRV) goes from erratic and shallow during frustration to smooth with a more regularly oscillating HRV curve during appreciation. (From McCraty R, Childre D. *The Appreciative Heart: The Psychophysiology of Positive Emotions and Optimal Functioning*. Boulder Creek, CA; Institute of HeartMath; 2000. Copyright 2000, Institute of HeartMath.)

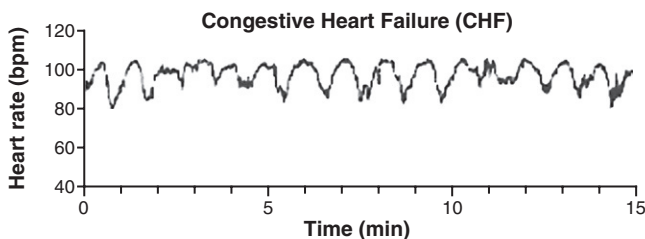


**FIGURE 94-3**

Anger, relaxation, and appreciation. In these three conditions, note the shift from the erratic heart rate variability curve of anger to the somewhat more regular, but low-amplitude curve of relaxation, and finally into the smooth, sine wave–like curve of appreciation, consistent with “coherence” or good synchronization between sympathetic and parasympathetic systems and the rest of the bodywide network of inputs. (From McCraty R, Childre D. *The Appreciative Heart: The Psychophysiology of Positive Emotions and Optimal Functioning*. Boulder Creek, CA; Institute of HeartMath; 2000. Copyright 2000, Institute of HeartMath.)

**FIGURE 94-4**

Cheyne-Stokes breathing in congestive heart failure (CHF). Here, the heart rate is regular, but dangerously so. Apparently, some ability to oscillate and respond to bodily cues has been lost in this end stage of CHF.



outcomes, including lower blood pressure, diminished pain, improvement of inflammatory and immune disorders, and improved cognitive function,<sup>89–93</sup> the question is whether this low-HRV state is beneficial. One hypothesis is that low HRV in deep meditation may result from internal quiescence, a “wholly selfless sense of love, peacefulness and spiritual connection beyond mere relaxation,”<sup>56</sup> or a “harmonic inclusiveness,”<sup>94</sup> in which ANS outflow is diminished, but the person feels alive, present, and connected. Conversely, some forms of dynamic meditation activate sympathetic drive,<sup>95</sup> and at least one study showed that more experienced Zen meditators had irregularities in their heart rate right after exhalation.<sup>96</sup> Whether these results represent sympathovagal imbalance, disease, or spiritual attunement is yet to be determined.

A parallel paradox is seen in high-intensity exercise, which temporarily elevates heart rate and *lowers* HRV, thus transiently placing high-risk populations, such as people who have experienced myocardial infarction, at greater risk for dangerous arrhythmias. Yet exercise is associated with *long-term improvements in HRV* and cardiovascular recovery, as summarized by Millar et al.<sup>97</sup> My hypothesis is that parallels in “psychological and emotional exercises,” such as the mindful experience of anger or grief, may challenge the system and expand one's array of experience while building long-term resilience. For example, a study of bereavement showed that in the first week after loss of a loved one, multiple HRV-related measures worsened in the bereaved person. By 6 months, however, measures had recovered to values of nonbereaved controls.<sup>98</sup> Whether these and similar studies demonstrate psychological resilience<sup>99</sup> or a mere, expected return to baseline is unclear and thus bear greater exploration.

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## Heart Rate Variability and Health

Although HRV is linked to systemwide health, an important caveat to the following section is that normative data are still limited, and existing reviews show up to 260,000% individual variation, especially in spectral measures.<sup>100</sup> More research and experience are needed to contextualize test results for individual patients.

Many studies have found that HRV declines with age, potentially as one loses time in deep sleep.<sup>101,102</sup> However, the decline slows after the fifth decade. Parasympathetic function reaches its nadir in the eighth decade and increases in extreme old age, possibly aiding longevity.<sup>103</sup> HRV tends to be lower in postmenopausal women than in girls and younger women,<sup>104</sup> and it has not been shown to improve with hormone replacement therapy.<sup>105</sup> Men have higher sympathetic tone and lower parasympathetic tone than women in general; as women age, however, they appear to lose their parasympathetic dominance more markedly than do men.<sup>101</sup>

In cardiovascular health, low HRV is an independent predictor of future events and mortality, including cardiac-related sudden death from myocardial infarction, fatal arrhythmias, and all-cause mortality in certain populations.<sup>5,8,10,14,16,106–108</sup> HRV profile stratifies risk for worsening congestive heart failure,<sup>109–111</sup> coronary heart disease,<sup>13</sup> and atherosclerotic plaques, even in young, asymptomatic adults,<sup>112–114</sup> as well as elevated triglycerides.<sup>115</sup> Similarly, HRV correlates with early insulin resistance,<sup>116</sup> obesity in children and adults,<sup>38,115,117,118</sup> multiple metabolic syndrome,<sup>119</sup> and hypertension.<sup>120–122</sup> Hot flashes are associated with a significant decrease in vagal tone<sup>39</sup> and hence may be a cardiac risk.

Research has verified significant links between HRV and the following: neurologic disorders such as epilepsy, Parkinson disease, restless leg syndrome, migraine, and insomnia<sup>22–28,123</sup>; rheumatologic disorders including fibromyalgia, rheumatoid arthritis, and lupus<sup>40–42</sup>; gastroenterologic dysfunctions including functional dyspepsia and IBS<sup>45,46</sup>; and other inflammatory diseases such as asthma<sup>43,44</sup> and atopic dermatitis.<sup>47,48</sup> In addition, many studies tracked the effects of HRV on markers of inflammation and immunity.<sup>3–9</sup>

Innovative researchers are now using HRV to *predict* the onset of infection several days before symptoms and track its severity.<sup>124–126</sup> Similarly, low HRV can independently predict complicated recovery after abdominal surgery.<sup>127</sup> Conversely, working to improve HRV appears to reduce perception of pain.<sup>128</sup>

In mental health, low HRV is linked with depression, social isolation, bereavement, posttraumatic stress disorder, and suppressed anger,<sup>29–36,129–131</sup> and it may partially mediate the significantly increased risk of cardiac mortality in depressed individuals after myocardial infarction, although antidepressants do not always improve HRV.<sup>33</sup> Even in otherwise healthy individuals, stress has been demonstrated to change short-term HRV profiles, for example, in surgeons performing high-stress operations<sup>127</sup> and in physicians during and after a call.<sup>132</sup>

Environmental and work-related factors also affect HRV. Although results of studies are mixed, most suggest that pollution and tobacco smoke worsen HRV.<sup>133–139</sup> Exposure to factory toxicants, job stress, and shift work all diminished HRV,<sup>140</sup> whereas improving workspace and ambient light improved HRV and cortisol rhythms.<sup>141</sup> Disturbingly, a Japanese study showed that people who ate the provisional tolerable weekly intake (PTWI) of methylmercury (3.4 mcg/kg/week) from big eye tuna and swordfish for 14 weeks had significant increases in sympathovagal imbalance, which returned to normal 15 weeks later; controls showed no changes.

## Factors That Improve Heart Rate Variability

Fortunately, many interventions improve HRV. In the case of lethal arrhythmias, cardiac resynchronization therapy (pacing) is sometimes necessary.<sup>142</sup> Other medical procedures, including spinal stimulation,<sup>143</sup> vagal nerve stimulation,<sup>66,144,145</sup> and acupuncture,<sup>146</sup> all show positive effects. Among pharmaceuticals and supplements, beta blockers and some calcium channel blockers appear to be useful.<sup>147–150</sup> In depressed individuals, selective serotonin receptor inhibitors (SSRIs) and cognitive-behavioral therapy improve HRV,<sup>151,152</sup> whereas tricyclic antidepressants and caffeine lower it.<sup>153,154</sup> St. John's wort was associated both with improvements and no change in two separate studies,<sup>155,156</sup> and gamma-aminobutyric acid (GABA)-covered chocolate boosted HRV recovery after stress.<sup>157</sup>

Foods, including green, leafy vegetables,<sup>158</sup> omega-3 polyunsaturated fatty acids in fish and fish oil,<sup>159,160</sup> and a Mediterranean diet<sup>161</sup> improve HRV. Wine paired with omega-3 fatty acid intake shows some benefit, but whether this benefit exists independently is unclear.<sup>162</sup> In fact, separate studies found that long-term moderate alcohol consumption and alcohol mixed with energy drinks both had deleterious effects on HRV.<sup>163</sup>

Lifestyle links with clear benefit include smoking cessation, which results in immediate improvements in HRV.<sup>164,165</sup> Although exercise showed no HRV benefit in one study,<sup>106,166</sup> most of the research demonstrated significant exercise-related benefit,<sup>166–170</sup> even including reversal of cardiac neural remodeling after myocardial infarction.<sup>171</sup> Entering a hotter or colder ambient temperature shifts HRV; cold environments acutely decrease heart rate and raise HRV. Whether

these conditions, exemplified in the Polar Bear Plunge, result in lasting benefit is unclear.<sup>172</sup>

Simple mind-body techniques show much promise for improving HRV. Slow breathing or chanting a prayer or a mantra strongly affects HRV and baroreceptor sensitivity, even in people with advanced congestive heart failure.<sup>68,173</sup> Prayer in itself, especially centering prayer and prayers of gratitude, can produce high measures of HRV coherence,<sup>57</sup> as does expressive writing.<sup>174</sup> Listening to classical music or meditation music also significantly improves HRV.<sup>175</sup>

Biofeedback based on control of breath rate or focus on positive emotion is one of the most highly researched therapies to improve HRV.<sup>176</sup> Studies showed improvements in the following: cortisol and dehydroepiandrosterone levels; symptoms of depression, posttraumatic stress disorder, and mood regulation<sup>35,57,177</sup>; blood pressure<sup>71,72</sup>; cholesterol levels; aggression levels; and job satisfaction among correctional officers.<sup>84</sup> This same technique allowed high school students to perform better on standardized tests and function at a new, higher baseline of HRV coherence after training in biofeedback.<sup>49,50</sup> In summary, much evidence indicates that mind-body techniques have a positive effect not only on HRV itself, but also on health, emotions, and cognitive performance.

### The Basics Matter

In keeping the heart rate variability profile healthy, the most powerful, safe, and reliable measures are the simple ones, namely, learning to develop a positive or appreciative view on life. Acting out these feelings daily in a healthy dose of fun or compassion makes a difference. So be sure to tell your patient that he or she will be practicing good medicine by evaluating life and priorities and maintaining gratitude and social connectedness.

## Making Recommendations to the Patient

Given the foregoing data, you can develop an integrative plan to help patients maintain or enhance their HRV. In making an integrative treatment plan, you should ask the following questions: What are the known effects? What are the risks? What is the evidence? What is the cost or the availability? And, importantly, what does the patient believe or value? As a practitioner, your relationship with the patient and your own experience with a particular approach to healing strongly affect this last point. For that reason, you may want to experiment with several of these approaches yourself before talking to patients about them. Not only will you have the chance to improve your own health and well-being, but also you will have a personal experience that allows you to step on a common path with the patient. This kind of mutual and personal teaching honors the spirit of integrative medicine, in which the health and wisdom of both patient and health care practitioner are important, indeed critical, to healing! Luckily, many of the approaches listed here are fun. You may even want to try them with your office

staff or at home for your own learning. The Institute of HeartMath offers just such office-based trainings (see Key Web Resources).

## Steps to Enhance Heart Rate Variability

Remember that patients do not need to attempt all or even most of these therapies immediately. A wise approach is to suggest that patients pick a few therapies that appeal to them first and then modify them as they come to know their own needs.

### Step 1: Follow Good Preventive Measures

- Quit smoking.
- Maintain a healthy weight.
- Keep cholesterol levels in check.
- Eat a diet rich in omega-3 fatty acids, either from fish or from fish oils (see Chapter 86, The Antiinflammatory Diet).
- Keep alcohol consumption low to moderate.
- Exercise regularly but moderately, with guidance from a physician if heart disease or other significant illness is present.

### Step 2: Maintain a Healthy State of Mind

- Keep up social connections or make new ones. Healthy relationships are powerful determinants of heart health.
- Obtain professional help for serious symptoms of depression or anxiety.
- Develop practices that help you feel calm, centered, present, and appreciative (see Chapter 93, Relaxation Techniques). Music often makes this easier.

### Deep, Slow Breathing

This breathing exercise is cheap, safe, and easy to perform in just a few minutes. The best results come when people maintain six breaths/minute or simply focus on an appreciative or caring emotion that slows the breath and creates coherence automatically.

### Meditation

Choose walking meditation, mindfulness meditation, chanting, or any other form that is appealing.

### Prayer

Pray either on your own or in a group, for the social connection.

### Journaling

Even writing down a few words and phrases per day can be healing.

### A Simple Beginning

In the office, a simple way to help patients to begin enhancing heart rate variability is to teach them a deep-breathing technique.

1. Have the patient place a hand on his or her belly—while you demonstrate!
2. Make sure to have him or her “deep belly breathe” so that the stomach rises on the inbreath. On the outbreath, the belly falls.
3. In general, have the patient aim to breathe out for twice as long—or whatever he or she can sustain, as compared with the inbreath. A 4 to 8 count, for example, works well.
4. Have the patient repeat this twice a day, morning and night, or whenever stress arises, for 3 to 5 minutes to train the body-mind. If focusing on the breath per se is difficult, focusing on a positive feeling can work just as well.

### Biofeedback

Several good computerized tools are on the market to help you learn to use biofeedback.

- [www.wilddivine.com](http://www.wilddivine.com). This visually intriguing computerized adventure is driven as you learn skills to control your bodily rhythms through biofeedback.

- [www.heartmath.com](http://www.heartmath.com). This organization provides literature, handheld devices, and desktop biofeedback software, as well as thorough training for health care professionals and lay people. One limitation is that a person must be still to use these devices, but seeing live feedback is tremendously engaging to many who try it. Music can also be included in the program to assist you. Ultimately, the tools train you to function well without them.

### Guided Imagery

Excellent resources for tapes or CDs are as follows:

- [www.healthjourneys.com](http://www.healthjourneys.com)
- [www.soundstrue.com](http://www.soundstrue.com)

### Step 3: Consider Medical Therapies and Supplements

- Beta blockers, verapamil (and possibly other calcium channel blockers), and antiarrhythmics may improve HRV, but their use must be guided by a physician.
- For depression, tricyclic antidepressants appear to worsen HRV, whereas SSRIs appear to improve it. St. John's wort may be beneficial. GABA appears to help HRV recovery from stress.

### KEY WEB RESOURCES

HeartMath: [www.heartmath.com](http://www.heartmath.com)

Wild Divine: [www.wilddivine.com](http://www.wilddivine.com)

StressEraser: <http://stresseraser.com/>

This organization provides literature, handheld devices, and desktop biofeedback software, as well as thorough training for health care professionals and lay people. They offer the emWave computer biofeedback system, which costs approximately \$300.

This visually intriguing computerized adventure teaches skills to control your bodily rhythms through biofeedback. The program costs approximately \$300.

The StressEraser is a small biofeedback device that monitors breathing and heart rate to enhance heart rate variability. It costs approximately \$180.

### References

References are available online at [expertconsult.com](http://expertconsult.com).



## References

- May O, Arildsen H. Long-term predictive power of heart rate variability on all-cause mortality in the diabetic population. *Acta Diabetol.* 2011;48:55–59.
- Stein PK, Barzilay JI, Chaves PH, et al. Novel measures of heart rate variability predict cardiovascular mortality in older adults independent of traditional cardiovascular risk factors: the Cardiovascular Health Study (CHS). *J Cardiovasc Electrophysiol.* 2008;19:1169–1174.
- Malave HA, Taylor AA, Nattama J, et al. Circulating levels of tumor necrosis factor correlate with indexes of depressed heart rate variability: a study in patients with mild-to-moderate heart failure. *Chest.* 2003;123:716–724.
- Weber CS, Thayer JF, Rudat M, et al. Low vagal tone is associated with impaired post stress recovery of cardiovascular, endocrine, and immune markers. *Eur J Appl Physiol.* 2010;109:201–211.
- Lehrer P, Karavidas MK, Lu SE, et al. Voluntarily produced increases in heart rate variability modulate autonomic effects of endotoxin induced systemic inflammation: an exploratory study. *Appl Psychophysiol Biofeedback.* 2010;35:303–315.
- Sloan RP, Shapiro PA, Demeersman RE, et al. Aerobic exercise attenuates inducible TNF production in humans. *J Appl Physiol.* 2007;103:1007–1011.
- Huston JM, Tracey KJ. The pulse of inflammation: heart rate variability, the cholinergic anti-inflammatory pathway and implications for therapy. *J Intern Med.* 2011;269:45–53.
- Huang CM, Chang HC, Kao ST, et al. Radial pressure pulse and heart rate variability in heat- and cold-stressed humans. *Evid Based Complement Alternat Med.* 2011;2011:751317.
- Stein P, Barzilay J, Chaves P, et al. Higher levels of inflammation factors and greater insulin resistance are independently associated with higher heart rate and lower heart rate variability in normoglycemic older individuals: the Cardiovascular Health Study. *J Am Geriatr Soc.* 2008;56:315–321.
- Camm AJ, Pratt CM, Schwartz PJ, et al. Mortality in patients after a recent myocardial infarction: a randomized, placebo-controlled trial of azimilide using heart rate variability for risk stratification. *Circulation.* 2004;109:990–996.
- La Rovere MT, Pinna GD, Maestri R, et al. Short-term heart rate variability strongly predicts sudden cardiac death in chronic heart failure patients. *Circulation.* 2003;107:565–570.
- Tapanainen JM, Thomsen PE, Kober L, et al. Fractal analysis of heart rate variability and mortality after an acute myocardial infarction. *Am J Cardiol.* 2002;90:347–352.
- Liao D, Carnethon M, Evans GW, et al. Lower heart rate variability is associated with the development of coronary heart disease in individuals with diabetes: the atherosclerosis risk in communities (ARIC) study. *Diabetes.* 2002;51:3524–3531.
- La Rovere MT, Pinna GD, Hohnloser SH, et al. Baroreflex sensitivity and heart rate variability in the identification of patients at risk for life-threatening arrhythmias: implications for clinical trials. *Circulation.* 2001;103:2072–2077.
- Dekker JM, Crow RS, Folsom AR, et al. Low heart rate variability in a 2-minute rhythm strip predicts risk of coronary heart disease and mortality from several causes: the ARIC Study. Atherosclerosis Risk In Communities. *Circulation.* 2000;102:1239–1244.
- Katz A, Liberty IF, Porath A, et al. A simple bedside test of 1-minute heart rate variability during deep breathing as a prognostic index after myocardial infarction. *Am Heart J.* 1999;138:32–38.
- Molon G, Solimene F, Melissano D, et al. Baseline heart rate variability predicts clinical events in heart failure patients implanted with cardiac resynchronization therapy: validation by means of related complexity index. *Ann Noninvasive Electrocardiol.* 2010;15:301–307.
- Battipaglia I, Barone L, Mariani L, et al. Relationship between cardiac autonomic function and sustained ventricular tachyarrhythmias in patients with an implantable cardioverter defibrillators. *Europace.* 2010;12:1725–1731.
- Huebner T, Goernig M, Schuepbach M, et al. Electrocardiologic and related methods of non-invasive detection and risk stratification in myocardial ischemia: state of the art and perspectives. *Ger Med Sci.* 2010;8:Doc27.
- Heitmann A, Huebner T, Schroeder R, et al. Multivariate short-term heart rate variability: a pre-diagnostic tool for screening heart disease. *Med Biol Eng Comput.* 2010;49:41–50.
- Rodrigues TC, Ehrlich J, Hunter CM, et al. Reduced heart rate variability predicts progression of coronary artery calcification in adults with type 1 diabetes and controls without diabetes. *Diabetes Technol Ther.* 2010;12:963–969.
- Jeppesen J, Beniczky S, Fuglsang-Frederiksen A, et al. Detection of epileptic-seizures by means of power spectrum analysis of heart rate variability: a pilot study. *Technol Health Care.* 2010;18:417–426.
- Kamal AK. Assessment of autonomic function in epileptic patients. *Neurosciences (Riyadh).* 2010;15:244–248.
- Valappil RA, Black JE, Broderick MJ, et al. Exploring the electrocardiogram as a potential tool to screen for premotor Parkinson's disease. *Mov Disord.* 2010;25:2296–2303.
- Nilsen KB, Tronvik E, Sand T, et al. Increased baroreflex sensitivity and heart rate variability in migraine patients. *Acta Neurol Scand.* 2009;120:418–423.
- Duanping L, Xian L, Rodriguez-Colon S, et al. Children with insomnia may have impaired heart rate variability. Paper presented at the American Heart Association Fiftieth Annual Conference on Cardiovascular Disease Epidemiology and Prevention, March 2, San Francisco; 2010.
- McLay RN, Spira JL. Use of a portable biofeedback device to improve insomnia in a combat zone: a case report. *Appl Psychophysiol Biofeedback.* 2009;34:319–321.
- Muzumdar HV, Sin S, Nikova M, et al. Changes in heart rate variability after adenotonsillectomy in children with obstructive sleep apnea. *Chest.* 2010;139:1050–1059.
- Siepmann M, Aykac V, Unterdorfer J, et al. A pilot study on the effects of heart rate variability biofeedback in patients with depression and in healthy subjects. *Appl Psychophysiol Biofeedback.* 2008;33:195–201.
- Sperling W, Reulbach U, Bleich S, et al. Cardiac effects of vagus nerve stimulation in patients with major depression. *Pharmacopsychiatry.* 2010;43:7–11.
- Taylor CB. Depression, heart rate related variables and cardiovascular disease. *Int J Psychophysiol.* 2010;78:80–88.
- Wise V, McFarlane AC, Clark CR, et al. An integrative assessment of brain and body function “at rest” in panic disorder: a combined quantitative EEG/autonomic function study. *Int J Psychophysiol.* 2011;79:155–165.
- Kemp AH, Quintana DS, Gray MA, et al. Impact of depression and antidepressant treatment on heart rate variability: a review and meta-analysis. *Biol Psychiatry.* 2010;67:1067–1074.
- Karavidas MK, Lehrer PM, Vaschillo E, et al. Preliminary results of an open label study of heart rate variability biofeedback for the treatment of major depression. *Appl Psychophysiol Biofeedback.* 2007;32:19–30.
- Ginsberg JP, Berry ME, Powell DA. Cardiac coherence and posttraumatic stress disorder in combat veterans. *Altern Ther Health Med.* 2010;16:52–60.
- Buckley T, Bartrop R, McKinley S, et al. Early bereavement is associated with increased heart rate and reduced heart rate variability. *Circulation.* <[http://circ.ahajournals.org/cgi/content/meeting\\_abstract/122/21\\_MeetingAbstracts/A14660](http://circ.ahajournals.org/cgi/content/meeting_abstract/122/21_MeetingAbstracts/A14660)>; 2010 Accessed 24.10.11.
- Kaveer N, Das A, Agrawal A, et al. Cardiovascular autonomic dysfunction in type II diabetics diagnosed within six months. *J Postgrad Med.* 2004;50:233–234.
- Vanderlei LC, Pastre CM, Junior IF, et al. Fractal correlation of heart rate variability in obese children. *Auton Neurosci.* 2010;155:125–129.
- Thurston RC, Christie IC, Matthews KA. Hot flashes and cardiac vagal control: a link to cardiovascular risk? *Menopause.* 2010;17:456–461.
- Figuerola A, Kingsley JD, McMillan V, et al. Resistance exercise training improves heart rate variability in women with fibromyalgia. *Clin Physiol Funct Imaging.* 2008;28:49–54.
- Hassett AL, Radvanski DC, Vaschillo EG, et al. A pilot study of the efficacy of heart rate variability (HRV) biofeedback in patients with fibromyalgia. *Appl Psychophysiol Biofeedback.* 2007;32:1–10.
- Milovanovic B, Stojanovic L, Milicevic N, et al. Cardiac autonomic dysfunction in patients with systemic lupus, rheumatoid arthritis and sudden death risk. *Srp Arh Celok Lek.* 2010;138:26–32.
- Lehrer P, Vaschillo E, Lu SE, et al. Heart rate variability biofeedback: effects of age on heart rate variability, baroreflex gain, and asthma. *Chest.* 2006;129:278–284.
- Lehrer PM, Vaschillo E, Vaschillo B, et al. Biofeedback treatment for asthma. *Chest.* 2004;126:352–361.
- Friesen CA, Lin Z, Schurman JV, et al. The effect of a meal and water loading on heart rate variability in children with functional dyspepsia. *Dig Dis Sci.* 2010;55:2283–2287.

46. Heitkemper M, Jarrett M, Cain KC, et al. Autonomic nervous system function in women with irritable bowel syndrome. *Dig Dis Sci*. 2001;46:1276–1284.
47. Tran BW, Papoiu AD, Russoniello CV, et al. Effect of itch, scratching and mental stress on autonomic nervous system function in atopic dermatitis. *Acta Derm Venereol*. 2010;90:354–361.
48. Boettger MK, Bar KJ, Dohrmann A, et al. Increased vagal modulation in atopic dermatitis. *J Dermatol Sci*. 2009;53:55–59.
49. Bradley RT, McCraty R, Atkinson M, et al. Emotion self-regulation, psychophysiological coherence, and test anxiety: results from an experiment using electrophysiological measures. *Appl Psychophysiol Biofeedback*. 2010;35:261–283.
50. McCraty R, Atkinson M, Tomasino D, et al. The impact of an emotional self-management skills course on psychosocial functioning and automatic recovery to stress in middle school children. *Integr Physiol Behav Sci*. 1999;34:246–268.
51. Thayer JF, Hansen AL, Saus-Rose E, et al. Heart rate variability, prefrontal neural function, and cognitive performance: the neurovisceral integration perspective on self-regulation, adaptation, and health. *Ann Behav Med*. 2009;37:141–153.
52. León I, Hernández J, Rodríguez S, et al. When head is tempered by heart: heart rate variability modulates perception of other-blame reducing anger. *Motiv Emot*. 2009;33:1–9.
53. Voegelé C, Sorg S, Studtmann M, et al. Cardiac autonomic regulation and anger coping in adolescents. *Biol Psychol*. 2010;85:465–471.
54. Buchner T, Petelczyc M, Zebrowski JJ, et al. On the nature of heart rate variability in a breathing normal subject: a stochastic process analysis. *Chaos*. 2009;19:028504.
55. McCraty R, Childre D. Coherence: bridging personal, social, and global health. *Altern Ther Health Med*. 2010;16:10–24.
56. McCraty R. *The Coherent Heart: Heart-Brain Interactions, Psychophysiological Coherence, and the Emergence of System-Wide Order*. Boulder Creek, CA: Institute of HeartMath; 2006.
57. McCraty R, Barrios-Choplín B, Rozman D, et al. The impact of a new emotional self-management program on stress, emotions, heart rate variability, DHEA and cortisol. *Integr Physiol Behav Sci*. 1998;33:151–170.
58. Tiller WA, McCraty R, Atkinson M. Cardiac coherence: a new, noninvasive measure of autonomic nervous system order. *Altern Ther Health Med*. 1996;2:52–65.
59. Costa-E-Sousa RH, Pereira-Junior PP, Oliveira PF, et al. Cardiac effects of oxytocin: is there a role for this peptide in cardiovascular homeostasis? *Regul Pept*. 2005;132:107–112.
60. Armour J. *Neurocardiology*. New York: Oxford University Press; 1994.
61. McCraty R, Childre D. *The Appreciative Heart: The Psychophysiology of Positive Emotions and Optimal Functioning*. Boulder Creek, CA: Institute of HeartMath; 2003.
62. Baule G, McFee R. Detection of the magnetic field of the heart. *Am Heart J*. 1963;55:95–96.
63. McCraty R. The energetic heart: bioelectromagnetic communication within and between people. In: Rosch P, Markov M, eds. *Bioelectromagnetic Medicine*. New York: Marcel Dekker; 2004.
64. Wölk C, Velden M. Detection variability within the cardiac cycle: toward a revision of the baroreceptor hypothesis. *J Psychophysiol*. 1987;1:61–65.
65. Andersen P, Andersson S. *Physiological Basis of the Alpha Rhythm*. New York: Appleton-Century-Crofts; 1968.
66. Hassert DL, Miyashita T, Williams CL. The effects of peripheral vagal nerve stimulation at a memory-modulating intensity on nor-epinephrine output in the basolateral amygdala. *Behav Neurosci*. 2004;118:79–88.
67. Song HS, Lehrer PM. The effects of specific respiratory rates on heart rate and heart rate variability. *Appl Psychophysiol Biofeedback*. 2003;28:13–23.
68. Bernardi L, Porta C, Spicuzza L, et al. Slow breathing increases arterial baroreflex sensitivity in patients with chronic heart failure. *Circulation*. 2002;105:143–145.
69. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Heart rate variability: standards of measurement, physiological interpretation and clinical use. *Circulation*. 1996;93:1043–1065.
70. Lehrer PM, Vaschillo E, Vaschillo B. Resonant frequency biofeedback training to increase cardiac variability: rationale and manual for training. *Appl Psychophysiol Biofeedback*. 2000;25:177–191.
71. McCraty R, Atkinson M, Lipsenthal L, et al. New hope for correctional officers: an innovative program for reducing stress and health risks. *Appl Psychophysiol Biofeedback*. 2009;34:251–272.
72. McCraty R, Atkinson M, Tomasino D. Impact of a workplace stress reduction program on blood pressure and emotional health in hypertensive employees. *J Altern Complement Med*. 2003;9:355–369.
73. Bianchi AM, Mendez MO. Automatic detection of sleep macrostructure based on a sensorized T-shirt. *Conf Proc IEEE Eng Med Biol Soc*. 2010;2010:3606–3609.
74. Migliorini M, Bianchi AM, Nistico D, et al. Automatic sleep staging based on ballistocardiographic signals recorded through bed sensors. *Conf Proc IEEE Eng Med Biol Soc*. 2010;2010:3273–3276.
75. Zhu X, Chen W, Nemoto T, et al. Long-term monitoring of heart rate, respiration rhythm, and body movement during sleep based upon a network. *Telemed J E Health*. 2010;16:244–253.
76. Sugano H, Tsujioka T, Inoue T, et al. Clinical tests and evaluations of a wireless ECG sensor for realization of ubiquitous health care systems. *Conf Proc IEEE Eng Med Biol Soc*. 2010;2010:2030–2033.
77. Poh MZ, McDuff D, Picard R. Advancements in noncontact, multiparameter physiological measurements using a webcam. *IEEE Trans Biomed Eng*. 2011;58:7–11.
78. Obeid D, Sadek S, Zaharia G, et al. Touch-less heartbeat detection and measurement-based cardiopulmonary modeling. *Conf Proc IEEE Eng Med Biol Soc*. 2010;2010:658–661.
79. Bigger JT Jr, Steinman RC, Rolnitzky LM, et al. Power law behavior of RR-interval variability in healthy middle-aged persons, patients with recent acute myocardial infarction, and patients with heart transplants. *Circulation*. 1996;93:2142–2151.
80. Kleiger RE, Stein PK, Bigger JT Jr. Heart rate variability: measurement and clinical utility. *Ann Noninvasive Electrocardiol*. 2005;10:88–101.
81. Martinez-Lavin M, Vargas A. Complex adaptive systems allostasis in fibromyalgia. *Rheum Dis Clin North Am*. 2009;35:285–298.
82. Leonarduzzi RF, Schlotthauer G, Torres ME. Wavelet leader based multifractal analysis of heart rate variability during myocardial ischemia. *Conf Proc IEEE Eng Med Biol Soc*. 2010;2010:110–113.
83. Cecen AA, Erkal C. The long march: from monofractals to endogenous multifractality in heart rate variability analysis. *Nonlinear Dynamics Psychol Life Sci*. 2009;13:181–206.
84. Glass L. Introduction to controversial topics in nonlinear science: is the normal heart rate chaotic? *Chaos*. 2001;19:028501.
85. Goldberger JJ, Challapalli S, Tung R, et al. Relationship of heart rate variability to parasympathetic effect. *Circulation*. 2001;103:1977–1983.
86. Darkik I. The origin of disease and health heart waves: the single solution to heart rate variability and ischemic preconditioning. *Cycles*. 1996;46:67–77.
87. Vandewalle G, Middleton B, Rajaratnam SM, et al. Robust circadian rhythm in heart rate and its variability: influence of exogenous melatonin and photoperiod. *J Sleep Res*. 2007;16:148–155.
88. Song LZ, Schwartz GE, Russek LG. Heart-focused attention and heart-brain synchronization: energetic and psychological mechanisms. *Altern Ther Health Med*. 1998;4:44–52, 54–60, 62.
89. Lutz A, Greischar LL, Rawlings NB, et al. Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *Proc Natl Acad Sci U S A*. 2004;101:16369–16373.
90. Canter PH, Ernst E. The cumulative effects of Transcendental Meditation on cognitive function: a systematic review of randomized controlled trials. *Wien Klin Wochenschr*. 2003;115:758–766.
91. Speca M, Carlson LE, Goodey E, et al. A randomized, wait-list controlled clinical trial: the effect of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients. *Psychosom Med*. 2000;62:613–622.
92. Castillo-Richmond A, Schneider RH, Alexander CN, et al. Effects of stress reduction on carotid atherosclerosis in hypertensive African Americans. *Stroke*. 2000;31:568–573.
93. Barnes VA, Treiber FA, Turner JR, et al. Acute effects of transcendental meditation on hemodynamic functioning in middle-aged adults. *Psychosom Med*. 1999;61:525–531.
94. Winter D. 1996 Meditating causes heart frequencies medicine struggles to understand. In: *Holarchy, Coherent and Fractal-Bliss: Solution to the Coherence Wars*, accessed 2/2/2012 from <http://www.goldenmean.info/holarchy>.
95. Peng CK, Henry IC, Mietus JE, et al. Heart rate dynamics during three forms of meditation. *Int J Cardiol*. 2004;95:19–27.
96. Lehrer P, Sasaki Y, Saito Y. Zazen and cardiac variability. *Psychosom Med*. 1999;61:812–821.
97. Millar PJ, Rakobowchuk M, McCartney N, et al. Heart rate variability and nonlinear analysis of heart rate dynamics following single and multiple Wingate bouts. *Appl Physiol Nutr Metab*. 2009;34:875–883.

98. Buckley T, Mihailidou AS, Bartrop R, et al. Haemodynamic changes during early bereavement: potential contribution to increased cardiovascular risk. *Heart Lung Circ.* 2011;20:91–98.
99. Davydov DM, Stewart R, Ritchie K, et al. Resilience and mental health. *Clin Psychol Rev.* 2010;30:479–495.
100. Nunan D, Sandercock GR, Brodie DA. A quantitative systematic review of normal values for short-term heart rate variability in healthy adults. *Pacing Clin Electrophysiol.* 2010;33:1407–1417.
101. Stolarz K, Staessen JA, Kuznetsova T, et al. Host and environmental determinants of heart rate and heart rate variability in four European populations. *J Hypertens.* 2003;21:525–535.
102. Crasnet V, Mezzetti S, Antoine M, et al. Effects of aging and cardiac denervation on heart rate variability during sleep. *Circulation.* 2001;103:84–88.
103. Zulfiqar U, Jurivich DA, Gao W, et al. Relation of high heart rate variability to healthy longevity. *Am J Cardiol.* 2010;105:1181–1185.
104. Ribeiro TF, Azevedo GD, Crescencio JC, et al. Heart rate variability under resting conditions in postmenopausal and young women. *Braz J Med Biol Res.* 2001;34:871–877.
105. Fernandes EO, Moraes RS, Ferlin EL, et al. Hormone replacement therapy does not affect the 24-hour heart rate variability in postmenopausal women: results of a randomized, placebo-controlled trial with two regimens. *Pacing Clin Electrophysiol.* 2005;28(suppl 1):S172–S177.
106. Migliaro ER, Contreras P, Bech S, et al. Relative influence of age, resting heart rate and sedentary life style in short-term analysis of heart rate variability. *Braz J Med Biol Res.* 2001;34:493–500.
107. Hayano J, Mukai S, Fukuta H, et al. Postural response of low-frequency component of heart rate variability is an increased risk for mortality in patients with coronary artery disease. *Chest.* 2001;120:1942–1952.
108. Lucreziotti S, Gavazzi A, Scelsi L, et al. Five-minute recording of heart rate variability in severe chronic heart failure: correlates with right ventricular function and prognostic implications. *Am Heart J.* 2000;139:1088–1095.
109. Bonaduce D, Petretta M, Marciano F, et al. Independent and incremental prognostic value of heart rate variability in patients with chronic heart failure. *Am Heart J.* 1999;138:273–284.
110. Yoshikawa T, Baba A, Akaishi M, et al. Neurohumoral activations in congestive heart failure: correlations with cardiac function, heart rate variability, and baroreceptor sensitivity. *Am Heart J.* 1999;137:666–671.
111. Nolan J, Batin PD, Andrews R, et al. Prospective study of heart rate variability and mortality in chronic heart failure: results of the United Kingdom heart failure evaluation and assessment of risk trial (UK-heart). *Circulation.* 1998;98:1510–1516.
112. Colhoun HM, Francis DP, Rubens MB, et al. The association of heart-rate variability with cardiovascular risk factors and coronary artery calcification: a study in type 1 diabetic patients and the general population. *Diabetes Care.* 2001;24:1108–1114.
113. Wennerblom B, Lurje L, Tygesen H, et al. Patients with uncomplicated coronary artery disease have reduced heart rate variability mainly affecting vagal tone. *Heart.* 2000;83:290–294.
114. Huikuri HV, Jokinen V, Sivanne M, et al. Heart rate variability and progression of coronary atherosclerosis. *Arterioscler Thromb Vasc Biol.* 1999;19:1979–1985.
115. Jensen-Urstad M, Jensen-Urstad K, Ericson M, et al. Heart rate variability is related to leucocyte count in men and to blood lipoproteins in women in a healthy population of 35-year-old subjects. *J Intern Med.* 1998;243:33–40.
116. Laitinen T, Vauhkonen IK, Niskanen LK, et al. Power spectral analysis of heart rate variability during hyperinsulinemia in nondiabetic offspring of type 2 diabetic patients: evidence for possible early autonomic dysfunction in insulin-resistant subjects. *Diabetes.* 1999;48:1295–1299.
117. Karason K, Molgaard H, Wikstrand J, et al. Heart rate variability in obesity and the effect of weight loss. *Am J Cardiol.* 1999;83:1242–1247.
118. Fagard RH, Pardaens K, Staessen JA. Influence of demographic, anthropometric and lifestyle characteristics on heart rate and its variability in the population. *J Hypertens.* 1999;17:1589–1599.
119. Liao D, Sloan RP, Cascio WE, et al. Multiple metabolic syndrome is associated with lower heart rate variability: the Atherosclerosis Risk in Communities Study. *Diabetes Care.* 1998;21:2116–2122.
120. Schroeder EB, Liao D, Chambless LE, et al. Hypertension, blood pressure, and heart rate variability: the Atherosclerosis Risk in Communities (ARIC) study. *Hypertension.* 2003;42:1106–1111.
121. Singh JB, Larson MG, Tsuji H, et al. Reduced heart rate variability and new-onset hypertension: insights into pathogenesis of hypertension: the Framingham Heart Study. *Hypertension.* 1998;32:293–297.
122. Virtanen R, Jula A, Kuusela T, et al. Reduced heart rate variability in hypertension: associations with lifestyle factors and plasma renin activity. *J Hum Hypertens.* 2003;17:171–179.
123. Isak B, Agan K, Ergun A, et al. Where is the core of the volcano? The undetermined origin of primary restless legs syndrome. *Int J Neurosci.* 2011;121:130–136.
124. Ahmad S, Ramsay T, Huebsch L, et al. Continuous multi-parameter heart rate variability analysis heralds onset of sepsis in adults. *PLoS One.* 2009;4:e6642.
125. Lee QY, Chan GS, Redmond SJ, et al. Classification of low systemic vascular resistance using photoplethysmogram and routine cardiovascular measurements. *Conf Proc IEEE Eng Med Biol Soc.* 2010;2010:1930–1933.
126. Hellard P, Guimaraes F, Avalos M, et al. Modeling the association between heart rate variability and illness in elite swimmers. *Med Sci Sports Exerc.* 2011;43:1063–1070.
127. Bohm B, Rotting N, Schwenk W, et al. A prospective randomized trial on heart rate variability of the surgical team during laparoscopic and conventional sigmoid resection. *Arch Surg.* 2001;136:305–310.
128. Storella RJ, Shi Y, O'Connor DM, et al. Relief of chronic pain may be accompanied by an increase in a measure of heart rate variability. *Anesth Analg.* 1999;89:448–450.
129. Carney RM, Blumenthal JA, Stein PK, et al. Depression, heart rate variability, and acute myocardial infarction. *Circulation.* 2001;104:2024–2028.
130. Hughes JW, Stoney CM. Depressed mood is related to high-frequency heart rate variability during stressors. *Psychosom Med.* 2000;62:796–803.
131. Horsten M, Ericson M, Perski A, et al. Psychosocial factors and heart rate variability in healthy women. *Psychosom Med.* 1999;61:49–57.
132. Malmberg B, Persson R, Flisberg P, et al. Heart rate variability changes in physicians working on night call. *Int Arch Occup Environ Health.* 2011;84:293–301.
133. Mills NL, Finlayson AE, Gonzalez MC, et al. Diesel exhaust inhalation does not affect heart rhythm or heart rate variability. *Heart.* 2011;97:544–550.
134. Zanobetti A, Gold DR, Stone PH, et al. Reduction in heart rate variability with traffic and air pollution in patients with coronary artery disease. *Environ Health Perspect.* 2010;118:324–330.
135. Wu S, Deng F, Niu J, et al. Association of heart rate variability in taxi drivers with marked changes in particulate air pollution in Beijing in 2008. *Environ Health Perspect.* 2010;118:87–91.
136. Wu CF, Kuo IC, Su TC, et al. Effects of personal exposure to particulate matter and ozone on arterial stiffness and heart rate variability in healthy adults. *Am J Epidemiol.* 2010;171:1299–1309.
137. Wilson MD, McGlothlin JD, Rosenthal FS, et al. Ergonomics: the effect of occupational exposure to environmental tobacco smoke on the heart rate variability of bar and restaurant workers. *J Occup Environ Hyg.* 2010;7:D44–D49.
138. Park SK, Auchincloss AH, O'Neill MS, et al. Particulate air pollution, metabolic syndrome, and heart rate variability: the Multi-Ethnic Study of Atherosclerosis (MESA). *Environ Health Perspect.* 2010;118:1406–1411.
139. de Hartog JJ, Lanki T, Timonen KL, et al. Associations between PM<sub>2.5</sub> and heart rate variability are modified by particle composition and beta-blocker use in patients with coronary heart disease. *Environ Health Perspect.* 2009;117:105–111.
140. Togo F, Takahashi M. Heart rate variability in occupational health: a systematic review. *Ind Health.* 2009;47:589–602.
141. Thayer JF, Verkuil B, Brosschot JF, et al. Effects of the physical work environment on physiological measures of stress. *Eur J Cardiovasc Prev Rehabil.* 2010;17:431–439.
142. Adamson PB, Kleckner KJ, VanHout WL, et al. Cardiac resynchronization therapy improves heart rate variability in patients with symptomatic heart failure. *Circulation.* 2003;108:266–269.
143. Anselmino M, Ravera L, De Luca A, et al. Spinal cord stimulation and 30-minute heart rate variability in refractory angina patients. *Pacing Clin Electrophysiol.* 2009;32:37–42.
144. Bajbouj M, Merkl A, Schlaepfer TE, et al. Two-year outcome of vagus nerve stimulation in treatment-resistant depression. *J Clin Psychopharmacol.* 2010;30:273–281.
145. Groves DA, Brown VJ. Vagus nerve stimulation: a review of its applications and potential mechanisms that mediate its clinical effects. *Neurosci Biobehav Rev.* 2005;29:493–500.
146. Lee S, Lee MS, Choi JY, et al. Acupuncture and heart rate variability: a systematic review. *Auton Neurosci.* 2010;155:5–13.

147. Yamabe M, Sanyal SN, Miyamoto S, et al. Three different bradycardic agents, zatebradine, diltiazem and propranolol, distinctly modify heart rate variability and QT-interval variability. *Pharmacology*. 2007;80:293–303.
148. Petretta M, Canonico V, Madrid A, et al. Comparison of verapamil versus felodipine on heart rate variability in hypertensive patients. *J Hypertens*. 1999;17:707–713.
149. Silke B, Hanratty CG, Riddell JG. Heart-rate variability effects of beta-adrenoceptor agonists (xamoterol, prenalterol, and salbutamol) assessed nonlinearly with scatterplots and sequence methods. *J Cardiovasc Pharmacol*. 1999;33:859–867.
150. Lin JL, Chan HL, Du CC, et al. Long-term beta-blocker therapy improves autonomic nervous regulation in advanced congestive heart failure: a longitudinal heart rate variability study. *Am Heart J*. 1999;137:658–665.
151. Carney RM, Freedland KE, Stein PK, et al. Change in heart rate and heart rate variability during treatment for depression in patients with coronary heart disease. *Psychosom Med*. 2000;62:639–647.
152. Gorman JM, Sloan RP. Heart rate variability in depressive and anxiety disorders. *Am Heart J*. 2000;140(suppl):77–83.
153. Roose SP, Laghrissi-Thode F, Kennedy JS, et al. Comparison of paroxetine and nortriptyline in depressed patients with ischemic heart disease. *JAMA*. 1998;279:287–291.
154. Bonnet M, Tancer M, Uhde T, et al. Effects of caffeine on heart rate and QT variability during sleep. *Depress Anxiety*. 2005;22:150–155.
155. Wan H, Chen Y. Effects of antidepressive treatment of Saint John's wort extract related to autonomic nervous function in women with irritable bowel syndrome. *Int J Psychiatry Med*. 2010;40:45–56.
156. Siepmann M, Krause S, Joraschky P, et al. The effects of St John's wort extract on heart rate variability, cognitive function and quantitative EEG: a comparison with amitriptyline and placebo in healthy men. *Br J Clin Pharmacol*. 2002;54:277–282.
157. Nakamura H, Takishima T, Kometani T, et al. Psychological stress-reducing effect of chocolate enriched with gamma-aminobutyric acid (GABA) in humans: assessment of stress using heart rate variability and salivary chromogranin A. *Int J Food Sci Nutr*. 2009;60(suppl 5):106–113.
158. Park SK, Tucker KL, O'Neill MS, et al. Fruit, vegetable, and fish consumption and heart rate variability: the Veterans Administration Normative Aging Study. *Am J Clin Nutr*. 2009;89:778–786.
159. Christensen JH, Skou HA, Madsen T, et al. Heart rate variability and n-3 polyunsaturated fatty acids in patients with diabetes mellitus. *J Intern Med*. 2001;249:545–552.
160. Sjoberg NJ, Milte CM, Buckley JD, et al. Dose-dependent increases in heart rate variability and arterial compliance in overweight and obese adults with DHA-rich fish oil supplementation. *Br J Nutr*. 2010;103:243–248.
161. Dai J, Lampert R, Wilson PW, et al. Mediterranean dietary pattern is associated with improved cardiac autonomic function among middle-aged men: a twin study. *Circ Cardiovasc Qual Outcomes*. 2010;3:366–373.
162. Christensen JH, Skou HA, Fog L, et al. Marine n-3 fatty acids, wine intake, and heart rate variability in patients referred for coronary angiography. *Circulation*. 2001;103:651–657.
163. Shively CA, Mietus JE, Grant KA, et al. Effects of chronic moderate alcohol consumption and novel environment on heart rate variability in primates (*Macaca fascicularis*). *Psychopharmacology (Berl)*. 2007;192:183–191.
164. Minami J, Ishimitsu T, Matsuoka H. Effects of smoking cessation on blood pressure and heart rate variability in habitual smokers. *Hypertension*. 1999;33:586–590.
165. Yotsukura M, Koide Y, Fujii K, et al. Heart rate variability during the first month of smoking cessation. *Am Heart J*. 1998;135:1004–1009.
166. Duru F, Candinas R, Dziekan G, et al. Effect of exercise training on heart rate variability in patients with new-onset left ventricular dysfunction after myocardial infarction. *Am Heart J*. 2000;140:157–161.
167. Iellamo F, Legramante JM, Massaro M, et al. Effects of a residential exercise training on baroreflex sensitivity and heart rate variability in patients with coronary artery disease: a randomized, controlled study. *Circulation*. 2000;102:2588–2592.
168. Stein PK, Ehsani AA, Domitrovich PP, et al. Effect of exercise training on heart rate variability in healthy older adults. *Am Heart J*. 1999;138:567–576.
169. Tsai YS, Lai FC, Chen SR, et al. The influence of physical activity level on heart rate variability among asthmatic adults. *J Clin Nurs*. 2011;20:111–118.
170. Lai FC, Tu ST, Huang CH, et al. A home-based exercise program improves heart rate variability and functional capacity among postmenopausal women with coronary artery disease. *J Cardiovasc Nurs*. 2011;26:137–144.
171. Billman GE. Cardiac autonomic neural remodeling and susceptibility to sudden cardiac death: effect of endurance exercise training. *Am J Physiol*. 2009;297:H1171–H1193.
172. Stauss H. Heart rate variability. *Am J Physiol*. 2003;285:R927–R931.
173. Bernardi L, Gabutti A, Porta C, et al. Slow breathing reduces chemoreflex response to hypoxia and hypercapnia, and increases baroreflex sensitivity. *J Hypertens*. 2001;19:2221–2229.
174. McGuire KM, Greenberg MA, Gevirtz R. Autonomic effects of expressive writing in individuals with elevated blood pressure. *J Health Psychol*. 2005;10:197–209.
175. Trappe HJ. The effects of music on the cardiovascular system and cardiovascular health. *Heart*. 2010;96:1868–1871.
176. Wheat AL, Larkin KT. Biofeedback of heart rate variability and related physiology: a critical review. *Appl Psychophysiol Biofeedback*. 2010;35:229–242.
177. Zucker TL, Samuelson KW, Muench F, et al. The effects of respiratory sinus arrhythmia biofeedback on heart rate variability and post-traumatic stress disorder symptoms: a pilot study. *Appl Psychophysiol Biofeedback*. 2009;34:135–143.



# Guided Imagery and Interactive Guided Imagery\*

Martin L. Rossman, MD

Imagination is more important than knowledge.

*Albert Einstein*

As a physician treating primarily people with chronic and life-threatening illnesses for nearly 40 years, I have found working with mental imagery, especially in an interactive manner, one of the most useful approaches I have ever encountered.

As doctors, we are trained to diagnose and treat physically observable manifestations of disease and illness. In some instances, we can provide definitive, even lifesaving interventions, and both we and our patients are pleased and grateful. In many circumstances, however, our attempts to help do not result in a neat and acceptable result. We may not be able to diagnose the source of our patient's condition (84% of the 15 most common symptoms presented to a primary care doctor never come to be diagnosed as a disease state), or, alternatively, we can give the condition a name and perhaps provide some relief but can do little or nothing about much of the suffering that accompanies it. This is especially true for our patients with chronic illness, who often represent the most challenging and time-consuming aspects of our practices.

People with chronic illness need not only excellent medical care but also attention to what we may call the invisible yet important aspects of health care that are accessible only through their own awareness. A skilled clinician with sophisticated imagery skills can help such patients work effectively with their own strengths to help them fare better, whatever their medical condition may be.

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## What Is Guided Imagery?

Guided imagery is a term variously used to describe a range of techniques from simple visualization and direct imagery-based suggestion through metaphor and storytelling. Guided

imagery is used to help teach psychophysiologic relaxation, to relieve pain and other symptoms, to stimulate healing responses in the body, and to help people tolerate procedures and treatments more easily.

Interactive Guided Imagery (IGI) is a service-marked term coined by the Academy for Guided Imagery for a process in which imagery is used in a highly interactive format to evoke a patient's autonomy. This technique gives patients ways to draw on their own inner resources to support healing, to make appropriate adaptations to changes in health, and to understand more clearly what their symptoms may be signaling.

Imagery is a natural way that the human nervous system stores, accesses, and processes information. It is the coding system in which memories, fantasies, dreams, daydreams, and expectations are stored. It is a way of thinking with sensory attributes, and in the absence of competing sensory cues, the body tends to respond to imagery as it would to a genuine external experience. The most common and familiar example of this phenomenon is sexual fantasy with its attendant physiologic responses.

Imagery has been shown in dozens of research studies to be able to affect almost all major physiologic control systems of the body—respiration, heart rate, blood pressure, metabolic rates in cells, gastrointestinal mobility and secretion, sexual function, and even immune responsiveness. Imagery is also a rapid way to access emotional and symbolic information that may affect both physiology and the way that patients care for themselves. For instance, a patient may talk at length about the nature of his or her back pain, yet the clinician may not appreciate it as much as when the patient uses imagery-laden language and says, “It feels like a knife twisting in my

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\* Interactive Guided Imagery is a particular approach taught by the Academy for Guided Imagery, in Malibu, California, of which Dr. Rossman is a founder and codirector.

**BOX 95-1. Indications for Guided Imagery**

- To help reduce acute or chronic stress and anxiety
- To reduce or relieve symptoms once they are diagnosed
- To prepare for a surgical operation or other procedure
- To help reduce or manage side effects of medications or procedures
- To help patients and practitioners better understand symptoms
- To increase coping abilities with chronic illness
- To help fight illness through working with the body's own healing processes
- To help manage anxiety, fear, and pain
- To help people prepare for changes including lifestyle, habits, adaptation to illness, and even death

back.” Not only does this give a graphic, sensory description of the symptom, but also it may lead to important psychosocial information involved in the perception of the pain. In this case, respectful questioning about betrayals or related feelings would be appropriate (Box 95-1).

The following personal case history shows how imagery can help us become more aware of the interplay of feelings, physiology, and symptoms.

**Case History (Headaches)**

A 28-year-old woman with chronic mixed headaches came to my office with a severe migraine. We had worked together before, so I guided her through a simple progressive relaxation technique and asked her to focus directly on her pain and invite an image to come to mind that could tell her something useful about the pain. An image came of a large mynah bird, sitting on her head and pecking away in the area of her pain.

“Why’s he doing that?” she asked, and I suggested that she ask him and imagine that he could answer in a way she could understand.

To her surprise, the bird answered, “Why not? You let everyone else pick on you!” She started crying and told me that the day before she had accidentally overheard a fellow employee making fun of her in the coffee room. She started to get angry, but then became nauseated and started to feel a migraine aura. She went home for the day, and the migraine developed into the headache that brought her in to see me. In her imagery dialogue, the bird agreed to work with her to understand and prevent her headaches more effectively. She left feeling 90% relieved without any other intervention.

The patient’s continuing dialogues with the mynah revealed a long-standing pattern of low self-esteem and non-assertiveness. The bird told her that the result was holding anger and directing it toward herself, a process that ultimately led to her headaches. I referred her to a good therapist; after 18 months, she was not only relieved of headaches but also much happier and heading in a more successful direction in her life.

**Applications in Medicine**

Because imagery is a natural language of the unconscious and the human nervous system, its potential uses in the healing professions are protean. Guided imagery is essentially a way of working with the patient, rather than of treating particular disease entities, but it is especially effective in the following areas:

- Relaxation training and stress reduction
- Pain relief
- Management of chronic illness and prevention of acute exacerbations
- Preparation for surgery and medical procedures
- Medication compliance and adherence issues
- Cancer treatment and life-threatening illnesses
- Terminal illnesses and end-of-life care
- Fertility, birthing, and delivery
- Grief therapy
- Posttraumatic stress disorder
- Anxiety disorders
- Depression

Guided imagery is a broad term comprising techniques that are applicable in the course of brief medical office visits or in longer counseling or psychotherapy formats. Physicians may practice it themselves or may employ ancillary health professionals to offer longer sessions. Physicians may also teach their patients guided imagery skills for self-care by educating them about it and recommending or prescribing appropriate guided imagery books, compact discs (CDs), and audio downloads (see the later section on resources and the [Key Web Resources box](#)).

**Is Research Literature Available on Guided Imagery?**

A large body of clinical research supports the everyday use of imagery in medicine, and research in this area has significantly increased in the past few years. Of more than 1200 PubMed articles on guided imagery research since 1969, nearly 500 have appeared since 2005, and half of them have been published since 2009. More than 90% of the studies show positive benefits in clinical situations that include stroke rehabilitation, preparing for childbirth, treating anxiety disorders and posttraumatic stress disorder, relieving pain in both children and adults, preparing for surgery and medical procedures, changing eating habits, smoking and drug cessation, and supporting patients during cancer treatment. A summary of the evidence on guided imagery and visualization on immune function is summarized in [Box 95-2](#).

**How Does Imagery Work?**

Research with functional magnetic resonance imaging indicates that when people visualize things or events, they activate the occipital cortex in the same way they do when

### BOX 95-2. Guided Imagery Effects on Immune Function as Summarized by Trakhtenberg

- A relationship exists between immune system functioning and guided imagery and stress/relaxation.
- Guided imagery and relaxation interventions can reduce distress and allow the immune system to function more effectively.
- Changes in immune system functioning are correlated with either an increase or a decrease in white blood cell (WBC) count or with changes in neutrophil adherence.
- Stress/relaxation may account for qualitative (nature of neutrophil adherence) or quantitative (WBC count) changes in immune system functioning.
- Cell-specific imagery may predict in which WBC category (i.e., type of WBC—neutrophils or lymphocytes) changes in WBC count will occur.
- An active cognitive exercise or process involved in the initial stages of guided imagery is associated with decreases in neutrophil adherence. In contrast, relaxation without an active imagery exercise is associated with increases in neutrophil adherence.
- Decreases in WBC count occur only in the initial stages of exposure to guided imagery or relaxation interventions. After 4 to 5 weeks of training, however, WBC count increases.
- Increases in WBC count may be caused by an increase in WBC production as a result of enhanced relaxation ensuing from extensive visualization practice, and decreases in WBC count in the initial stage of visualization training are secondary to a decrease in WBC production as a result of possible pressure ensuing from an attempt to learn new training techniques.
- Decreases and increases in WBC count may be caused by the effect of margination. This means that imagery training may change the movement of WBCs and their location within the body, rather than decreasing or increasing production of WBCs.
- The change in WBC count may occur earlier in medical patients with a depressed WBC count and later in physiologically normal, healthy individuals.

Adapted from Trakhtenberg EC. The effects of guided imagery on the immune system: a critical review. *Int J Neurosci*. 2008;118:839–855.

they actually see the same things or events. Similarly, the temporal cortex is activated when music or speech is imagined, and the motor or premotor areas of the cortex are activated when a person imagines movement. We believe that this cortical activation sends neural and neurochemical messages to lower centers of the brain that can activate or deactivate stress responses. Neuropeptides can also affect physiology at a distance and can modify physiologic states, including blood pressure, clotting mechanisms, and immunity.

Clinically, we have known for many years that when people worry, which is an imaginative function, they can activate stress physiology, which over time can lead to physiologic exhaustion, maladaptive behavior, and vulnerability to illness. In the same way, when a patient imagines himself or

herself in a beautiful, peaceful, safe place and concentrates on what he or she imagines seeing, hearing, and feeling there, the patient tends to induce a state of relaxation similar to what he or she would feel if actually in that place. The physiology of the “relaxation response,” as described by Benson, takes over, thus allowing a break in the chronic stress state and facilitating certain reparative and restorative processes the body uses for healing. With regular practice, the creation of this state can help reverse some of the effects of chronic stress.

The creation of a relaxed state also allows the patient to experience that he or she has some choice in feelings about and response to stressors, which can lead to greater self-efficacy and change in lifestyle patterns that affect health. Finally, in a relaxed yet aware state, the body is more responsive to images and suggestions of pain relief, comfort, enhanced or reduced blood flow, and even up-regulation of immunity.

Worry is an example of how negative images can trigger stress physiology. Imagery can also be directed toward positive physiologic responses.

Imagery is sometimes referred to as a “right brain” type of thinking because it tends to be synthetic, creative, and emotional. This type of thinking contrasts with the “left brain” form of linear, logical thinking with which we are all highly familiar.

These attributions are best considered a shorthand way of referring to modes of thinking that are associated with but not restricted to the respective hemispheres of the brain. They may be more accurately termed simultaneous versus sequential information processing. To illustrate the difference between these two types of thinking, let us imagine watching a train go by from two different perspectives. From the left brain or sequential processing perspective, one would observe the train from the level of the track. One would see the engine go by, then the first car, then the next, and the next, and so on—one car at a time, each following the one before. The right brain or simultaneous perspective would place one high above the train, where one could see not only the whole train, but also the tracks for miles ahead and behind, the countryside through which it travels, the place it started, and its next destination. Similarly, the holistic perspective of imagery shows one the forest, whereas the analytic perspective of linear thinking lets one more closely examine the trees. Both are useful.

Perhaps the reason that imagery seems so mysteriously powerful is that we have almost systematically ignored it in scientific culture and, as it is rediscovered, its many advantages in mind-body healing make us marvel at its utility. Imagery provides many advantages over analytic thinking when it is applied to personal healing. One is the big picture perspective that it offers. As the previous case history and the following example illustrate, imagery can often show how life events, emotions, and physical symptoms are connected.

### Case History (Lumpy Breasts)

A patient with lumpy breasts was invited to allow an image to come that represented the lumps. She was surprised that she imagined them as pearls. On exploring the pearl image, she realized that pearls are formed in response to something

irritating that could eventually turn harmful. Her orientation changed as she considered this idea. “Maybe the lumps are trying to protect me,” she said. “They want me to reduce the stress I’ve been living with and the caffeine I’ve been using to try to keep up.” This understanding led her to stop drinking coffee and change the way she was living to reduce her stress; her fibrocystic lumps soon disappeared.

Another advantage of imagery in mind-body healing is that it is closely related to emotion. Imagery is the basis of the arts, the essence of painting and sculpture, but also of poetry, storytelling, dance, drama, and even music. Imagery moves us and can represent what affects us emotionally. Because unexpressed emotions are often expressed in the body, many common and unexplainable symptoms that doctors see represent patients’ feelings that are unrecognized and unattended. Imagery can bring these connections to light and make them available for expression and potential resolution (see Chapter 100, Emotional Awareness for Pain).

Imagery is also closely related to physiology. Imagining sucking on a lemon stimulates salivation in most people, whereas imagining frightening events elevates the heart rate and blood pressure. Imagining muscle relaxation produces muscle relaxation, and regular imagining of an activated immune system increases both the number and aggressiveness of natural killer cells. This psychophysiological connection may account for the wide range of syndromes in which imagery has proved useful. These diagnoses include, but are not limited to, asthma, allergic rhinitis, tension and migraine headaches, neck and back pain, irritable bowel syndrome, premenstrual dysphoria, dysmenorrhea, Raynaud syndrome, anxiety, depression, hypertension, angina, and even diabetes. Imagery has also been shown to relieve anxiety and complications of invasive medical and surgical procedures, including endoscopy, colonoscopy, biopsy, and angiography, as well as childbirth.

Guided imagery acts as a bridge of communication of information between the subconscious and conscious mind that the patient can use to find health.

## Commonly Used Treatment Techniques

The list of techniques used in guided imagery is quite extensive, because this approach has been applied to problems ranging from chronic pain, to posttraumatic stress, to stimulating healing responses in the body, to enhancing mind-body awareness, and more. However, some of the more basic techniques are described here.

### Mental and Physical Relaxation

Imagery is often the easiest way for many Western patients to learn to relax. Typically, patients are instructed in abdominal breathing and sequential or progressive relaxation suggestions and are then invited simply to daydream themselves to a place of great beauty, safety, or peacefulness or a place that they experience as healing. Patients are guided to notice what they see, hear, feel, and even smell as they imagine themselves in a relaxing place. As they immerse themselves in the imagery in this way, they tend to relax easily and deeply.

## Symptom Relief Through Healing Imagery

Symptomatic imagery techniques reduce physical symptoms such as pain, anxiety, and insomnia without concern for the causes. Such techniques are useful alternatives or complements to medications and are particularly helpful when discomfort has a stress-related or functional basis. Many different situations and techniques are used, such as relaxation and then imagining how healing could happen in an area that is symptomatic. When patients are successful in relieving pain or other symptoms with imagery, they find the experience profoundly therapeutic and empowering.

### Interactive Imagery Dialogue

Interactive imagery dialogue can be used with an image that represents anything the client or therapist wants to know more about; in many ways, it is the quintessential insight technique. This method is used to explore an image of a symptom (whether physical, emotional, or behavioral), an image that represents resistance arising anywhere in the process, an image of an inner resource that can help the client deal with the current problem, or an image of the solution.

With interactive imagery, the point is not to analyze the images but to communicate with them as if they are alive (which, of course, they are). This is not to say that the images have an existence apart from the client, but rather that they represent complexes of thoughts, beliefs, attitudes, feelings, body sensations, expectations, and values that at times can function as relatively autonomous aspects of the personality. These constellations were referred to as “subpersonalities” by Roberto Assagioli,<sup>1</sup> the originator of psychosynthesis, and as “ego states” by Watkins and Watkins.<sup>2</sup>

### The Inner Advisor

The inner advisor is a specific type of IGI dialogue whereby clients are invited to converse with an imaginary figure that is specified to be both wise and loving or, as characterized in analytic terms, an “ego ideal.” This figure can be referred to as the “inner guide,” “inner healer,” “inner wisdom,” “inner helper,” “inner physician,” “higher self,” or any other term that is meaningful to and comfortable for the client. Because the client is invited to imagine a figure that has these qualities, a dialogue with whatever figure arises is usually meaningful and helpful. Specifying the positive qualities offers some safety to clients if they find themselves exploring issues that may be emotionally difficult.

### Evocative Imagery

The state-dependent technique called evocative imagery helps clients to shift moods and affective states at will, thus making new behaviors and insights more accessible to consciousness. Through the structured use of memory, fantasy, and sensory recruitment, the client is encouraged to identify a personal quality or qualities that would serve especially well in his or her current situation. For instance, a client may feel the need for more “calmness” or “peace of mind” to deal more effectively with a life issue or a medical illness. The guide then invites the client to relax and recall a time when peace of mind was actually experienced. Through the use of



sensory recruitment and present-tense recall, the client is encouraged to imagine that he or she is in that time again now, feeling that peace of mind. Once this peaceful feeling state has been well established and amplified, the patient is invited to let the past images go, but to come back to the present, bringing along the feelings of peace of mind. As the client now becomes aware of the situation while strongly in touch with this feeling, he or she is usually able to tolerate it far more effectively.

Dr. Sheldon Cohen<sup>3</sup> at Carnegie-Mellon University in Pittsburgh researched evocative imagery and found it to be highly effective in shifting affective states. Research aimed at assessing the effects of those altered affective states on subsequent behavior, problem-solving, and self-efficacy remains to be done and offers a fertile field for future psychological and behavioral study.

## Grounding: Moving From Insight to Action

Grounding is the process by which the insights evoked by imagery are turned into actions and greater awareness and motivation are focused into a specific plan for attitudinal, emotional, or behavioral change. This process of adding the will to the imagination involves clarification of insights, brainstorming, choosing the best option, affirmations, action planning, imagery rehearsal, and constant reformulation of the plan until it actually succeeds. It is often the missing link in insight-oriented therapies because it connects the new awareness to a specific action plan. Grounding is “where the rubber meets the road,” and imagery can be used to enhance the process by providing creative options for action; the guide and client can use imagery rehearsal to troubleshoot and anticipate obstacles to success.

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## How to Get Started With Guided Imagery

The first thing the practitioner should do is notice how much imagery-laden language and suggestion are used in daily interactions with patients. Notice the terms patients use when they describe “knife-like” pains or the feeling of a “hot poker in my stomach.” The practitioner should notice his or her own uses of imagery, too, such as in describing the mechanisms of a medication or intervention. Simple word pictures are commonly used when we prescribe and try to motivate patients to follow the regimen. Simple descriptions such as “This will relax the little muscles in your blood vessels, and that will lower your blood pressure” and “Acupuncture releases brain chemicals that relax your muscles and relieve pain” are very brief forms of what can be called guided imagery. Physicians can sometimes forget this effect when they become caught up in the necessities of informed consent, which tends to focus too much on the negative potential of treatments. Without “overpromising,” physicians should accompany any prescription or recommendation with an expectation that it will be of help, and a brief word picture of how that can happen conveys a large amount of information in a concise way.

The practitioner should read books on guided imagery and experiment personally with guided imagery CDs

or audios available through mp3 downloads (see later “Resources”). The more personal experience a practitioner has with guided imagery, the easier it will be to teach these skills to patients or simply to recommend or prescribe particular guided imagery exercises, lessons, or techniques. Some physicians set up their offices for guided imagery as follows: First the patient listens to guided imagery CDs; then the physician debriefs the experience with the patient, answers questions, and offers guidance on how to use the technique on a continuing basis.

The physician who wishes to guide patients through imagery experiences but has no experience or training in any form of relaxation, hypnosis, or meditation should pursue such training. Continuing medical education courses or local classes at community colleges or through other local sources are means of becoming familiar with mind-body approaches. Training that is specifically created for physicians or health professionals is more likely to be quickly usable with patients. For example, the Academy for Guided Imagery offers an excellent introductory course in a home study format, “The Fundamentals of Interactive Guided Imagery.” This course provides rationale, references, and an introduction to clinical skills that can allow the physician to explore guided imagery safely in practice. I consider such a course the minimum a professional should study before using guided imagery in practice.

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## The Structure of a Typical Interactive Guided Imagery Session

At the Academy for Guided Imagery, we refer to the time spent before entering into a formal guided imagery exploration as the “foresight” part of the process. Along with evaluating the appropriateness of using imagery with the client or patient, the guide works with the client to establish the desired goals and objectives for their work together.

As with any medical or psychological situation, goals can be defined in physical, emotional, or behavioral terms, and a reasonable trial period of exploration is agreed on by the client and guide. We often ask patients to have three exploratory sessions and then decide whether this approach seems useful to them, whether they can best use guided imagery as self-care, in a brief, time-limited period of work (10 to 15 sessions), or whether longer-term work seems to be needed.

The typical processes involved are described here. Not every session uses the same approach; all sessions may use any of a wide variety of processes and methods of exploration drawn from the guide's training and experience (Boxes 95-3 and 95-4).

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## Precautions and Contraindications

Although directive guided imagery sessions are generally quite safe, receptive imagery, as used in IGI, can be a powerful tool that can connect people with emotional material very quickly. If patients are emotionally fragile, have a history of psychosis, or have repressed traumatic material, receptive imagery can reveal affective content that can be

**BOX 95-3. A Typical Interactive Guided Imagery Session (see also Box 95-4)**

1. Assessment (foresight):
  - a. Ask what symptom, illness, or thoughts the patient would like to explore.
  - b. Ask what the patient wants to get out of the session.
  - c. Ask patient to narrow the problem to a short phrase or question.
  - d. Formulate a one-sentence summary of goals.
  - e. Obtain the patient's consent.
2. Imagery process (insight):
  - a. Relaxation:
    - (1) Ask how the patient best relaxes.
    - (2) Use the patient's best method or teach him or her a method.
  - b. Imagine a beautiful, safe place:
    - (1) "Allow yourself to imagine a comfortable and peaceful place. It may be a place that you have been before or something that's just coming into your imagination now. If you imagine several places coming to mind, allow yourself to pick just one to explore now."
    - (2) Ask the patient to describe the place in regard to sensations ("What do you see, hear, smell, feel, and taste? What makes you feel comfortable there?")
    - (3) Invite the patient to find a comfortable place to settle down.
  - c. Imagery dialogue:
    - (1) Invite the patient to form an image that represents the illness, symptom, or issue.
    - (2) Ask the patient to describe the image in detail. (Have him or her describe at least three things, such as appearance, character, and emotions of the image.)
    - (3) Ask the patient to describe the qualities that the image portrays.
    - (4) What feelings does the patient have about the image?
    - (5) Invite the patient to express these feelings to the image, and allow the image to respond.
    - (6) "Imagine that it can communicate with you in a way you can easily understand."
    - (7) Facilitate the imaginary conversation as needed, using "content-free" questions and suggestions such as the following:
      - (a) "Do you have any questions you would like to ask the image?"
      - (b) "How does it respond?"
      - (c) "Ask the image what it wants from you, and let it respond."
      - (d) "What does it want you to know?"
      - (e) "What does it need from you?"
      - (f) "What does it have in common with you?"
      - (g) "What does it have to offer you?"
      - (h) "Ask the image what it can tell you about the problem so you can better understand."
      - (i) "Ask the image what it can tell you about the solution so you can better understand."
      - (j) "Go back to the safe place, and return from the inner place."
  - d. When the image communicates, you may ask the patient how he or she feels about that or wants to respond, then encourage the patient to respond, and let the image respond to that. Your role is to facilitate the dialogue, not provide the answers.
  - e. If the patient appears frightened, ask whether he or she feels safe; if not, have the patient go back to the safe place or ask what he or she needs to feel safe.
3. Evaluation (hindsight):
  - a. Ask the patient what he or she felt was interesting or significant about the dialogue.
  - b. Ask the patient whether he or she learned anything from or about the image or the symptom.
  - c. Ask the patient whether the information changes his or her perspective or how he or she wants to respond.
  - d. Ask the patient what he or she would do next with what was learned.

Many physicians, nurses, and therapists work for a defined period of time (6 to 20 sessions) with patients in a psychoeducational or counseling model, with well-defined symptomatic or behavioral goals, and they refer patients to mental health practitioners if their work becomes psychologically complex. At the same time, we urge mental health practitioners to take precautions to ascertain the medical status of any patient and to ensure that the patient is also aware of the medical options.

At the end of each session, and at the end of the agreed-on period, the goals of the work are reviewed, and progress is assessed. After this evaluation, an agreement is made to terminate treatment, to continue for another period, to refer the patient to another practitioner, or to define a period in which the patient will do "ownwork" and then return to report his or her progress.

overwhelming. The practitioner should be sufficiently trained in guided imagery skills to be able to recognize potentially problematic situations and to prevent or remedy them when encountered unexpectedly.

Although guided imagery can sometimes help shed light on a puzzling diagnostic situation, it should not be used in lieu of proper medical diagnosis, to avoid overlooking necessary medical treatment. With due attention to this issue and the precautions and contraindications listed in Boxes 95-5 and 95-6, the practitioner can practice guided imagery safely and help patients become more active participants in their own health.

**BOX 95-4. Common Interactive Guided Imagery Suggestions and Questions**

- Allow an image to form.
- What do you notice about it?
- What are you aware of?
- What are you experiencing?
- What would you like to notice yourself having?
- What would you like to say to it?
- What sensations are you aware of?
- Let me know when you are ready to move on.

**BOX 95-5. Contraindications to Guided Imagery**

- Strong religious beliefs proscribing the use of imagery
- Disorientation, dementia, or impaired cognition in response to pharmacologic or other agents
- Inability to hold a train of thought for at least 5 to 10 minutes
- Potential litigation (Guided imagery may be considered a form of hypnosis, which affects the legal status of information obtained with its use.)

**BOX 95-6. Conditions in Which Guided Imagery Should Be Used With Caution\***

- History of physical or sexual abuse
- Active psychosis or prepsychotic state
- Diffused dissociative disorders
- Posttraumatic stress disorder or anxiety disorders
- Personal history of suicide attempt or family history of suicide or suicide attempt
- Unstable medical problems, such as severe asthma, heart disease, and pain

\*Practitioners treating people with these conditions/situations should be very well versed in both the treatment of the underlying disorder and the use of guided imagery.

**KEY WEB RESOURCES**

The Healing Mind: [www.thehealingmind.org](http://www.thehealingmind.org)

The Source: [www.drmilller.com](http://www.drmilller.com)

Tranceformation: [www.tranceformation.com](http://www.tranceformation.com)

Health Journeys: [www.healthjourneys.com](http://www.healthjourneys.com)

Academy for Guided Imagery (AGI).: <http://www.academyforguidedimagery.com/about/index.html>

Kaiser Permanente audio library: [https://members.kaiserpermanente.org/redirects/listen/?kp\\_shortcut\\_referrer=kp.org/listen](https://members.kaiserpermanente.org/redirects/listen/?kp_shortcut_referrer=kp.org/listen)

**Resources****Training**

Simple guided imagery for relaxation and healing is generally safe if the guidelines provided are followed. IGI is a powerful proprietary method of personal and psychological inquiry that can rapidly expose high levels of affect that can be overwhelming to certain patients. Practitioners desiring to use IGI should have an appropriate level of training for the applications they choose. The “Fundamentals of Interactive Guided Imagery” is a 13-hour home study course that will give you a thorough and meaningful introduction to this form of treatment and its roles in medicine, along with several essential skills you can begin to use in your practice. The Academy for Guided Imagery (800-726-2070; see also [Key Web Resources box](#)) also offers in-depth training that leads to certification in IGI.

**Guided Imagery Recordings and Self-Study Programs**

Audio recordings and self-study programs can be helpful tools to facilitate healing. Some respected resources for imagery tapes and CDs are listed in the Key Web Resources box. These Web site listings offer disease-specific recordings, as well as recordings addressing general topics such as surgical preparation and recovery, immune support, and cancer therapy.

This Web site offers many guided imagery CDs and self-study programs by Dr. Martin Rossman and others, based on interactive imagery principles, as well as research, health tracker, interactive opportunities, and other material useful to patients and professionals.

Dr. Emmett Miller has spent many years studying and practicing psychophysiological medicine and offers a wide variety of excellent health-oriented guided imagery and hypnosis recordings.

Dr. Steven Gurgevich, on the faculty of the Integrative Medicine program at the University of Arizona, uses the art of hypnotherapy and provides tapes for many medical conditions.

This large selection of excellent guided imagery CDs on many health topics is created by Belleruth Naparstek, LISW.

This Web site provides information, research, resources, and certification in guided imagery.

This audio library contains free downloadable guided visualizations for various health conditions including preparing for surgery.

**References**

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. Vargiu J. *Subpersonalities: Synthesis 1*. Redwood City, CA: Synthesis Press; 1974:52–90.
2. Watkins JG, Watkins HH. The theory and practice of ego-state therapy. In: Grayson H, ed. *Short-term Approaches to Psychotherapy*. New York: Human Science Press; 1979.
3. Cohen S. Personal communication. 1985.



# Journaling for Health

David Rakel, MD

I find, by experience, that the mind and the body are more than married, for they are most intimately united; and when one suffers, the other sympathizes.

*Lord Chesterfield*

The sorrow that hath no vent in tears may make other organs weep.

*Henry Maudsley*

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## Pathophysiology of Disclosure

The expression of emotionally upsetting experiences by writing or talking has been found to improve physical health, enhance immune function, and result in fewer visits to medical practitioners.<sup>1</sup>

In attempting to understand the pathophysiology behind the positive clinical effects of disclosure, we can review a study by James Pennebaker,<sup>2</sup> a pioneer in the field. He interviewed polygraphers (operators of lie detectors) who worked for the Federal Bureau of Investigation and Central Intelligence Agency. In performing these tests, the polygraphers would look for changes in parameters of the autonomic nervous system, such as heart rate, blood pressure, respiratory rate, and skin conductance, for clues of validity. Pennebaker described what was called the polygraph confession effect, in which readings in these areas significantly dropped after a person confessed. These changes were consistent with those seen with relaxation. Investigators believe that to inhibit actively one's thoughts, feelings, and behaviors requires physical work, work that can result in a chronic low-grade stress to the autonomic nervous system, which may, in turn, lead to disease. This inhibition can also lead to dysregulation of the hypothalamic-pituitary-adrenal axis and cause hypercortisolemia and immune suppression.<sup>3</sup>

Disclosing stressful events transfers repressed thoughts from the unconscious to the conscious level, at which they can be organized and controlled. This transfer removes the need for chronic low-grade stress to stimulate the autonomic nervous system and the hypothalamic-pituitary-adrenal axis

that can lead to disease and somatic symptoms. Disclosing allows the mind to interpret this new information from the subconscious and unlocks emotions that can stimulate positive physical results.

To illustrate how a stressor is stored in the mind, let us consider the money machine that is often an attraction at a county or state fair. The machine consists of an enclosed booth, a pile of paper money, and a fan. A lucky person wins the chance to enter the booth and grab as much money as possible while the fan blows it all around. When the human mind stores a stressful event, the event is not organized and stored as a concrete thought, but rather exists as a chaotic accumulation of a multitude of images, sensations, and emotions, like the money in the booth. Not until we grab the money, hold it in our hand, and count it are we aware of what we have. Disclosing is the process of organizing chaotic thoughts, thus allowing a person to interpret and evaluate the stressor. When this is done, the chronic somatic stress improves because the body no longer needs to sympathize.

When people put their emotional upheavals into words, either through expressive writing or talking, their physical and mental health improves.

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## Journaling After a Stressful Event

A review of online journal entries before and after the World Trade Center destruction in New York City on September 11, 2001 (9/11) offers insight into how a community discloses and communicates after a tragic event. If a community opens up and talks about the event, the health of the community improves. After 9/11, the city of New York had fewer visits to health care providers. It appears that this tragic event opened people up and stimulated communication that fostered relationships and a sense of community. The words they used in their writing switched to include less use of the ego-centered "I" to a more communal use of "we." This event brought the community together and reduced social isolation, in part by allowing its members to express their emotions (Box 96-1).<sup>4</sup>

**BOX 96-1. How to Journal**

1. Find a quiet place where you will not be disturbed.
2. Using pen, pencil, or computer, write about an upsetting or troubling experience in your life, something that has affected you deeply and that you have not discussed at length with others.
3. First describe the event in detail. Write about the situation, surroundings, and sensations that you remember.
4. Then describe your deepest feeling about the event. Let go and allow your emotions to run freely in your writing. Describe how you felt about the event then and how you feel now.
5. Write continuously. Do not worry about grammar, spelling, or sentence structure. If you come to a "block," simply repeat what you have already written.
6. Before finishing, write about what you may have learned or how you may have grown from the event.
7. Write for 20 minutes for at least 4 days. You can write about different events or reflect on the same one each day.
8. If the process proves helpful, consider keeping a journal regularly.

Adapted from Raket DP, Shapiro D. Mind-body medicine. In: Raket RE, ed. *Textbook of Family Practice*. 6th ed. Philadelphia: Saunders; 2001.

This process happens naturally in the first 2 to 3 weeks after a tragic event. This period is called the emergency phase, during which people and the media open up and discuss the event openly. Approximately 3 weeks after the event, the amount of discussion significantly declines, even though emotions and thoughts about it remain (Fig. 96-1). At this time, called the inhibition phase, when thoughts of the event remain but no one is talking about it, one may wish to encourage continued emotional expression.

Although seeing how this process unfolds in communities is interesting, how may this process of disclosure help us facilitate better health for individual patients? Let us first explore some key studies that show benefit.

## Key Areas of Research

### Asthma and Rheumatoid Arthritis

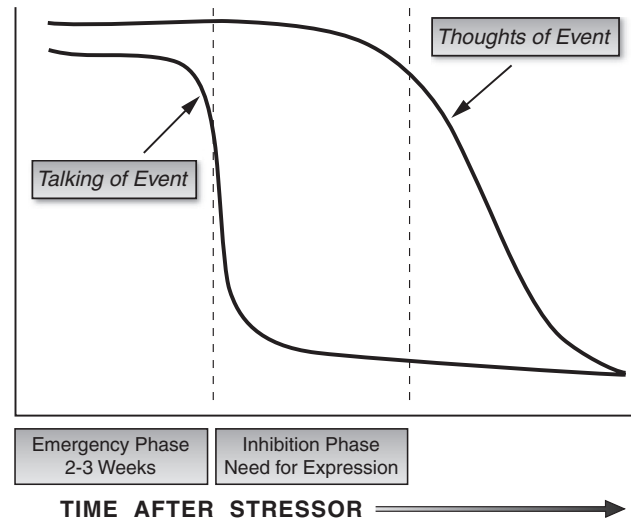
Smyth et al<sup>5</sup> asked 107 patients with asthma or rheumatoid arthritis to write either about the most stressful event of their lives (study group) or about daily events (control group) for just 20 minutes over 3 consecutive days. Four months after journaling, the asthmatic patients in the treatment group showed a 20% improvement in lung function, compared with no improvement in the control group. The patients with rheumatoid arthritis who wrote about stressful events showed a 28% reduction in disease severity, whereas the control group showed no change. These are excellent results requiring only paper, pencil, and 60 minutes of a patient's time.

### Memory Function

Writing about emotional events may enhance cognitive function and memory. In one study, college freshmen at North Carolina State University who were assigned to write about

**FIGURE 96-1**

Pattern of talking compared with thinking about a traumatic event. Journaling is most beneficial during the inhibition phase, when talking decreases but thoughts remain. (Adapted from Raket DP. Journaling: the effects of disclosure on health. *Altern Med Alert*. 2004;7:8–11.)



their thoughts and feelings about coming to school showed better working memory after 7 weeks compared with students who wrote about trivial topics.<sup>6</sup> Another group in the same study who wrote about their negative emotions had not only better memory but also less intrusive thinking; they were better able to focus on their studies. When students write about the stress of an upcoming test, they perform better on the examination.<sup>7</sup> Other research has linked such writing to higher grades among college students.<sup>8,9</sup>

### Wound Healing

A study of similar design showed that writing about emotional events resulted in quicker wound healing than writing about trivial topics such as time management.<sup>10</sup> (No noticeable health benefit has been found in control groups who write about managing time in their lives.) In the second week, after writing for 20 minutes a day for 3 days, the subjects underwent a punch biopsy in the upper arm. Those who wrote about traumatic events had significantly smaller wounds 14 days after the puncture than did those who wrote about trivial topics.<sup>10</sup>

### Irritable Bowel Syndrome

Of 103 study subjects with irritable bowel syndrome, 82 in the writing group were asked to write at an online portal for 30 minutes on 4 consecutive days about their deepest thoughts, emotions, and beliefs regarding the disease and their perception of its effects. Compared with the nonwriting control group, the expressive writing resulted in improved disease severity and fewer negative thoughts about their irritable bowel syndrome.<sup>11</sup>

### Blood Pressure and Infectious Disease

Steffen et al<sup>12</sup> reported that African American subjects who had a higher level of perceived racism with the suppression of anger were also found to have higher blood pressure than subjects with lower levels of perceived racism. The first group also had higher blood pressure during sleep, a finding suggesting a baseline elevation in sympathetic tone.

Another study showed a higher incidence of infectious diseases and cancer in homosexual men who concealed their homosexual identity than in those who were open about their sexuality.<sup>13</sup>

## Employment

In times of challenging economies and job layoffs, learning how the expression of emotions through writing can enhance the ability to obtain a job can be helpful. A group of senior-level engineers who wrote about the emotions of being laid off found new jobs more quickly than did those who did not write. The writing allowed the former group to address the anger, deal with it, and move on. The researchers of the study concluded that this work allowed the first group to have a more positive interview presence when they were looking for a job.<sup>14</sup>

## Writing Characteristics Associated With Health

For therapeutic benefit, the health care practitioner does not need to read what is written. In fact, more harm can come from having patients read their writing to others. The therapeutic benefit comes from the expression of the emotions themselves. In evaluation of such writing, however, the following key characteristics have been most commonly associated with a shift toward improved health<sup>15,16</sup>:

- The writer constructed an evolving story. People who created a story with a beginning, middle, and end did better than those who wrote the same story day after day. Creating a story transforms the event into one that is easier to understand and learn from.
- The writer developed insight and used more causal words (realize, understand).
- The writer developed more optimism, with greater use of positive words and a moderate number of negative words.
- As the story evolved, pronouns changed from first person singular (I, me, my) to second person plural (we, us), suggesting that with writing, the person became less isolated and more connected to his or her community.

The writing topic is less important than the exploration of emotions and thoughts of a topic.

### KEY WEB RESOURCES

James W. Pennebaker: <http://homepage.psy.utexas.edu/homepage/Faculty/Pennebaker/Home2000/JWPhome.htm>

Dr. Howard Schubiner's Mind Body Program: <http://www.unlearn-yourpain.com/index.php>

Center for Journal Therapy: [www.journaltherapy.com/](http://www.journaltherapy.com/)

My Therapy Journal: <https://www.mytherapyjournal.com/>

## Precautions

The process of disclosure may improve physical but not always mental health.<sup>17</sup> Our minds suppress traumatic events for a reason, and uncovering these events can be difficult for the conscious mind to handle, especially in children. In many cases, patients should work closely with a licensed therapist so they can continue to heal from this expression.

Timing of disclosure is also important. When the body-mind is ready to deal with repressed emotions, it generally has a way of letting us know. The danger comes in encouraging someone to write or express emotions when he or she is not ready to do so. This gives meaning to the old Zen saying, "Don't push the river." Do not encourage writing immediately after a stressful emotional event. Research suggests that this is not helpful and may be harmful.<sup>18</sup> A general recommendation on when to write is to consider expressive writing when the individual finds his or her mind focusing on an event repetitively or ruminating over something.

In helping others explore emotions of past events, one must avoid creating guilt. Little evidence shows that traumatic events in our lives can increase the risk of a disease such as cancer. We must not create this association but simply learn how these events can help us improve our current and future health.

## Relationship-Centered Care

The primary care practitioner is in an ideal position to help patients heal through disclosure because people are more likely to discuss stressful events with someone who is accepting and whom they trust.<sup>15</sup> This relationship takes time to develop to a point at which a patient feels comfortable with disclosure. It takes an average of 1 month for children to discuss an abusive event with a psychotherapist.<sup>19</sup> The most important aspect of relationship-centered care is that we provide an environment in which the patient feels comfortable exploring issues that allow us to discover the root of what can influence long-term health. In doing this, whatever tool we use, be it journaling or counseling, will work better because our patients have a connection with someone with whom they feel comfortable sharing their deepest and most meaningful stories. Listening with intention and compassion may be our most valuable therapeutic tool.

The Patient Handout at the end of this chapter offers directions for patients on how to journal to improve health.

This Web site of one of the key researchers in the field includes relevant publications, research tools, and links.

This program, offered by Howard Schubiner, MD, uses expressive writing to help provide healthy expression of emotions to reduce pain and tension.

The Center for Journal Therapy offers classes and instruction on using journaling for health.

This online journal with secure entries provides multiple ways to express oneself. A fee is required.

## References

References are available online at [expertconsult.com](http://expertconsult.com).

### Patient Handout: Using Journaling to Aid Health

#### What Is Journaling?

Journaling is the process of writing about times in our lives that were stressful or traumatic. It provides an avenue for the expression of thoughts and memories that may have been internalized. These repressed emotions can often lead to a worsening of physical symptoms. William Boyd, a pathologist active in the early to mid-twentieth century, described this process well; he wrote, "The sorrow that hath no vent in tears, may make other organs weep." Journaling is one type of therapy that can be used to aid this process.

#### How Does It Work?

Studies have found that if we express feelings about a time in our lives that was very traumatic or stressful, our immune function strengthens, we become more relaxed, and our health may improve. Writing about these processes helps us organize our thoughts and create closure to an event that our minds have a tendency to want to suppress or hide. This can be done in the privacy of your home and requires only pen and paper.

#### Does Anybody Need to Read It?

No. No one needs to read what you write. The most benefit comes from writing the document, and the words can be thrown away if you desire. In fact, some people find that burning or destroying the document can add ceremony to the process. Letting the wind carry away the smoke can act as a positive metaphor that helps to let go, forgive, and heal. Others, however, prefer to keep their writings private, so they can look back on them and see how they have grown from the events. Be sure to keep the writing in a safe location to prevent others from reading it if there is information you want to keep private.

#### Are There Any Side Effects or Things I Should Be Aware of?

Recalling stressful memories can make you feel uncomfortable for a few days. If this were not the case, the body would not use so much energy trying to repress them. The benefits of journaling become most apparent weeks to months after writing. Do not feel the need to journal about every stressful event. The research shows that expressive writing provides the most benefit when used to express emotions of events that you find yourself ruminating about or that may come into your mind's thoughts time and time again.

This process can bring back into mind some frightening events for which you may need the help of a licensed counselor. Please notify your medical practitioner if you develop feelings that would benefit from further discussion. This is often the first step toward creating an environment that will promote healing from within that will have healthy effects long term.

#### How Is It Done?

Emotions can be expressed in many different ways. Journaling is simple and inexpensive and can be done independently. It would be beneficial to keep a regular journal to write about events that bring anger, grief, or joy. If that is unlikely and you just want to deal with a specific event or see whether this technique will help your condition, however, follow these steps:

1. Find a quiet place where you will not be disturbed.
2. Using pen, pencil, or computer, write about an upsetting or troubling experience in your life, something that has affected you deeply and that you have not discussed at length with others.
3. First describe the event in detail. Write about the situation, surroundings, and sensations that you remember.
4. Then describe your deepest feeling about the event. Let go and allow your emotions to run freely in your writing. Describe how you felt about the event then and how you feel now.
5. Write continuously. Do not worry about grammar, spelling, or sentence structure. If you come to a "block," simply repeat what you have already written.
6. Before finishing, write about what you may have learned or how you may have grown from the event.
7. Write for 20 minutes for at least 4 days. You can write about different events or reflect on the same one each day. The event is less important than the process of expressing emotions about an event.
8. If the process proves helpful, consider keeping a journal regularly.

#### How Can I Learn More?

An excellent resource for more information on this subject can be found through the following publications written by leading researchers in the field:

*Opening Up: The Healing Power of Expressing Emotions* by James W. Pennebaker (Guilford Press, 1997)

*Writing to Heal: A Guided Journal for Recovering from Trauma and Emotional Upheaval* by James W. Pennebaker (New Harbinger Press, 2004)

*The Writing Cure: How Expressive Writing Promotes Health and Emotional Well-being* by Stephen J. Lepore and Joshua M. Smyth (American Psychological Association, 2002)

The Center for Journal Therapy offers classes and instruction on using journaling for health. [www.journaltherapy.com/](http://www.journaltherapy.com/)

Howard Schubiner, MD, offers a program that uses expressive writing to help provide healthy expression of emotions to reduce pain and tension: <http://www.unlearnyourpain.com/index.php>

This online journal allows private journal entries that can be tracked and searched. It can be used for all types of journal entries. A fee is required: <https://www.mytherapyjournal.com>



## References

- Berry DS, Pennebaker JW. Nonverbal and verbal emotional expression and health. *Psychother Psychosom*. 1993;59:11–19.
- Pennebaker JW. *Opening Up: The Healing Power of Expressing Emotions*. New York: Guilford Press; 1997.
- Kiecolt-Glaser JK, Glaser R, Cacioppo JT, Malarkey WB. Marital stress: immunologic, neuroendocrine, and autonomic correlates. *Ann N Y Acad Sci*. 1998;840:656–663.
- Cohn MA, Mehl MR, Pennebaker JW. Linguistic markers of psychological change surrounding September 11, 2001. *Psychol Sci*. 2004;15:687–693.
- Smyth JM, Stone AA, Hurewitz A, Kaell A. Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis. *JAMA*. 1999;281:1304–1309.
- Klein K, Boals A. Expressive writing can increase working memory capacity. *J Exp Psychol Gen*. 2001;130:520–533.
- Ramirez G, Beilock SL. Writing about testing worries boosts exam performance in the classroom. *Science*. 2011;331:211–213.
- Pennebaker JW, Francis M. Cognitive, emotional and language processes in disclosure. *Cogn Emot*. 1996;10:601–626.
- Cameron LD, Nicholls G. Expression of stressful experiences through writing: effects of a self-regulation manipulation for pessimists and optimists. *Health Psychol*. 1998;17:84–92.
- Banburey CL. Wounds heal more quickly if patients are relieved of stress: a review of research by Susanne Scott and colleagues from King's College. London. Presented at the Annual Conference of the British Psychological Society. *BMJ*. 2003;327:522.
- Halpert A, Rybin D, Doros G. Expressive writing is a promising therapeutic modality for the management of IBS: a pilot study. *Am J Gastroenterol*. 2010;105:2440–2448.
- Steffen PR, McNeilly M, Anderson N, Sherwood A. Effects of perceived racism and anger inhibition on ambulatory blood pressure in African Americans. *Psychosom Med*. 2003;65:746–750.
- Cole SW, Kemeny ME, Taylor SE, Vischer BR. Elevated physical health risk among gay men who conceal their homosexual identity. *Health Psychol*. 1996;15:243–251.
- Spera SP, Buhrfeind ED, Pennebaker JW. Expressive writing and coping with job loss. *Acad Manage J*. 1994;37:722–733.
- Pennebaker JW, Mayne TJ, Francis ME. Linguistic predictors of adaptive bereavement. *J Pers Soc Psychol*. 1997;72:863–871.
- Pennebaker JW. *Pain, language, and healing*. Presented at the Biofeedback Society of Wisconsin Integrative Health-Care Conference, September 11–13, Green Lake, WI; 2003.
- Fox SG, Strum CA, Walters HA. Perceptions of therapist disclosure of previous experience as a client. *J Clin Psychol*. 1984;40:496–498.
- Pennebaker JW. Expressive writing in a clinical setting: a brief practical guide to expressive writing for therapists and counselors. *Independent Practitioner*. 2010;30:23–25.
- Gonzalez LS, Waterman J, Kelly RJ, et al. Children's patterns of disclosures and recantations of sexual and ritualistic abuse allegations in psychotherapy. *Child Abuse Negl*. 1993;17:281–289.



# Healing Through Forgiveness

J. Adam Rindfleisch, MD, MPhil, and Gayle Reed, PhD, RN

If you want to see the heroic, look at those who can love in return for hatred. If you want to see the brave, look for those who can forgive.

*The Bhagavad-Gita*

Of central importance to the integrative approach to medicine is the creation of empathic, trusting relationships between caregivers and patients. If their caregivers provide them with a safe place to do so, patients often disclose traumatic experiences they may not feel comfortable discussing elsewhere. They may describe experiences of abuse—physical, emotional, or sexual. Pain inflicted by others, from minor slights and insults to the most horrifying experiences of brutality or betrayal, can significantly influence health at multiple levels; providers of integrative medicine must bear this in mind. For many people, being able to forgive others or themselves is an absolutely vital component of the process of reclaiming wholeness.

Some people freely recognize the role of forgiveness in healing the damage caused by traumatic experiences; others do not. How and when to address issues of forgiveness can be one of the most challenging aspects of caring for others. Addressing such issues can also be one of the most powerful and rewarding tools a patient is given.

This chapter explores the role that past traumas and forgiveness play in health. The process of forgiving is outlined, and methods for helping patients to forgive are suggested. Additional resources for further reading are also provided.

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## Traumatic Experiences and Health: The Need for Forgiveness

A strong relationship exists between traumatic experiences and the emergence of physical and mental health problems. In a 1999 study conducted at Harvard University in Massachusetts, 91 people with various chronic pain syndromes were asked to complete several measurement instruments. The researchers found that at least half the people in

the study had strong histories of traumatic childhood events, a proportion much higher than that seen in the general population.<sup>1</sup> A 2001 Canadian study revealed that women with a history of childhood sexual abuse were much more likely to both use health care resources and have chronic pain symptoms than a group of matched controls.<sup>2</sup> A 2001 review in the *Annals of Internal Medicine* noted, “Both childhood maltreatment and psychological trauma in adulthood have been associated with increased vulnerability to psychiatric illness and more medical symptoms.”<sup>3</sup> Research findings increasingly demonstrate that “...adverse personal, social, and interpersonal experiences, especially when they occur early in life, can result in physical and psychological difficulties in adulthood.”<sup>4</sup>

How may an integrative provider help someone overcome the health effects of negative past experiences? Since the 1990s, a steadily growing body of research has emerged indicating what philosophical and spiritual traditions worldwide have acknowledged for some time: Forgiveness has the power to restore well-being. Simply imagining oneself granting forgiveness alters physiology. Blood pressure is lowered, heart rate decreases, and skin conductance changes.<sup>5</sup> Psychological measures of emotional state are also favorably affected.<sup>6</sup> People who are more inclined to forgive are less likely to experience symptoms of depression,<sup>7</sup> anxiety,<sup>8,9</sup> and posttraumatic stress.<sup>10</sup> Forgiveness of self is associated with less blood viscosity and better ratios of helper T to cytotoxic T white blood cells.<sup>11</sup>

Forgiveness clearly has the potential to serve as a powerful healing tool in multiple ways.

A strong relationship exists between traumatic experiences and the emergence of physical and mental health problems.

Strong evidence also indicates that forgiveness can improve health in individuals with various physical and psychological conditions.

A 2005 study of 61 people with chronic low back pain found a direct relationship between an inability to forgive and pain intensity; the more a person could forgive, the less psychological distress and pain he or she experienced.<sup>12</sup> Forgiveness has been associated with lower cardiovascular risk, possibly because it decreases anger and hostility; it has even been linked to improvements in lipid measures.<sup>13</sup> Forgiveness was found to decrease anger-induced myocardial ischemic events as well.<sup>14</sup> It decreased anger, depression, anxiety, and vulnerability to drug use in past substance abusers,<sup>15</sup> and a 4-week intervention helped terminally ill older patients with cancer to enhance levels of hope and quality of life.<sup>16</sup> Forgiveness therapy also lowered depression, anxiety, and posttraumatic stress and improved self-esteem, emotional mastery, and the ability to find meaning in suffering in women suffering from spousal emotional abuse.<sup>17</sup> It improves mental health by decreasing the tendency to ruminate, and it probably has secondary effects of improving social relationships as well.<sup>11</sup> Investigators have suggested that forgiveness therapy may hold great potential in the treatment of fibromyalgia and chronic fatigue,<sup>18</sup> and perhaps for any chronic health conditions.<sup>4</sup> Meta-analyses also pointed out the benefits of forgiveness for healing intergenerational pain, recovery from sexual abuse and incest, and abortion-related guilt.<sup>19,20</sup>

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## The Nature of Forgiveness

Several different measurement instruments are used to conduct research studies, and many have proven quite useful. Ultimately, however, each person must discern his or her own way of defining forgiveness and knowing when and how it has occurred. Even when people do not actually feel equipped to forgive, they are often able to recognize that forgiving is important. When patients are ready, integrative providers can guide them through the process.

As Jack Kornfield, a well-known writer and teacher of Buddhist meditation, noted, “We have all heard stories about the mysterious power of compassion and forgiveness in the lives of others. Each time we are inspired by these accounts, we remember that we, too, can forgive.”<sup>21</sup>

Remarkable descriptions of forgiveness abound. Some examples are as follows:

- Forgiveness is an important teaching in the New Testament of the Bible. The Gospel of Matthew refers to the importance of “turning the other cheek,” and Jesus asked for forgiveness for those who crucified him.
- The Dalai Lama continually reminds the Tibetan people to practice kindness and compassion toward the Chinese, despite the persecution his people have experienced under Chinese rule.
- Father William Meninger describes the tale of Sister Catherine, a 55-year-old nun who was informed that a physician had mistakenly injected a lethal medication into her during the brain operation she had just undergone. Her response was to call in her fellow church officials and declare, “There will be no repercussions. No one is to be held at fault. ... I forgive without reservation anyone who may have been in any way responsible for what has happened.” She died 2 hours later.<sup>22</sup>

- Jack Kornfield witnessed the power of forgiveness in Cambodia in 1979, when the Khmer Rouge was committing mass genocide. At a refugee camp, 25,000 people gathered together despite knowing that they could be killed for doing so. The leader of the meditation recited one phrase from the time of the Buddha: “Hatred never ceases by hatred, but by love alone is healed. This is the ancient and eternal law.” After multiple recitations, people began to chant with him, despite all the losses—of home, of freedom, of loved ones—that they had endured.<sup>23</sup>
- Bishop Desmond Tutu, during the era of apartheid in South Africa, was known to pray for the well-being of the white government officials despite their role in perpetuating the system that was so painful for his congregation, the country’s black Africans.
- Multiple accounts exist of Jewish people’s forgiving those who perpetrated the Holocaust during World War II. For instance, Rabbi Joseph Gelberman, whose family was exterminated by the Nazis, stated he was able to forgive because he “had to let go of what happened.”<sup>22</sup>

Such accounts are powerful, but it is not to say that forgiving cannot occur on a personal level for “everyday” people as well as for religious leaders and spiritual communities. Giving and receiving pain are part of the human experience, and forgiving and being forgiven must therefore be part of it as well.

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## Guidelines for Helping People to Forgive

William Meninger defines the process of forgiveness as follows:

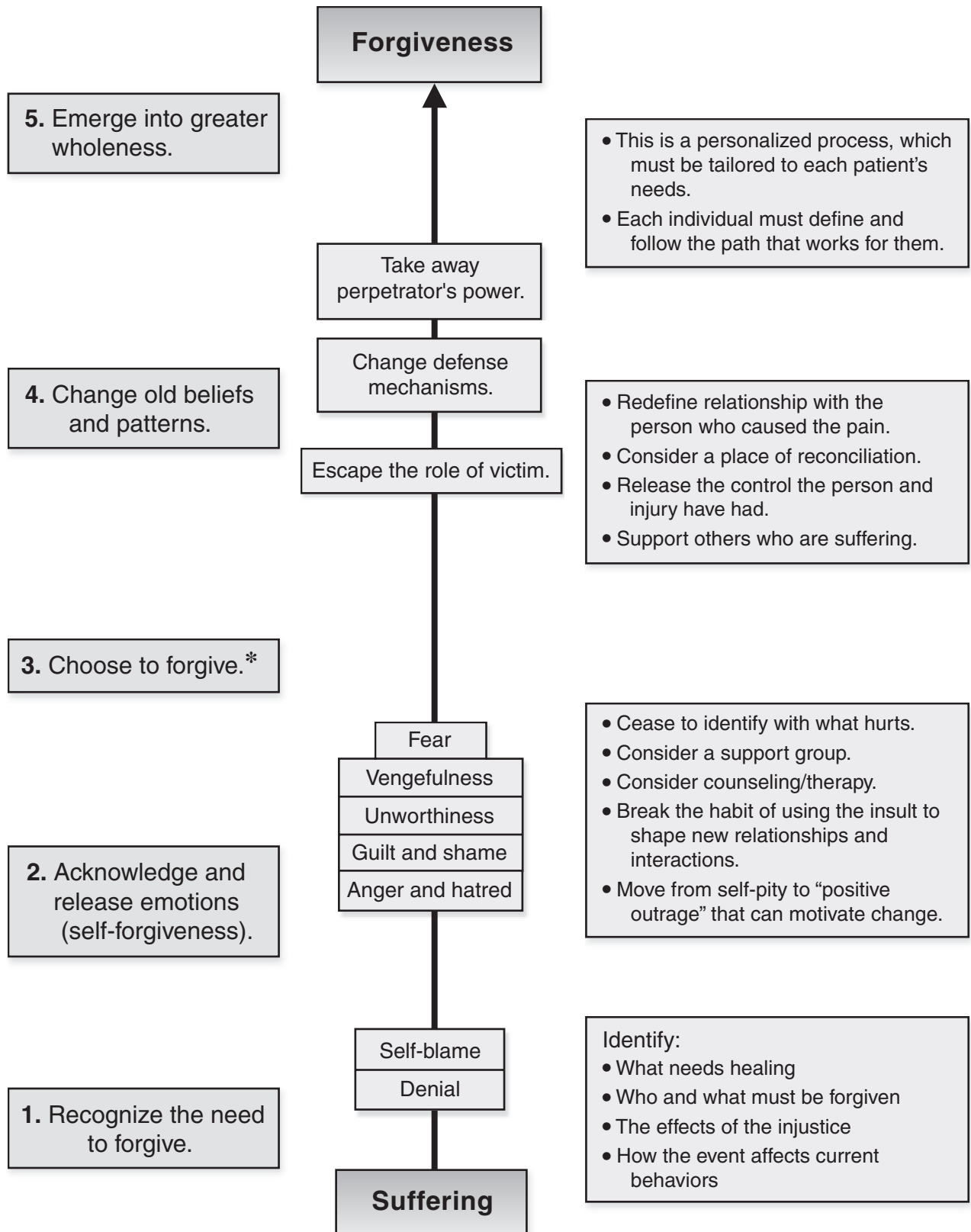
We begin to deal with our wounds by denying or minimizing them. When we finally do face them squarely and recognize the ones who inflicted them, we move on to the next step. This usually involves trying to excuse the perpetrator and blaming ourselves for causing or, at least, not stopping, the original wounds. When we are able to cease the self-blame, we begin to feel sorry for ourselves and to wallow in a mud hole of self-pity, bitterness, and recrimination. The next step is anger. We determine that we will do something about what happened to us and move forward with our lives. We stop rubbing salt in our wounds, and we actively seek healing. This leads us to the final stage, wholeness.<sup>22</sup>

Figure 97-1 illustrates some of the key steps that occur as a person goes through the forgiveness process. These steps need not always occur in a particular order, and not every person experiences every step before forgiveness occurs.

Stepwise approaches guiding forgiveness have been developed by several authorities, and suggestions derived from several of these are summarized in the Patient Handout at the end of this chapter. For further information, clinicians are referred to the work of Robert Enright<sup>24,25</sup> at the University of Wisconsin, Madison, and Frederic Luskin,<sup>26,27</sup> coordinator of the Stanford Forgiveness Project in Palo Alto, California. Additional recommended books and Web sites for both patients and providers are listed in the previously mentioned Patient Handout.<sup>28-35</sup>

**FIGURE 97-1**

The forgiveness process. General stages in the process are listed in the column on the *left*. Boxes overlying the *arrow* list major obstacles to forgiving. Specific actions are listed on the *right*. More detailed steps are outlined in the resource list in the Patient Handout at the end of this chapter. \*Often the most difficult step.



In discussing forgiveness with patients and using the Patient Handout, keep the following in mind:

- As with counseling for weight loss, substance abuse, or other types of behavioral change, suggesting that people cultivate forgiveness is only likely to be useful if people are “in a place” where they are willing and able to consider doing so. Some people may be offended if they are encouraged to forgive when they are not yet prepared to begin the process. As in motivational interviewing for substance use, the provider must assess readiness for change. Is the patient precontemplative, contemplative, or already taking steps toward forgiveness?
- The provider should emphasize, as noted in the Patient Handout, that forgiveness is not the same as tolerance, passivity, or forgetting what happened. No expectation exists that the patient must accept the perpetrator's behavior as acceptable or allowable. Forgiveness is done for the person doing the forgiving; the goal is to free him or her as much as possible from the negative consequences of a traumatic experience.
- Moving through the steps described in this chapter may be associated with an intense release of emotions. The provider must carefully assess whether mental health professionals are needed to assist a patient with the forgiveness process.
- Asking a person to forgive may be asking him or her to move away from a pattern of thoughts and feelings that has been present for many years. It is not a simple process for many people. Follow-up is important. The process takes time.
- A person's concept of forgiveness is based on his or her cultural and religious background. The provider should take a spiritual history and be aware of cultural beliefs, to suggest forgiveness as part of an individualized treatment plan that respects these beliefs and encourages appropriate social support.
- Meditation has shown promise in bringing about forgiveness and should be considered.<sup>36</sup>
- Forgiveness is not just a therapeutic intervention, it is an end point—a healthier state of being—unto itself.<sup>4</sup>

An integrative provider must carefully gauge whether a person is prepared to do forgiveness work. Readiness to change must be carefully assessed.

A spiritual history can be useful in guiding a discussion of forgiveness as a tool for improving health.

Forgiving can be a difficult, emotion-laden, and time-consuming process. Be certain someone has the support he or she needs before beginning the process. Strongly consider requesting assistance from mental health professionals.

## Conclusion

Viktor E. Frankl, a psychiatrist and Holocaust survivor, summarizes the importance of how we deal with traumatic experiences in his work, *Man's Search for Meaning*:

We must never forget that we may also find meaning in life even when confronted with a hopeless situation, when facing a fate that cannot be changed. For what then matters is to bear witness to the uniquely human potential at its best, which is to transform a personal tragedy into a triumph, to turn one's predicament into a human achievement.<sup>37</sup>

Patients continually seek the meaning underlying their illnesses, their suffering, and their terrible losses. As healers, we can help to guide this search. Forgiveness is one tool that may help us all move through tragedy and pain toward greater wholeness.

### The Nature of Forgiveness

The following perspectives are based in part on the work of Enright and Luskin, as provided in Further Reading list.

- Forgiveness is a transformation. The key is to release suffering and thereby increase inner peace and understanding.
- Forgiveness is not forgetting. In fact, you have to remember and acknowledge negative emotions and events before forgiveness can occur.
- Forgiveness is not pardoning, excusing, or saying that something will be treated as acceptable behavior in the future.
- Forgiveness is, first and foremost, done for the person doing the forgiving. It is paradoxical in that when you forgive others, you heal yourself.
- Forgiveness is a path to freedom. It frees you from the control of the person who caused the harm. That person loses his or her power to cause you to feel negative emotions.
- Forgiveness can break old patterns that may otherwise interfere when you try to create new relationships.
- Forgiveness can take a long time and much hard work.
- Forgiveness need not require “making up” with the person who caused the harm. It is an internal process. It is primarily for you. The goal is to help you heal, to help you grow.
- Thinking about forgiveness may not be enough. For many, tapping into principles described in various spiritual traditions from around the world is necessary. Meditation, interpersonal dialogues, and intense emotional work may be essential parts of the forgiveness process for many people (see the Further Reading list and the Key Web Resources box).

## KEY WEB RESOURCES

World Forgiveness Alliance: <a href="http://www.forgivenessday.org/">www.forgivenessday.org/</a>	This alliance is “dedicated to evoking the healing power of forgiveness worldwide.”
International Forgiveness Institute: <a href="http://www.forgivenessinstitute.org/">http://www.forgivenessinstitute.org/</a>	This institute was created by Robert Enright, a well-known forgiveness researcher. The Web site has information on books and other resources, as well as course offerings through the University of Wisconsin.
Forgive for Good: <a href="http://www.learningtoforgive.com/">www.learningtoforgive.com/</a>	This Web site of Dr. Fred Luskin, who has done extensive forgiveness research, has links to his books, forgiveness tools, and other resources.
Gayle L. Reed: <a href="http://www.forgivenessrecovery.com">www.forgivenessrecovery.com</a>	This Web site of Dr. Gayle Reed, who offers forgiveness recovery programs, has several forgiveness resources.
“The Power of Forgiveness”: <a href="http://www.thepowerofforgiveness.com">www.thepowerofforgiveness.com</a>	This Web site for the movie, “The Power of Forgiveness,” has resources, including a “How Forgiving Are You?” quiz.

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## References

References are available online at [expertconsult.com](http://expertconsult.com).

### Patient Handout: Healing Through Forgiveness

To err is human; to forgive, divine.  
—Alexander Pope

Scientific research has indicated that forgiving past wrongs can be helpful for a variety of health problems, including anxiety, depression, substance abuse, and chronic pain. When we focus on forgiving, our blood pressure drops and our heart rate slows down. Our mood improves. Forgiveness can alter the state of our health.

What follows is a series of steps designed to help you forgive a past wrong. Follow each step, one at a time, and take a moment to write down your answers to each question. You need not share your answers with others. This process should be based on what feels best for you.

1. Think of a person who has wronged you, someone who you have not been able or willing to forgive thus far.
2. Describe the experience or experiences in which this “offender” harmed you or treated you unjustly. Does it help to have the pain and unfairness validated by a trusted person?
3. Describe the emotions you feel as you consider these events. Do you feel anger? Shame? Guilt? How much time do you spend thinking about or reliving what happened? Take as much time as you need to acknowledge your feelings and experiences and put them into words.
4. How has being unable to forgive affected your health? Has it affected your ability to relate to others? Did it change your view of the world? How has being hurt in the past caused you to protect yourself? Does how you defend yourself limit you in any way?
5. Consider what it means to forgive as well as the potential benefits of forgiving.
6. Are you ready and willing to forgive? When you feel that the answer is “yes,” continue with the steps described below. Sometimes just deciding to forgive is the most difficult step of all! (Note: The following guidelines/suggestions are inspired by the works listed in the Further Reading section at the end of this chapter. Follow the steps in whatever order works best for you.)
7. Consider a situation in which another person had to forgive you for something. How did you feel? Recognize that everyone is involved in both forgiving and being forgiven. If you put yourself in the position of the person who hurt you, considering his or her life history and current circumstances, can you understand why he or she did this? (Again, understanding helps you to develop empathy for the person; it does not mean you are minimizing, condoning, or excusing what he or she did.)
8. Practice withholding resentment and developing goodwill toward the one who hurt you. You could consider performing an act of kindness toward the person who hurt you, if it is safe and possible to do so, but any attitude of goodwill that honors your decision to forgive is important. Do what respects your inherent worth as a human being as well as the inherent worth of the one who hurt you.
9. Consider that being realistic about the relationship with the person who hurt you can also be an aspect of goodwill. It can be helpful for both you and the person who hurt you to break any harmful patterns or connections.
10. Mourn and release the pain and emotions that the unjust event(s) caused you. Ask for support from friends or family members as you do this. In this way, you will no longer waste energy on this past injury, and you will be able to avoid passing the pain from the injury back to the person who hurt you and to other people around you.
11. Now that you are facing the pain in order to move through it, what virtues will you choose to follow to turn your suffering into triumph? Will you choose courage, compassion, kindness, love... forgiveness itself? What meaning will you discover? What kind of person are you becoming?
12. As you experience meaning and release, offer support to others who are experiencing similar difficulties. Helping others who have been suffering can help you find renewed purpose as a result of your own painful experiences.
13. For additional insight and assistance, consider discussing these issues with a health professional (counselor, psychologist, physician) or referring to the books mentioned in the Further Reading section of this chapter.

## References

- Goldberg RT, Pachas WN, Keith D. Relationship between traumatic events in childhood and chronic pain. *Disabil Rehabil.* 1999;21:23–30.
- Finestone HM, Stenn P, Davies F, et al. Chronic pain and health care utilization in women with a history of childhood sexual abuse. *Child Abuse Negl.* 2001;24:547–556.
- Katon W, Sullivan M, Walker E. Medical symptoms without identified pathology: relationship to psychiatric disorders, childhood and adult trauma, and personality traits. *Ann Intern Med.* 2001;134:917–925.
- Elliott BA. Forgiveness for chronic disease. *J Relig Health.* 2011;50:240–247.
- Witvliet C, Ludwig TE, Vander Laan KL. Granting forgiveness or harboring grudges: implications for emotion, physiology, and health. *Psychol Sci.* 2001;12:117–123.
- Lawler KA, Younger JW, Piferi RL, et al. A change of heart: cardiovascular correlates of forgiveness in response to interpersonal conflict. *J Behav Med.* 2003;26:373–393.
- Brown RP. Measuring individual differences in the tendency to forgive: construct validity and links with depression. *Pers Soc Psychol Bull.* 2003;29:759–771.
- Coyle CT, Enright RD. Forgiveness intervention with post-abortion men. *J Consult Clin Psychol.* 1997;65:1042–1045.
- Freedman SR, Enright RD. Forgiveness as an intervention goal with incest survivors. *J Consult Clin Psychol.* 1996;64:983–992.
- Witvliet CV, Phipps KA, Feldman ME, et al. Posttraumatic mental and physical health correlates of forgiveness and religious coping in military veterans. *J Trauma Stress.* 2004;17:269–273.
- Worthington EL, Witvliet CV, Lerner AJ, Scherer M. Forgiveness in health research and medical practice. *Explore.* 2005;1:169–176.
- Carson JW, Keefe FJ, Goli V, et al. Forgiveness and chronic low back pain: a preliminary study examining the relationship of forgiveness to pain, anger, and psychological distress. *J Pain.* 2005;6:84–91.
- Friedberg JP, Suchday S, Srinivas VS. Relationship between forgiveness and psychological and physiological indices in cardiac patients. *Int J Behav Med.* 2009;16:205–211.
- Waltman MA, Russell DC, Coyle CT, et al. The effects of a forgiveness intervention on patients with coronary artery disease. *Psychol Health.* 2009;24:11–27.
- Lin WE, Enright RD, Krahn D, et al. Effects of forgiveness therapy on anger, mood, and vulnerability to substance use among inpatient substance-dependant clients. *J Consult Clin Psychol.* 2004;72:1114–1121.
- Hansen MJ. A palliative care intervention in forgiveness therapy for elderly terminally ill cancer patients. *J Palliat Care.* 2009;5:1–60.
- Reed GL, Enright RD. The effects of forgiveness therapy on depression, anxiety and posttraumatic stress for women after spousal emotional abuse. *J Consult Clin Psychol.* 2006;74:920–929.
- Toussaint L, Overvold-Ronningen M, Vincent A, et al. Implications of forgiveness enhancement in patients with fibromyalgia and chronic fatigue syndrome. *J Health Care Chaplaincy.* 2010;16:123–139.
- Lundahl B, Taylor MJ, Stevenson R, Roberts KD. Process-based interactions: a meta-analytic review. *Res Soc Work Pract.* 2008;18:465–478.
- Wade NG, Worthington EL, Meyer JE. But do they work: a meta-analysis of group interventions to promote forgiveness. In: Worthington EL, ed. *Handbook of Forgiveness.* New York: Routledge; 2005: 423–439.
- Kornfield J. *The Art of Forgiveness, Lovingkindness, and Peace.* New York: Bantam; 2004.
- Meninger WA. *The Process of Forgiveness.* New York: Continuum; 1998.
- Kornfield J. The practice of forgiveness. *Spirit Rock Meditation Center Newslett.* 1999–2000; Sept-Feb:5.
- Enright RD. *Forgiveness is a Choice.* Washington, DC: APA Books; 2001.
- International Forgiveness Institute. <[www.forgivenessinstitute.org/](http://www.forgivenessinstitute.org/)>; Accessed 26.10.11.
- Luskin F. *Forgive for Good.* San Francisco: HarperCollins; 2002.
- Forgive for Good.* <[www.learningtoforgive.com/](http://www.learningtoforgive.com/)>; Accessed 26.10.11.
- Casarjian R. *Forgiveness: A Bold Choice for a Peaceful Heart.* New York: Bantam; 1992.
- Flanigan B. *Forgiving the Unforgivable: Overcoming the Bitter Legacy of Intimate Wounds.* New York: Macmillan; 1992.
- Jampolsky GG. *Forgiveness: The Greatest Healer of All.* Hillsboro, OR: Beyond Words; 1999.
- Kushner HS. *How Good Do We Have to Be? A New Understanding of Guilt and Forgiveness.* Boston: Little, Brown; 1996.
- Smedes LB. *Forgive Forget: Healing the Hurts We Don't Deserve.* San Francisco: Harper and Row; 1984.
- Worthington E. *Five Steps to Forgiveness: The Art and Science of Forgiving.* New York: Crown; 2001.
- Forgiveness Project. A Campaign for Forgiveness Research. <[www.forgiving.org/](http://www.forgiving.org/)>; Accessed 26.10.11.
- World Forgiveness Alliance. <[www.forgivenessday.org/](http://www.forgivenessday.org/)>; Accessed 26.10.11.
- Oman D, Shapiro SL, Thoresen CE, et al. Meditation lowers stress and supports forgiveness among college students: a randomized controlled trial. *J Am Coll Health.* 2008;56:569–578.
- Frankl V. *Man's Search for Meaning: Revised and Updated.* New York: Simon and Schuster; 1984:88.
- Kornfield J. *The Beginner's Guide to Forgiveness: How to Free Your Heart and Awaken Compassion.* Beginner's Series. Sounds True; 2002 (CD with forgiveness meditations).
- Kornfield J. *The Art of Forgiveness, Lovingkindness, and Peace.* New York: Bantam; 2004.
- Kushner HS. *How Good Do We Have to Be? A New Understanding of Guilt and Forgiveness.* Boston: Little, Brown; 1996 (useful for issues relating to self-forgiveness).
- Luskin F. *Forgive for Good.* New York: HarperCollins; 2002.
- Luskin F. *Forgive for Love: The Missing Ingredient for a Healthy and Lasting Relationship.* New York: HarperCollins; 2007 (focuses on forgiveness issues related to life partners).
- Meninger WA. *The Process of Forgiveness.* New York: Continuum; 1996.
- Schimmel S. *Wounds Not Healed by Time.* Oxford: Oxford University Press; 2002.
- Smedes LB. *The Art of Forgiving: When You Need to Forgive and Don't Know How.* Nashville, TN: Moorings; 1996.
- Spring JA. *How Can I Forgive You: The Courage to Forgive, The Freedom Not To.* New York: HarperCollins; 2004.
- Volf M. *Free of Charge.* Grand Rapids, MI: Zondervan; 2005.
- Worthington E. *Forgiving and Reconciling: Bridges to Wholeness and Hope.* Downer's Grove, IL: Intervarsity Press; 2003 (focuses on a Christian perspective of forgiveness).
- Worthington EL, ed. *Handbook of Forgiveness.* New York: Routledge; 2005.

## Further Reading

- Casarjian R. *Forgiveness: A Bold Choice for a Peaceful Heart.* New York: Bantam; 1992.
- Enright RD. *Forgiveness is a Choice: A Step-by-Step Process for Resolving Anger and Restoring Hope.* Washington, DC: APA Books; 2001.
- Enright RD, Finney KK. *Rising Above the Storm Clouds: What It's Like to Forgive.* Washington, DC: Magination Press; 2004 (general introduction to forgiveness to help children forgive each other).
- Enright RD, Fitzgibbons RP. *Helping Clients Forgive: An Empirical Guide for Resolving Anger and Restoring Hope.* Washington, DC: APA Books; 2000.
- Flanigan B. *Forgiving the Unforgivable: Overcoming the Bitter Legacy of Intimate Wounds.* New York: Macmillan; 1992 (has useful healing exercises in Part III).
- Forgiveness Project. Web site of a worldwide organization conducting research on the importance of forgiveness. <[www.forgiving.org/](http://www.forgiving.org/)>; Accessed 26.10.11.
- Hallowell EM. *Dare to Forgive.* Deerfield Beach, FL: Health Communications; 2004.
- International Forgiveness Institute. International Web site based on the work of Dr. Enright. <[www.forgivenessinstitute.org/](http://www.forgivenessinstitute.org/)>; Accessed 26.10.11.
- Jampolsky GG. *Forgiveness: The Greatest Healer of All.* Hillsboro, OR: Beyond Words; 1999.





# Recommending Meditation

Luke Fortney, MD

## What is Meditation?

Found in cultures, spiritual traditions, and healing systems throughout the world, meditation is a mind-body practice with many methods and variations, all of which are grounded in the silence and stillness of compassionate, nonjudgmental present-moment awareness. Although contemplative meditation practices are rooted largely in the world's spiritual traditions, the practice of meditation does not require belief in any particular religious or cultural system. In fact, public familiarization with meditation and increased research within the fields of neuroscience, psychology, and medicine have led to an increased understanding of consciousness and improved treatment for many health conditions.

Mindfulness is one aspect of the meditation experience that reflects the basic and fundamental human capacity to attend to relevant aspects of experience in a nonjudgmental and nonreactive way, which, in turn, cultivates clear thinking, equanimity, compassion, and open-heartedness. According to University of Massachusetts Center for Mindfulness founder Jon Kabat-Zinn, "Meditation is simplicity itself. It's about stopping and being present. That is all." Stated as simply as possible, *meditation means being present with what is*.

The goal of mindfulness is to maintain fluid awareness in a moment-by-moment experiential process that helps one disengage from strong attachment to beliefs, thoughts, or emotions in a way that generates greater sense of emotional balance and well-being.<sup>1</sup> This simple yet radical assertion holds the potential for wide-reaching therapeutic benefit for many current health care challenges such as rising health care costs,<sup>2</sup> chronic lifestyle-influenced illness,<sup>3</sup> practitioner burnout,<sup>4</sup> patient dissatisfaction,<sup>5</sup> and generalized stress for both practitioner<sup>6</sup> and patient.<sup>7</sup>

Meditation means being present with unmanipulated experience as it arises moment by moment.

## Why Meditate?

Prescribed meditation practice can elicit physical ease and mental stability, which provide a foundation for health and wellness as it directly influences one's ability to meet the challenges resulting from stress, burnout, and illness for patient and practitioner alike. For most people, illness brings out feelings of confusion, anxiety, fear, and anger. Shock, isolation, depression, fear, and helplessness are some common experiences patients face in dealing with chronic disease.<sup>8</sup> Feeling out of control or losing one's grounding can give rise to reactivity of the mind and body that leads to increased pain and suffering. Applying the simple practice of nonjudgmental present-moment awareness and experiencing how this process influences one's relationship with life stressors are ways that meditation practice addresses the epidemic of mind-body afflictions that are expressed physically, such as acid reflux, migraine headache, low back pain, restless legs, fibromyalgia, chronic fatigue, irritable bowel, and many other conditions. These and other conditions disproportionately burden health care systems and often do not respond to conventional treatment alone.<sup>2</sup> Meditation is an inward-orienting, self-empowering practice that can stimulate the healing process and help patients and health care practitioners navigate unsettling and turbulent experiences. According to long-time meditation teacher Charlotte Joko Beck,<sup>9</sup> "The practice of meditation provides a skill that affords a greater sense of self determination—the ability to cultivate and draw upon inner resources to help meet all circumstances with equanimity and clarity." To learn the basic elements of meditation practice, see [Boxes 98-1 through 98-4](#) and [Figure 98-1](#).

The practice of meditation serves one's threefold physical, mental, and spiritual health.

### BOX 98-1. Getting Started With Mindfulness Meditation Practice: SOLAR or SOL Acronym

#### Stop

- Find a quiet place where you will not be interrupted for the next several minutes.
- Set your cell phone alarm to vibrate in 5 or more minutes, and then forget about time altogether. You can adjust the length of your meditation time as you feel is appropriate.
- Sit comfortably in an alert position with a straight and relaxed back. With eyes open or closed, position your hands as you like.
- Allow an intention for this time, such as, "May I allow myself to be present to the simplicity of movements in the body as breathing, feeling, and sensing. May I enjoy the benefits of silence and stillness."

#### Observe

- Direct your attention into noticing sensations in the body and notice posture, feet on the floor, hips on the chair, or feeling a sense of being balanced and grounded.
- Allow the breath to flow in and out of the nose at a natural and unforced rate and depth. Avoid manipulating either a slower or faster rate. Just let the body breathe. In your own bodily experience, notice the sensations of simply breathing.
- Moment by moment, allow yourself to take *pause*, *breathe*, and *feel* just what arises in your experience.

#### Let it Be

- For this time now, *let everything be as it is* without reacting to or trying to change any of it. Like a watchful bystander, just witness your experience moment by moment as it happens right now, however it may be, pleasant or unpleasant.
- If you become caught up in any particular storyline, fantasy, daydream, rumination, compulsive thought, or distraction gently stop, drop into your body, and allow all experiences to roll on past the screen of your awareness like moving frames in a film.

#### And...

#### Return

- Let the breath be your anchor in the present moment. If you become distracted or caught up in any particular *thought*, *image*, *emotion*, or *sensation* (TIES acronym), just bring your attention back to the breath, and *return again and again* to the experience of breathing in a nonjudgmental and self-forgiving way.
- At the end of your meditation period, remain still for a few more moments. Notice how you feel. Invite the intention to be mindfully present by taking a moment to *pause*, *breathe*, and *feel* whatever is happening in any experience throughout your day.

### BOX 98-2. Practice Suggestions and Getting Started

- For "formal practice," find a quiet place to sit, with few distractions. In the beginning, it may be difficult to sit still for even 5 minutes. You may note restless or even disturbing thoughts. Over time with regular practice, the mind will become more stable and clear.
- Do not meditate too long in the beginning. It may be useful to start with short guided practices (<http://www.fammed.wisc.edu/our-department/media/mindfulness>).
- Commit to a set amount of time specifically for meditation. A good intention before you start is, "For this short time now, I have nowhere to go and nothing to do." Having a timer such as a smart phone application (e.g., Zen Timer) can ease any worry of having to keep track of time.
- Sit in a comfortable and alert position with an upright spine. For most people, sitting in a chair with feet flat on the floor is ideal. Other positions can include crossed legs, kneeling on a bench, or straddling a cushion.
- With eyes open or closed, allow the gaze to settle easily.
- Be persistent and regular with daily meditation. Progress comes by maintaining constant effort in daily practice. In time, try to meditate for 15 to 20 minutes in the morning just after rising and again before going to bed, but any duration and opportunity for meditation is beneficial, even if it is only one breath or 1 minute. The daily commitment of meditation requires a continual nonjudgmental return to the practice itself, over and over again every day. If you miss a day, or a week, or even years, simply return to the practice of meditation without judgment.
- For "informal practice," try to approach everyday activities with the same mindful intention, attitude, attention and presence as in "formal" meditation. While driving to work, focus on driving. When at work, concentrate on the performance of each task. At home, live and be completely present with others. Keep in mind that meditation is not about withdrawal from the world or responsibilities. It is about living with purpose, awareness, and kindness.
- A deepening of spiritual life and religious experience may occur. Although this can be pleasant, it can also be disconcerting early on and may require the reassurance and guidance of an understanding teacher.

## Review of Meditation Research

Evidence pointing to the medical benefits of meditation is widely documented and continues to increase in quality and quantity. In 2007 alone, more than 70 scientific articles were published on mindfulness meditation practice. In particular, the biologic correlates of meditation experience have received the most attention in research, quite out of proportion to the complete meditative experience, which includes both objective external effects and subjective

### BOX 98-3. Precautions and Recommendations for Meditation Practice

- Leg and back discomfort can be a common concern. Do not strain the body. Sit in an alert and comfortable position. Remember that meditation is about openness and not about contracting the body into discomfort.
- In the beginning, intrusive, repetitive, or disturbing thoughts may make it difficult to sit still for even 5 minutes. Keep in mind that meditation is not about making things go away. It is simply the nonjudgmental process of staying present with whatever is happening moment by moment, pleasant or unpleasant. However, over time and with regular practice, the mind will become more stable.
- In learning meditation, one should be guided by teachers and practice that resonate authentically, are nondivisive, and instill feelings of support. Do not forfeit personal boundaries and safety for any teacher or teaching. Listen to your intuition and reason, and trust that the experience you are having is exactly what you need in this moment.
- Meditation can at times uncover preexisting stressors or traumas, similar to peeling back the layers of an onion, thus revealing unpleasant underlying emotions. A professional counselor familiar with contemplative practice can help facilitate the healthy release of these emotions.
- Be attentive to and honest about your experience. In a compassionate way, attend to realizations and insights that arise from regular meditation practice. This may include journaling, creative expression, and talking with a skilled meditation teacher.
- Including a gentle form of movement is encouraged, such as contemplative or mindful walking, walking a labyrinth, hatha yoga, Pilates, nia, tai chi or qi gong, swimming, or biking. However, avoid striving and straining.

internal experience. However, research is only beginning to elucidate how the mind-body connection affects health in promoting wellness, as well as in managing and preventing disease.

The interplay between the mind and the body has been difficult to describe and operationalize from a scientific standpoint. However, many case examples reveal the potential value in developing clinically oriented mind-body therapies. As early as 1935, French cardiologist Brosse<sup>10</sup> studied Indian yogis capable of decreasing their heart rates to almost zero as shown on electrocardiography. In 1961, Bagchi and Wenger<sup>11</sup> found that some expert meditation subjects could produce bidirectional changes in every measurable autonomic variable. The *Lancet* published an account of the voluntary live burial of a yogi who sat cross-legged underground for 62 hours while continuous vital sign recordings revealed no distress.<sup>12</sup> In 1968, Hoenig<sup>13</sup> witnessed an experiment in which a yogi confined for 9 hours in a small enclosed pit and monitored with electroencephalography and ECG demonstrated a normal waking rhythm for the full 9 hours. This

### BOX 98-4. Summary of Mindfulness Meditation Practice

#### The Experience (TIES Mnemonic)

- **Talk/thoughts:** mental chatter, incessant thinking, storyline narratives
- **Images:** mental pictures, imagined scenes, visualized scenarios
- **Emotional feelings:** love, hate, fear, joy, sadness, anxiety, etc.
- **Physical Sensations:** sound, touch, sight, taste, smell

#### The Process (SOLAR or SOL Mnemonic)

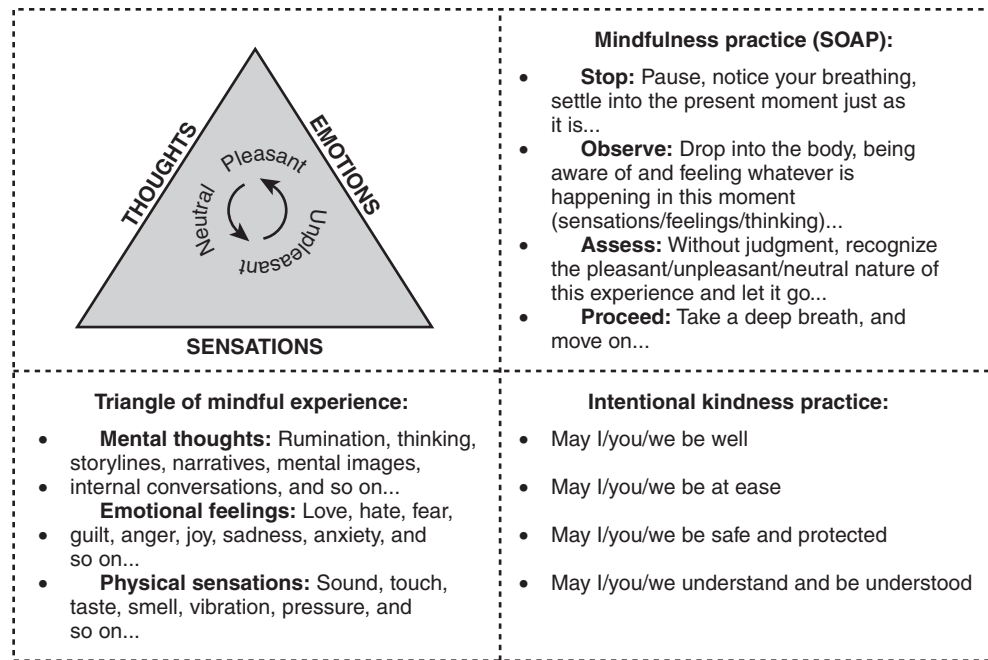
- **Stop:** Pause and drop into this experience right now.
- **Observe** being aware of and noticing what is actually happening in this moment.
- **Let it be:** Acknowledge and allow this arising experience to be what it is, pleasant or unpleasant.
- **And...**
- **Returning** again and again to the present moment, remember to pause, breathe, and feel whatever is happening.

finding led Hoenig to conclude that the subject was awake and relaxed throughout the experiment. This researcher also observed a variable heart rate from 40 to 100 beats/minute in recurring cycles on ECG.<sup>13</sup> As in fetal heart monitoring, later research showed that synchronous increases in heart rate variability in adults predict a decrease in cardiovascular mortality,<sup>14,15</sup> which can be reproduced using meditation practices.<sup>16,17</sup>

Benson et al<sup>18</sup> helped pioneer academic interest in meditation through their research on the physiologic and neurochemical principles of the *relaxation response*, which is defined as a hypometabolic state of parasympathetic activation.<sup>18</sup> Further, many studies have demonstrated that meditation training reduces anxiety and increases positive affect,<sup>19-21</sup> whereas others have shown that mindfulness meditation prevents recurrence of depression.<sup>22,23</sup> In a 1985 study by Kabat-Zinn et al,<sup>24</sup> patients with chronic pain showed a statistically significant reduction in various measures of pain symptoms when they were trained in mindfulness-based stress reduction. Meditation practices have also shown beneficial effects on tension headaches,<sup>25</sup> psoriasis,<sup>26</sup> blood pressure,<sup>27-29</sup> serum cholesterol,<sup>29</sup> smoking cessation,<sup>30,31</sup> alcohol abuse,<sup>32</sup> carotid atherosclerosis,<sup>33</sup> coronary artery disease,<sup>3,34,35</sup> longevity and cognitive function in older adults,<sup>36</sup> psychiatric disorders,<sup>18-23,37</sup> excessive worry,<sup>38</sup> use of medical care,<sup>39</sup> and medical costs in treating chronic pain.<sup>40</sup> A 2004 meta-analysis found mindfulness-based stress reduction training useful for a broad range of chronic disorders that are difficult to treat, such as depression, anxiety, fibromyalgia, mixed cancer diagnoses, coronary artery disease, chronic pain, obesity, and eating disorders.<sup>41</sup> The investigators noted consistent and strong effect sizes across these very different situations, thus indicating a generalized application of meditation for both daily life distress and more extraordinary medical disorders.<sup>41</sup>

**FIGURE 98-1**

Mindfulness “practice as you go” cards (cut-out handout for patients).



In a meta-analysis of brain imaging studies on various meditation styles, Newberg<sup>42</sup> suggested that the neurophysiologic effects derived from various meditation practices seem to outline a consistent and reproducible pattern of significant brain activity in key cerebral structures. Research focusing more specifically these physiologic effects of meditation by Davidson et al<sup>43</sup> described a positive correlation between meditation practice and left-sided prefrontal cortex activity, which is associated with positive affect. In this study, mindfulness meditation was associated with increases in antibody titers to influenza vaccine, a finding suggesting correlations among meditation, positive emotional states, localized brain activity, and improved immune function. Corroborating research demonstrated a direct link between immune function and mood, with positive affective states resulting in stronger immune function and decreased incidence of illness.<sup>44-46</sup> Lutz et al<sup>47</sup> observed increased left-sided prefrontal cortex gamma wave activity and synchronicity in expert Tibetan Buddhist meditators with more than 10,000 hours of meditation experience when compared with novice meditator controls, both at rest and during meditation. This finding suggests that attention and affective processes are flexible skills that can be learned.

Although ongoing research aims to elucidate the measurable biologic correlates of meditation and its significance with regard to health, the experiential knowledge that has arisen from time-tested practices of the great spiritual traditions should be acknowledged. Meditation practitioners within these spiritual systems continue to explore the subtle inner dimensions of meditative experience by using methods and perspectives that equally address the human condition in our search for healing and well-being.

Meditation is useful for any indication, including daily life and extraordinary medical disorders.

## Mindfulness in Medical Practice

Practicing health-oriented medicine in dysfunctional health systems and institutions that do little to honor health is increasingly difficult.<sup>48</sup> As clinicians are asked to see more patients, they are forced to limit their focus to a physical process, laboratory test, imaging study, or quick prescription. For clinicians, maintaining a balance between personal needs and the demands of medical training and practice is often neglected at the cost of well-being and health. Sleep, exercise, relaxation, and personal interests take a back seat to long clinical hours and academic demands that contribute to burnout.<sup>49</sup> Research suggests that mindfulness meditation cultivates present-moment awareness that may reduce medical error and improve patient care. For example, faulty thinking, such as snap judgments, distracted attention, inadvertent stereotyping, and other cognitive traps, lead to critical mistakes in patient care.<sup>50</sup> Growing research also shows that practitioners who themselves exhibit healthy habits are more effective in motivating patients to make significant positive changes in their own lives.<sup>51</sup> This is also true of health practitioners who themselves practice meditation. In a randomized controlled trial of 124 psychiatric inpatients managed by 18 psychology residents, Grepmaier et al<sup>52</sup> showed that patients of interns who received mindfulness training did significantly better than did patients treated by interns who did not receive mindfulness training.

To address these concerns, the University of Wisconsin Integrative Medicine Program created a collaborative online education module (<http://www.fammed.wisc.edu/mindfulness>; see **Box 98-5** first item) to provide ongoing support for mindfulness practice and to help clinicians bring mindfulness into the clinical encounter by using a three step process: (1) pause, (2) presence, and (3) proceed<sup>53</sup> (see Chapter 3, The Healing Encounter). The first step, pause,

encourages the user to stop, pause, and be present in the moment. The second step, presence, encourages the user to drop into the moment and become aware of sensations, emotions, and thoughts that arise without judgment or analysis. The third step, proceed, encourages health-oriented action that responds in a skillful and compassionate way by using insight from steps 1 and 2. For example, the disease- or symptom-focused visit would result in a medication to abort a migraine headache, but the mindful session could also address emotional stressors that are main migraine triggers. This approach focuses more on the underlying causes of suffering that may be exacerbating pain than on the symptoms of pain alone. The mindful clinical encounter encourages the clinician to pay attention to and illuminate key healing mechanisms that arise from the patient-clinician interaction.

## Types of Meditation

Most types of meditation are embedded in a specific historical time period, based on the realizations of a particular teacher or group, and should be considered with their original cultural background in mind. Most techniques are best understood within the context of their particular spiritual traditions. The collection of information, teachings, and practices is massive, however, and selecting your own meditation practice can be challenging. One way to help is to read books, visit Web sites, attend local retreats and classes, and meet with teachers and groups to help discern what practices are a good fit for you. Keep in mind that *no one way is best*. Although insights and realizations from meditation practice have a universal quality, many practice styles exist. As the common saying goes, “all paths lead to Rome.” After considerate searching, choose a practice that has personal resonance and meaning of some kind for you. For help with this process, see [Boxes 98-5](#) and [98-6](#), and [Table 98-1](#).

“What joy awaits discovery in the silence behind the portals of your mind no human tongue can tell. But you must convince yourself; you must meditate and create that environment.”

Paramahansa Yogananda

## Movement as Meditation

Often, we think of meditation as sitting on a cushion, folding your legs under you, closing the eyes, and focusing the attention on something such as a candle, a word, or a chant. These are just a few of the many varieties of meditation style, but this is not the only way meditation can be done. “Formal” meditation practice, however, typically involves being seated and still in certain comfortable and alert positions, generally on a firm chair or a floor cushion ([Fig. 98-2](#), meditation postures). Most styles of meditation practice also recommend some form of movement practice such as yoga, contemplative or mindful walking, tai chi, labyrinth walking, dance, and so on. Being present and

### BOX 98-5. Resources and Links to Learn Meditation

- <http://www.fammed.wisc.edu/mindfulness> (Online guided practices and resources for mindfulness in medicine from the University of Wisconsin)
- <http://www.umassmed.edu/content.aspx?id=41252> (University of Massachusetts Center for Mindfulness)
- <https://www.fammed.wisc.edu/aware-medicine/mindfulness> (University of Wisconsin Aware Medicine Curriculum)
- <http://eomega.org/> (New York/East Coast Omega Institute)
- <http://nccam.nih.gov/> (National Center for Complementary and Alternative Medicine)
- <http://diydharm.org/about-us> (Do It Yourself Dharma)
- <http://www.spiritrock.org/> (California/West Coast Spirit Rock Meditation Center)
- <http://www.contemplativeoutreach.org/site/PageServer> (Contemplative Outreach [Centering Prayer])
- <http://www.christinecenter.org> (Wisconsin/Midwest Christine Center)
- *Meditation for Beginners*, by Jack Kornfield, PhD (book and CD)
- *Guided Mindfulness Meditation*, by Jon Kabat-Zinn (CD)
- *Full Catastrophe Living*, by Jon Kabat Zinn (book)
- *Open Mind Open Heart*, by Fr. Thomas Keating, OCSO (book)
- *The Beginner's Guide to Contemplative Prayer*, by James Finley, PhD (CD)

### BOX 98-6. Other Popular Meditation Styles, Teachers, and Spiritual Practices

- Ram Dass, formerly a Harvard University psychologist and researcher, learned Hindu meditation and chanting from his guru Maharaji. Books: *Be Here Now* and *Still Here*. Web site: [www.ramdasstapes.org](http://www.ramdasstapes.org)
- Eckhart Tolle, formerly an Oxford University research scholar, experienced a spiritual transformation and teaches contemporary spirituality. Book: *The Power of Now*. Web site: [www.eckhartolle.com](http://www.eckhartolle.com)
- Tom Brown, Jr was mentored by “Grandfather,” an Apache Medicine Man and Scout. Book: *The Vision*. School: Nature and Wilderness Survival Schools. Web site: [www.trackerschool.com](http://www.trackerschool.com)
- Ken Wilber, creator of the unified field theory of consciousness. Book: *A Brief History of Everything*. School: Integral Institute. Web sites: [www.kenwilber.com](http://www.kenwilber.com), [www.integralinstitute.org](http://www.integralinstitute.org), <http://wilber.shambhala.com>
- John Main, a Catholic monk, founder of Christian Meditation inbreath mental mantra “MA-RA” and outbreath “NA-THA” Sanskrit for “Come Lord Jesus.” Book: *Word into Silence*. Web site: [www.wccm.org](http://www.wccm.org)
- Neale Donald Walsch, author of *Conversations with God* and founder of Re-Creation retreats. Web site: [www.nealedonaldwalsch.com](http://www.nealedonaldwalsch.com)

TABLE 98-1. Systems of Meditation Table\*

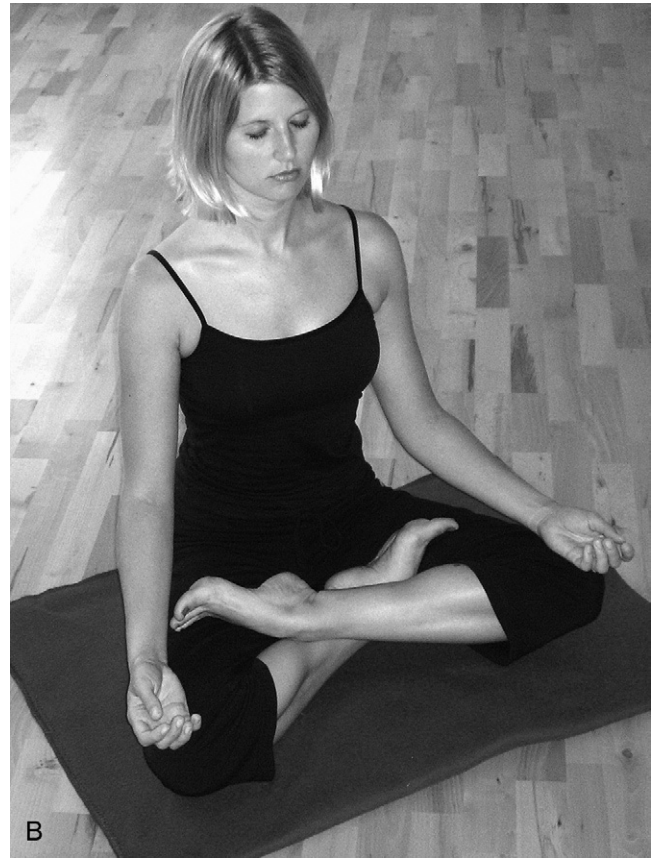
	CENTERING PRAYER/ CONTEMPLATION	KABBALAH (QABALAH)	MINDFULNESS MEDITATION	RIDHWAN SCHOOL DIAMOND APPROACH	SELF- REALIZATION FELLOWSHIP (SRF)	TRANSCENDENTAL MEDITATION	TIBETAN BUDDHISM	ZEN BUDDHISM/ CH'AN
Traditional Background	Catholic/Christian (inclusive)	Jewish mystical (inclusive)	Vipassana/insight; mindfulness-based stress reduction medical (inclusive)	Sufi Islam, mystical psychology (inclusive)	Hindu Kriya yoga (inclusive)	Vedic Hindu (inclusive)	Various Tibetan lineages (inclusive)	Numerous Chinese and Japanese lineages (inclusive)
Teachers	Thomas Keating; Thomas Merton; Cynthia Bourgeault; M. Basil Pennington; William Meninger	Yehuda Ashlag; David Cooper; Michael Laitman	Jon Kabat-Zinn; Bhante Gunaratana; Sharon Salzberg; Jack Kornfield; Thich Nhat Hanh	A. H. Almaas (Hameed Ali)	Paramahansa Yogananda; Sri Daya Mata	Maharishi Mahesh Yogi (Various)	Fourteenth Dalai Lama; Panchen Lama; Chogyam Trungpa; seventeenth Karmapa	Bodhidharma; Eisai; Dogan; Huang Po; Charlotte Joko Beck; Claude A. Thomas
Technique	Sacred word; prayer; lectio divina	Kabbalah	Breath/body awareness	Inquiry	Kriya yoga; Hong-Sau; Aum	Personalized mantra	Mantra; visualization; chanting	Zazen
Body/Activity Focus	Contemplative walking	Self-directed	Mindful walking; Hatha yoga; body scan	Breathing exercises	Energization exercises	Self-directed	Rlung-sgom walking; mudras	Martial arts- Kungfu; Zen arts (ceramics, archery, calligraphy)
Readings/ Books	<i>New Seeds of Contemplation</i> (by Merton); <i>Open Mind Open Heart</i> (by Keating)	<i>A Beginner's Guide to Kabbalah</i> (CD); <i>A Heart of Stillness</i> (by Cooper)	<i>Mindfulness in Plain English</i> (by Gunaratana); <i>Full Catastrophe Living</i> (by Kabat-Zinn); <i>A Path with Heart</i> (by Kornfield)	<i>Essence; The Diamond Heart Series</i> I-IV; <i>Inner Journey Home</i> (by Almaas)	<i>Autobiography of a Yogi</i> ; <i>SRF Lessons</i> (by Yogananda)	<i>Science of Being and Art of Living: Transcendental Meditation</i> (by Maharishi)	<i>The World of Tibetan Buddhism</i> ; <i>Path to Bliss</i> (by Gyatso); <i>Start Where You Are</i> (by Chodron)	<i>Zen Mind Beginner's Mind</i> (by Suzuki); <i>The Three Pillars of Zen</i> (by Kapleau); <i>Everyday Zen</i> (by Beck)

Coursework	Retreats; contemplative outreach	Tree of Life; Ten Sefirot; Devekut; teacher directed	Mindfulness-based stress reduction / cognitive therapy	Diamond approach lessons; retreats	Mailed lessons; Retreats; guru relationship; interviews with monks	Seven-step coursework; interviews; personal mantra; retreats	Teacher- student; lineage directed	Teacher-student
Main Sites/ Headquarters	Abbey of Gethsemani, Trappist, Ky; Snowmass Colo; multiple/regional	Multiple	Insight Meditation Society, Mass; University of Massachusetts (for mindfulness- based stress reduction); Spirit Rock, Calif; Plum Village, France; multiple	Berkeley, Calif; Boulder, Colo; multiple	Los Angeles; multiple (see also Yogoda Satsanga Society of India, sister organization to SRF)	Fairfield, Iowa; multiple; (Transcendental Meditation Independent UK)	Lhasa, Tibet; Dharamsala, India; multiple	Shaolin Temple, China (birthplace); multiple centers
Web Sites/ Contact Information	<a href="http://www.centeringprayer.com">www. centeringprayer. com</a> (also see Christian Meditation: <a href="http://www.wccm.org">www.wccm.org</a> )	<a href="http://www.kabbalah.info">www.kabbalah.info</a> ; <a href="http://www.kabbalah.com">www.kabbalah.com</a> ; 1-800-kabbalah	<a href="http://www.dharma.org">www.dharma.org</a> ; <a href="http://www.umassmed.edu/cfm/mbsr">www.umassmed. edu/cfm/mbsr</a> ; <a href="http://www.eomega.org">www.eomega.org</a> ; <a href="http://www.spiritrock.org">www.spiritrock.org</a> ; <a href="http://www.plumvillage.org">www.plumvillage. org</a>	<a href="http://www.ahalmaas.com">www. ahalmaas. com</a> ; <a href="http://www.ridhwan.org">www. ridhwan. org</a>	<a href="http://www.srf-yogananda.org">www.srf- yogananda. org</a>	<a href="http://www.tm.org">www.tm.org</a> ; <a href="http://www.maharishipeacepalace.org">www. maharishipeacepalace. org</a> ; 1-888-learnTM; ( <a href="http://www.tm-meditation.co.uk">www.tm-meditation. co.uk</a> , independent, less expensive)	<a href="http://www.tibet.com">www.tibet.com</a> ; <a href="http://www.deerparkcenter.org">www. deerparkcenter. org</a> ; <a href="http://www.dawnmountain.org">www. dawnmountain. org</a> ; <a href="http://www.drikungtmc.org">www.drikungtmc. org</a>	<a href="http://www.dharmanet.org">www. dharmanet. org</a> ; <a href="http://www.tricycle.com">www.tricycle. com</a>
Comments	Contemplation dates back to St. Anthony and the Desert Fathers; revived after Vatican II; in the tradition of Christian saints and mystics	Ancient oral tradition of wisdom and mystery; tells of Light of Creation; Jewish renewal movement	Popularized in 1980s; from an 8-wk course in a medical/ research setting; many vipassana/ insight sanghas or groups	Founded in 1970s; called the Work, draws from psychology and integrates spiritual approach to self- liberation	Founded in 1920; popularized yoga- meditation in the United States; teaches direct path to self- realization through ancient Kriya yoga	Popularized in 1960s, expanded meditation in the United States; large corpus of health research at Maharishi Vedic University	Model of nonviolence, loving compassion of sentient beings; ongoing dialogue with neuroscience researchers	Chinese/ Japanese tradition arrived in the United States after World War II; most Zen meditation research in Japanese

\*This table is representative and not exhaustive.

**FIGURE 98-2**

Meditation postures. **A**, Seated position with chair. Maintain a straight back. **B**, Full lotus position. Maintain a straight back. Use of a cushion, shawl, mat, or blanket for comfort may be helpful. **C**, Half-lotus position. Maintain a straight back. Use of a cushion, shawl, mat, or blanket for comfort may be helpful. **D**, Kneeling position with bench. Maintain a straight back. Use of a shawl, mat, or blanket for comfort may be helpful.





connected with the body and really noticing the qualities of the various physical sensations that arise with movement are important. Allowing the body to be your guide is a way of experiencing grounding and centering. Participating in activities that are safe and appropriate for each person is recommended.

## References

References available online at [expertconsult.com](http://expertconsult.com).

Through meditation, one learns how to be present with and see through the obstacles of dissatisfaction, restlessness, and overidentification that imprison and obscure the mind.

## References

- Ludwig D, Kabat-Zinn J. Mindfulness in medicine. *JAMA*. 2009;300:1350–1352.
- Deyo R, Mirza SK, Turner JA, Martin BI. Overtreating chronic back pain: time to back off? *J Am Board Fam Med*. 2009;22:62–68.
- Paul-Labrador M, Polk D, Dwyer JH, et al. Effects of a randomized controlled trial of transcendental meditation on components of the metabolic syndrome in subjects with coronary heart disease. *Arch Intern Med*. 2006;166:1218–1224.
- McCray LW, Cronholm PF, Bogner HR, et al. Resident physician burnout: is there hope? *Fam Med*. 2008;40:626–632.
- Astin JA. Why patients use alternative medicine: results from a national study. *JAMA*. 1998;279:1548–1553.
- Eckleberry-Hunt J, Lick D, Boura J, et al. An exploratory study of resident burnout and wellness. *Acad Med*. 2009;84:269–277.
- Chiesa A, Serretti A. Mindfulness based stress reduction for stress management in healthy people: a review and meta-analysis. *J Altern Complement Med*. 2008;15:593–600.
- Lerner M. *Choice in Cancer: Integrating the Best of Conventional and Alternative Approaches to Cancer*. Cambridge, MA: MIT Press; 1994.
- Beck CJ. *Everyday Zen*. New York: HarperCollins; 1989.
- Brosse T. A psychophysiological study. *Main Curr Mod Thought*. 1946;4:77–84.
- Wenger M, Bagchi BK. Studies of autonomic functions in practitioners of yoga in India. *Behav Sci*. 1961;6:312–323.
- Vakil R. Remarkable feat of endurance of a yogi priest. *Lancet*. 1950;2:871.
- Hoenig J. Medical research on yoga. *Confin Psychiatr*. 1968;11:69–89.
- La Rovere M, Bigger JT Jr, Marcus FI, et al. Baroreflex sensitivity and heart-rate variability in prediction of total cardiac mortality after myocardial infarction. *Lancet*. 1998;351:478–484.
- Nolan J, Batin PD, Andrews R, et al. Prospective study of heart rate variability and mortality in chronic heart failure: results of the United Kingdom heart failure evaluation and assessment of risk trial. *Circulation*. 1998;98:1510–1516.
- Luciano B, Sleight P, Bandinelli G, et al. Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: comparative study. *BMJ*. 2001;323:1446–1449.
- Peng C, Henry IC, Mietus JE, et al. Heart rate dynamics during three forms of meditation. *Int J Cardiol*. 2004;95:19–27.
- Benson H, Kotch JB, Craswell KD. The relaxation response: a bridge between psychiatry and medicine. *Med Clin North Am*. 1977;61:929–938.
- Kabat-Zinn J, Massion AO, Kristeller J, et al. Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *Am J Psychiatry*. 1992;149:936–943.
- Miller J, Fletcher K, Kabat-Zinn J. Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *Gen Hosp Psychiatry*. 1995;17:192–200.
- Beauchamp-Turner D, Levinson D. Effects of meditation on stress, health, and affect. *Med Psychother*. 1992;5:123–131.
- Teasdale J, Segal ZV, Williams JM, et al. Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *J Consult Clin Psychol*. 2000;68:615–623.
- Ma S, Teasdale J. Mindfulness-based cognitive therapy for depression: replication and exploration of differential relapse prevention effects. *J Consult Clin Psychol*. 2004;72:31–40.
- Kabat-Zinn J, Lipworth L, Burney R. The clinical use of mindfulness meditation for the self-regulation of chronic pain. *J Behav Med*. 1985;8:163–190.
- Blanchard E, Nicholson N, Taylor A, et al. The role of regular home practice in the relaxation treatment of tension headache. *J Consult Clin Psychol*. 1991;59:467–470.
- Kabat-Zinn J, Wheeler E, Light T, et al. Influence of a mindfulness-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy and phototherapy. *Psychosom Med*. 1998;60:625–632.
- Alexander C, Schneider R, Staggers F, et al. Trial of stress reduction for hypertension in older African Americans. *Hypertension*. 1996;28:228–237.
- Gianfranco P, Steptoe A. Stress reduction and blood pressure control in hypertension: a role for transcendental meditation? *J Hypertens*. 2004;22:2057–2060.
- Cooper M, Aygen M. Effect of meditation on blood cholesterol and blood pressure. *Harefuah*. 1978;95:1–2.
- Royer-Bounour P. The transcendental meditation technique: a new direction for smoking cessation programs. *Dissert Abstr Int*. 1989;50:3428–B.
- Davis J, Fleming MF, Bonus KA, Baker TB. A pilot study on mindfulness based stress reduction for smokers. *BMC Complement Altern Med*. 2007;Jan 25:2–7.
- Zgierska A, Rabago D, Zuelsdorff M, et al. Mindfulness meditation for alcohol relapse prevention: a feasibility pilot study. *J Addict Med*. 2008;2:1–9.
- Fields J, Walton K, Schneider R, et al. Effect of a multimodality natural medicine program on carotid atherosclerosis in older subjects: a pilot trial of Maharishi Vedic medicine. *Am J Cardiol*. 2002;89:952–958.
- Zamarrá J, Schneider R, Bessighini I, et al. Usefulness of the transcendental meditation program in the treatment of patients with coronary artery disease. *Am J Cardiol*. 1996;77:867–870.
- Ornish D, Brown S, Scherwitz L, et al. Can lifestyle changes reverse coronary heart disease? *Lancet*. 1990;336:129–133.
- Alexander C, Chandler H, Langer E, et al. Transcendental meditation, mindfulness, and longevity: an experimental study with the elderly. *J Pers Soc Psychol*. 1989;57:950–964.
- Shannahoff-Khalsa D. An introduction to kundalini yoga meditation techniques that are specific for the treatment of psychiatric disorders. *J Altern Complement Med*. 2004;10:91–101.
- Shearer S, Gordon L. The patient with excessive worry. *Am Fam Physician*. 2006;73:1049–1056.
- Orme-Johnson D. Medical care utilization and the transcendental meditation program. *Psychosom Med*. 1987;49:493–507.
- Caudill M, Schnable R, Zuttermeister P, et al. Decreased clinic use by chronic pain patients: response to behavioral medicine intervention. *Clin J Pain*. 1991;7:305–310.
- Grossman P, Niemann L, Schmidt S, et al. Mindfulness-based stress reduction and health benefits: a meta-analysis. *J Psychosom Res*. 2004;57:35–43.
- Newberg A, Iversen J. The neural basis of the complex mental task of meditation: neurotransmitter and neurochemical considerations. *Med Hypoth*. 2003;61:282–291.
- Davidson R, Kabat-Zinn J, Schumacher J, et al. Alterations in brain and immune function produced by mindfulness meditation. *Psychosom Med*. 2003;65:564–570.
- Hayney MS, Dienberg Love G, Buck J, et al. The association between psychosocial factors and vaccine-induced cytokine production. *Vaccine*. 2003;21:2428–2432.
- Rosenkranz M, Jackson D, Dalton K, et al. Affective style and in vivo immune response: neurobehavioral mechanisms. *Proc Natl Acad Sci USA*. 2003;100:11148–11152.
- Cohen S, Herbert TB. Health psychology: psychological factors and physical disease from the perspective of human psychoneuroimmunology. *Annu Rev Psychol*. 1996;47:113–142.
- Lutz A, Lawrence L, Rawlings N, et al. Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *Proc Natl Acad Sci U S A*. 2004;101:16369–16373.
- Fortney L, Taylor M. Meditation in medical practice: a review of the evidence and practice. *Prim Care*. 2010;37:81–90.
- Krasner MS, Epstein RM, Beckman H, et al. Association of an educational program in mindful communication with burnout, empathy, and attitude among primary care physicians. *JAMA*. 2009;302:1284–1293.
- Sibinga E, Wu AW. Clinician mindfulness and patient safety. *JAMA*. 2010;304:2532–2533.
- Frank E, Breyan J, Elon L. Physician disclosure of healthy personal behaviors improves credibility and ability to motivate. *Arch Fam Med*. 2000;9:287–290.
- Grepmaier L, Mitterlehner F, Loew T, et al. Promoting mindfulness in psychotherapists in training influences the treatment results of their patients: a randomized double-blind controlled study. *Psychother Psychosom*. 2007;76:332–338.
- Sierpina VS, Kreitzer MJ, Rakel D, et al. Mindfulness in medicine. *Explore (NY)*. 2011;7:124–126.



# Motivational Interviewing

Robert Rhode, PhD

Health care providers often diagnose a patient's condition and recommend health-promoting behaviors (e.g., take this drug as prescribed, exercise, stop smoking, decrease substance use, make appointments for care, follow a diet). Integrative medicine is more than just recommending some alternative or nonallopathic health-promoting behaviors. It also involves the way in which those recommendations are made to the client.

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## Three Helping Styles

### Directing

In most allopathic health care settings, the recommendation to the client is given in a directing helping style, which often includes identifying the health goal or destination and giving clear advice on how to reach that destination. The health care provider is using his or her expertise, identifying the problems to be addressed, and prescribing treatments or proscribing behaviors. The client would do well to heed and follow this well-intended advice. This style is initiated with medical students who are taught how to recognize symptoms and relevant treatments. Their excitement about their growing knowledge almost guarantees that when they start seeing clients, they will expound on their expertise and treatment recommendations with enthusiasm and direct the client on what to do. Medical students may be quite surprised and frustrated to find many of their clients explicitly rejecting this sound advice during the consultation (by responding with, “Yes, but...”) or to have clients returning for a follow-up consultation with the same problem after ignoring the earlier proffered advice. Health care providers with years of experience are familiar with this dance and may have acquiesced to clients’ not following treatment recommendations.

Although a directing helping style does not always facilitate the desired health improvement, it is necessary in health care, and some clients are responsive to it. Some clients prefer to be told what to do, and when their clinicians speak, they listen and implement the advice received. In some

situations, the client's cooperation cannot be solicited, such as during an emergency or when the client is unconscious. At such times, the clinician takes charge, acts unilaterally, and institutes treatment.

### Following

Another style often used in health care can be called a following helping style, which has no destination or goal other than developing rapport, or staying with the client. Health care providers offer healing by being genuinely present and attending to clients with heart and mind. In some situations, no obvious treatment or choice exists, and just being with the client is the medicine. This approach may be more valued in an integrative medicine setting than in one that emphasizes only allopathic approaches. A following helping style is also useful to clinicians in other situations, such as when the client is uncertain about changing jobs, relationships, donating an organ, or becoming pregnant. When one choice or another has no obvious risks or benefits, the clinician is very likely to use a following helping style to facilitate the client's talking about his or her choices and avoid advocating or directing toward either choice.

### Guiding

A guiding helping style is a third way, and may be somewhere between a directing and a following helping style. This approach solicits the patient's experience and yet still moves toward a health goal. A clinician using a guiding helping style may be similar to a hiking guide. The hiking guide can be useful to point out the trail and warn about looming clouds and the need to pick up the pace before a storm arrives. The hiking guide is not going to carry the hiker to the top of the mountain, however. Motivational interviewing can be considered a specialized version of a guiding helping style that assists clients to access their own reasons and desires to engage in the health-promoting behavior. It may be a style that is most useful when the client must collaborate with the clinician to implement the health-promoting behavior.

Many lifestyle behaviors fall into this category because it is the client who has to exercise, eat more nutritiously, engage in meditation, or abstain from smoking.

Motivational interviewing can be considered a specialized version of a guiding helping style that assists clients to access their own reasons and desires to implement the health-promoting behavior.

The proportions among communication skills used in these three helping styles have been depicted as in Figure 99-1.<sup>1</sup> With a directing helping style, the health care provider engages in extensive informing, teaching, advising, and passing on of expertise. He or she asks questions to learn about the client's experience and makes a diagnosis or determines which treatment may be best. He or she listens to the answers the client gives to those questions. With a following style, the clinician does much less informing and much more listening, facilitated perhaps by asking questions to help the client say more. With a guiding style, clients do some informing but less than in a directing style and more than in a following style. Questions are asked so the client learns (in that manner of "Now that I hear myself say it, I realize...") and not so the clinician can make a diagnosis or provide an answer or treatment. The clinician who uses a guiding style does more listening than when using a directing style but less than when using a following style. A guiding style involves going toward a destination, and in that way it resembles a directing helping style. It also is client centered, by collaborating with the client and recognizing the client as an expert and primary decision maker, and in that way it is similar to a following style.

A directing helping style has been called a "push technology."<sup>2</sup> The clinician is attempting to install knowledge or motivation as if the client is missing it. A guiding helping style is a "pull technology." The health care provider is attempting to pull the knowledge and motivation from the client's existing

resources and experiences. A directing helping style is consistent with the clinician's role as healer, the one who cures, and the expert. A guiding helping style emphasizes healing rather than the healer, with two experts (the client and the clinician) in the consultation room. In settings where a directing helping style is common, the recipients of care are often called "patients." When a guiding or following helping style is more often used, the care recipients are often called "clients" or even "consumers." Figure 99-2 shows that the health care provider who uses a directing helping style does the most talking, whereas clients do very little. With a following helping style, the client does most of the talking, and the health care provider does much less. A guiding helping style is in between the two styles.

A health care provider who can use all three of these helping styles in response to different clients and situations likely sees more client improvement. All these styles are helpful. This chapter focuses on the guiding helping style and, in particular, on motivational interviewing, not because it is always better but because it is often underused, given the common reliance on a directing helping style in health care settings. A guiding helping style may also be more consistent with integrative medicine.

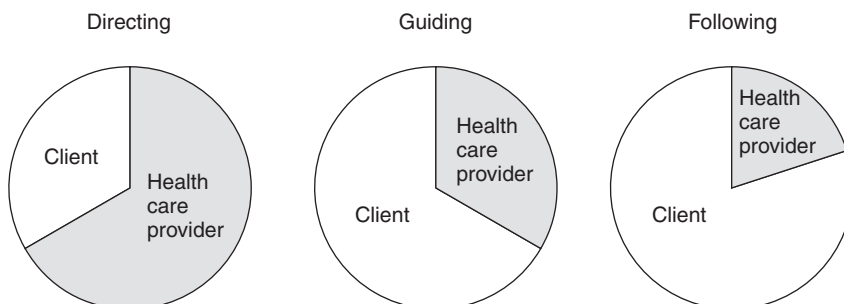
## Foundation or Spirit of Motivational Interviewing

A motivational interviewing approach has three foundational values. Many clinicians, particularly integrative medicine clinicians, agree in principle on the first two, even if they are not always able to demonstrate them during their consultations or interactions.

1. Collaboration: The clinician comes alongside, joins up, looks at the client's life or situation together with the client, and partners with the client to consider a difficult situation.
2. Respecting the client's autonomy: The clinician respects that it is the client who has to engage in the health-promoting



**FIGURE 99-1**  
Frequency of communication skills.



**FIGURE 99-2**  
Who is talking during the consult.

behavior. The clinician supports that the client can decide to change now, later, or not at all.

3. Curiosity: This leads to mining for, fishing for, and nurturing the client's reasons for engaging in the health-promoting behavior. Before giving any advice or teaching, the health care provider solicits what the client knows.

A directive helping style does not often involve collaboration with the client because the health care provider is adopting an expert role and is "driving the bus." Similarly, not much need exists to be curious about the client's experience because the clinician is deciding what needs to be done. An example of this is when the clinician tells the client that he or she is drinking too much, meets the criteria for alcoholism, needs to attend Alcoholics Anonymous meetings, and should abstain from drinking. The client's objection to the diagnosis and treatment recommendation does not change the clinician's conviction and is often labeled, very logically, by the clinician as an example of the client's denying reality or the truth ("The patient is in denial.").

When a motivational interviewing style is used, the clinician respects the client as capable and competent, and therefore it makes sense to collaborate with him or her. If the clinician intends to collaborate with the client, it makes sense to respect and support the client's autonomy. The client will literally be the one to implement (or not) the health-promoting behavior. During a stay in the hospital, health care providers may have more control over the patient's diet, activity, and medication. When the client is out of the hospital, the client decides what to eat, what to do, and what medication to take. Respecting that reality and explicitly recognizing that the client will make these decisions relieves the clinician of the frustrating task of trying to control the client. The clinician is no longer driving the bus but is "on the bus" with the client.

If the client is capable, competent, and believed to be the key person to implement any treatment, then it makes perfect sense to be curious about the client's experience and his or her reasons for embracing or rejecting the health-promoting behaviors. The client who is drinking too much is now approached differently. The clinician still maintains a focus on the destination of less drinking or abstaining. Instead of telling the client what the problem is, however, he or she now asks what the client thinks about the drinking and how it fits with other goal or values. Instead of pushing a treatment, the clinician explores what makes sense to the client to try. The client's objections to abstaining are not heard as denial but rather as the client's natural ambivalence to giving up something that he or she enjoys or to which he or she is attached. The clinician may help the client find his or her motivation to change this drinking by exploring which of the client's goals are hindered by the current drinking.

This collaborating with a capable client seems consistent with integrative medicine as described by Andrew Weil<sup>3</sup>: "There is this tremendous innate healing capacity that we all have. When I sit with a person who is sick, always at the back of my mind is the question, 'What is blocking healing here? What is preventing it? What can I do from outside that can facilitate that process?'"

Table 99-1 describes some ways to experiment with a motivational interviewing style, in contrast to a directing helping style. Another way to generate a motivational interviewing approach is for the health care provider to imagine quitting his or her job and envision that he is not an expert.

Suspending the expert role will very likely lead to joining with the client who is facing the challenge of improving well-being or managing a chronic condition. Although "care" today has the connotation of intervening in a beneficial way, another meaning is "to be with." Collaborating includes looking together at the situation, and from there, being curious about the client's motivation for the health-promoting behaviors is easy.

## What Difference May It Make If a Motivational Interviewing Approach Is Used?

Meta-analysis and reviews of the effectiveness of motivational interviewing have been published.<sup>4-8</sup> Following the initial description of motivational interviewing in 1983, much of the research has related to health behaviors in the area of substance use. Over the years, more studies have focused on a broader range of health-promoting behaviors (Fig. 99-3). The effect sizes for various health behaviors 3 and 12 months after treatment are shown in Figure 99-4.

**TABLE 99-1.** Ways to Experiment With a Motivational Interviewing Style in Contrast to a Directing Helping Style

DIRECTING HELPING STYLE	MOTIVATIONAL INTERVIEWING STYLE
<b>These may be methods a health care provider could use to help a client. These fit with a directing helping style.</b>	<b>Instead of using a directing helping style, a health care provider could use a motivational interviewing style, as follows:</b>
Explaining why the client should engage in the health-promoting behavior.	Listening with the goal of understanding the client's dilemma concerning the health-promoting behavior.
Teaching the client, telling him or her what to do, or giving advice.	Asking what the client knows, then providing some information or advice, and finally asking how that fits with his or her life.
Describing specific benefits that would result from doing the health-promoting behavior.	Asking, "What benefits may there be for you if you engaged in this health-promoting behavior?"
Telling the client how to implement the health-promoting behavior.	Asking, "What are you already doing that would make it possible for you to engage in this health-promoting behavior?" Or, "How may you engage in this health-promoting behavior so it fits into your day?"
Emphasizing how important it is for the client to engage in the health-promoting behavior.	Asking, "Why is it important to you to think about or engage in this health-promoting behavior?"
Telling or inspiring the client to engage in the health-promoting behavior.	Asking, "Why would you want to enhance your health?"

Perhaps the Strength of Recommendation Taxonomy rating for the evidence would be grade A for health behaviors such as substance use and human immunodeficiency virus risk behaviors. For other health behaviors such as nutrition, exercise, and smoking, the rating may be grade B. The rating for potential harm may be grade 1 for all health behaviors.

## Helping Clients Find and Use Their Motivation

Motivation is not binary, on or off, there or not there. Most clients are ambivalent about engaging in health-promoting behaviors, rather than either being motivated or not motivated. They have some reasons for the health-risky behavior and some reasons for the health-promoting behavior. They enjoy smoking but know they should quit. They want to lose

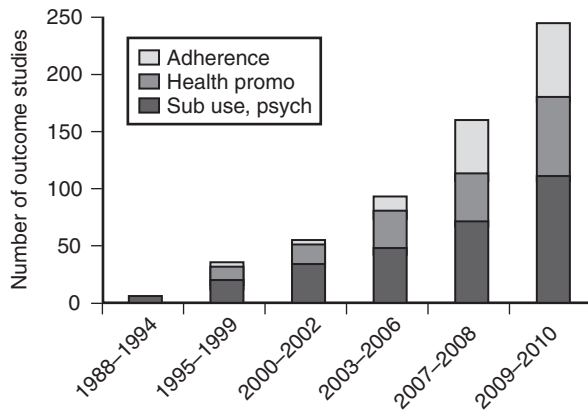
weight but have failed in the past. They want to reduce their blood pressure but have no time to meditate. When clinicians use a motivational interviewing approach, they respect that this ambivalence is a common human experience and does *not* indicate denial or resistance.

A client who is not engaging in some health-promoting behavior can be conceptualized by the health care provider as not having sufficient motivation to do what would be health promoting. Trying to instill more motivation either by inspiration or by threat can be seductive. That kind of directing helping style sometimes works. A health care provider who intends to use a motivational interviewing style similarly recognizes that the client does not have sufficient motivation to engage in the health-promoting behavior; in this case, however, the clinician goes looking for what motivation there is and ways that the client may find additional motivation.

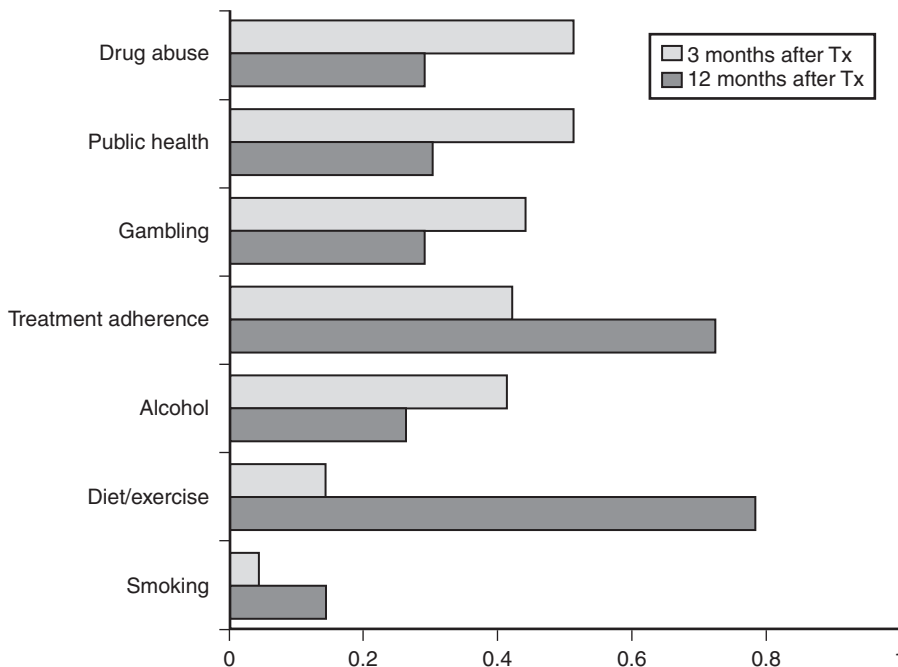
Noncompliance can be defined as a situation in which two people (the clinician and the patient) work toward different goals.

**FIGURE 99-3**

Growth of motivational interviewing studies. promo, promotion; psych, psychological issues; sub use, substance use.



Finding the client's motivation can be easier when the clinician thinks about various aspects of motivation. Researcher Paul Amrhein<sup>9</sup> identified that statements about desire, ability, reasons, and need often occur in conversations with a focus on changing a particular behavior (in motivational interviewing, this particular behavior or goal is called the target behavior). Statements the client makes in these categories probably indicate the client's movement toward taking action, and two additional categories related to the client's action can be observed: taking steps and commitment. Clients can make statements in any of these six categories in the direction of health (in which case it is referred to as change talk) or in the direction of not engaging in the health-promoting behavior (in which case it is referred to as sustain



**FIGURE 99-4**

Effect size comparing motivational interviewing to no motivational interviewing at 3 and 12 months. (From Hettema J, Steele J, Miller W. A meta-analysis of research on motivational interviewing treatment effectiveness (MARMITE). *Annu Rev Clin Psychol.* 2005;1:91-111.)

talk, as in maintaining the status quo). Table 99-2 provides additional descriptions of each of these categories.

These categories provide the health care provider with guidance about where to go fishing for the client's motivation. A client who says "I don't have time to meditate" is describing something about ability. The clinician may then focus on a different category to try to solicit a motivation for meditating: "You don't have time to meditate, but it sounds like you wish you did." This statement involves recognizing ability in the sustain direction and fishing for desire in the change direction. If the client complains about following a new cholesterol-lowering diet, the clinician can respond: "You are not finding it fun to follow this diet, so why are you intending to do so?" This question involves recognizing desire in the sustain direction and fishing for reasons in the change direction. Table 99-3 provides examples of each category of motivation in both sustain and change directions for the target behavior of engaging in behaviors that would promote heart health after a heart attack.

These categories can be used by the health care provider to guide the interview. Several research studies found that the goals of the consult where change talk is elicited were associated with the desired behavior change. In one study of clients in treatment for alcohol problems, 16% of the days a client abstained 9 to 15 months after treatment could be predicted from how much the client was drinking at the start of treatment. A similar amount, 19% of the days a client abstained and 34% of the amount the client drank, could be predicted from how much change talk the client said in a single session 9 to 15 months earlier.<sup>10</sup> Change talk during today's consultation may be a good proxy for the actual behavior change in the future.

One way of understanding how motivational interviewing may be used by clients to implement change is also a way for the health care provider to guide verbal behaviors during the consultation. People tend to believe what they say more than what they hear. If the consultation is arranged so the client is describing out loud his or her desire to drink less, the ability to drink less, the need to drink less, the reasons for drinking less, steps to be taken to drink less, and ultimately the commitment to drink less, he or she may be talking himself or herself into the actual behavior of drinking less.

If a directing helping style is used, the health care provider is the one reinforcing the health-promoting behavior of drinking less. The client is passive and may or may not act on the health care provider's recommendations. The client may even be more able to propose objections to the change because the health care provider is inadvertently alleviating the client of having to identify the advantages of the change and thereby freeing the client to focus on the disadvantages of the change.

A second way of understanding how motivational interviewing may be used by clients to implement change is to recognize who must actually engage in the health-promoting behavior. During the consultation, the clinician or nurse who uses a directing helping style can check the client's blood glucose level, talk about the importance of lowering blood pressure, or underscore the need to exercise. The client, however, is the one who must engage in these same behaviors after the consultation is over and when the health care provider is no longer around. If the health care provider uses a motivational interviewing style and arranges the consultation so the *client* talks out loud about the reasons to check blood glucose levels, the way he or she will eat as to lower blood pressure, or what kind of exercise would be enjoyable, the client is rehearsing the very behavior needed to be implemented an hour, a day, a week, or a month after the consultation.

**TABLE 99-2.** Change Talk and Sustain Talk by the Client

CATEGORY	CLIENT TALKS ABOUT	WORDS THAT MAY BE CLUES		
Desire	What the client may enjoy or not enjoy, like or dislike, find as fun or not fun, want or not want.	I want I would like I enjoy	I don't want I hate I wouldn't enjoy	I wish
Ability	What the client perceives he or she is able or unable to do, what is possible or impossible, what he or she can or cannot do.	I can I'm unable I could	I can't I'm able I cannot	
Need	What the client thinks he or she should do, has to do, should not have to do, what is just or unjust, what the "right" or "wrong" thing is to do.	I need to I should I'd better	I have to I shouldn't have to I'd better not	I ought to
Reasons	The rationale, justification, or motive for doing or not doing the behavior.	Reasons are often preceded by "so," "because," or "so that," and they often follow statements in other categories, particularly need: "I don't need to because..."		
Steps	Behaviors the client has performed (in the recent past) that may be in the direction of change or in the direction of staying the same.	Steps are not the target behavior but are on the way toward or away from the target behavior.		
Commitment	What the client will or will not do in the future and intentions or agreements about the future. The strength of the commitment can vary, but they are commitment statements because they talk about the future.	I'll try I definitely will I promise	I may I won't I suppose	I will

**TABLE 99-3.** Categories of Motivation in Both Sustain and Change Directions for the Target Behavior of Engaging in Behaviors That Would Promote Heart Health After a Heart Attack

Target behavior is engaging in behavior that would reduce the risk of another heart attack. The client says this:	Is the client's statement in the direction of health (change talk) or in the direction of continuing the health risk (sustain talk)?	Within what category may the client's statement fit?	Possible response by the health care provider to manage the sustain talk or pull for or reinforce the change talk:
I don't like reduced-salt foods.	Sustain	Desire	"So using a salt substitute is going to be hard to do. Why were you thinking it may be a good idea?" (Recognize the desire in the sustain direction, and then pull for reasons in the change direction.)
I can't get to that evening Healthy Heart meeting.	Sustain	Ability	"You aren't able to get there, but it sounds like you have some recognition that it may be useful." (Recognize the sustain talk, and then pull for reasons or need in the change direction.)
The support from the Healthy Heart class would be helpful.	Change	Reason	"You may like the class." (Attempt to evoke change talk in an additional category of desire.) Or, "You can imagine some benefits from the class." (Reinforce the change talk in the reason category.)
I shouldn't need to do all this for my heart.	Sustain	Need	"It's not fair." (Acknowledge the sense of injustice and injury.) Or, "You would prefer that your heart just work." (Recognize how taking care of the heart is not enjoyable, but begin to call attention to the client's desire for the heart to work, which could lead to steps to take care of the heart.)
I think I may enjoy that support group.	Change	Desire	"You are looking forward to it." (Reinforce the enjoyment.) Or, "What are you hoping to get out of it?" (Attempt to evoke additional change talk in the reason category.)
I got a salt substitute.	Change	Step	"Good for you." (Affirm the client's action in the change direction.) Or, "What will you do next?" (Pull for more change talk in the step category.)
I'm not having any angina anymore, so I figure I don't need to take that medication.	Sustain	Reason	"You're glad your angina is gone." (Stay away from the reason category, go to another category, desire, and hope to find change talk there.)
I threw out those recipes with less salt.	Sustain	Step	"Something else makes more sense to you to try than reducing your salt." (Avoid trying to install reasons or motivation to reduce salt, and pull for other things the client may be willing to try.)
I could get a ride to the Heart Health class.	Change	Ability	"Sounds like it is important to you to try it out." (Pull for change talk in the need or reason category.)
I won't be weighing myself every day.	Sustain	Commitment	"If you thought that would make a difference, you could consider doing it." (Avoid arguing about what the client is going to do, and pull for reasons in the change direction.)
I probably need to go to a yoga class every day.	Change	Need	"It's something that you think would help." (Pull for change talk in the reasons category.)
I will be going to that exercise class tomorrow.	Change	Commitment	"You've made up your mind to try it out." (Reinforce the change talk in the commitment category.)



**TABLE 99-4.** Target Behavior Is to Engage in Those Behaviors That Would Manage a Diabetic Condition

SUSTAIN TALK	CHANGE TALK
I don't like sticking my finger.	I want to reduce my risk of losing my eyesight.
I can't take my meter with me during the day.	I could get that new, smaller meter.
I don't need to do all this checking and changing my diet.	I must learn more about the glycemic index.
I don't follow my diet sometimes because I don't want people to know I have diabetes and have to accommodate my dietary needs.	If I lower my sugars maybe I won't wind up like my mother, who had diabetes and lost her foot.

A client who says things such as those listed in the change talk column of Table 99-4 is rehearsing what he or she literally must think or say after the consultation is over to remind, justify, or motivate himself or herself to engage in behaviors related to managing diabetes. In addition, a client who is making statements such as those in the sustain talk column is probably reducing his or her motivation to engage in health-promoting behaviors after the consultation. One way that health care providers inadvertently arrange this is by saying the change talk. The client, who is ambivalent, then brings up the sustain talk, and that is what he or she may remember after the consultation. However, a health care provider who says the sustain talk before the client says it may be perceived as very empathic. The client experiences the clinician as someone who understands why it is so difficult to engage in the health-promoting behavior. By saying the sustain talk first, the health care provider alleviates the client from having to say it and decreases the client's reinforcement of the status quo. Having recognized the sustain talk, the health care provider has perhaps earned the client's cooperation and increased the probability that the client will shift to some change talk.

## Helping the Client Say More Change Talk

Helping the client say more change talk can sometimes be as simple as asking the client to describe his or her desires, needs, or reasons for engaging in the health-promoting behavior:

“What would you *enjoy* about meditation?”

“How may you be *able* to arrange to take your medications reliably?”

“Why do you think you *need* to reduce the salt in your diet?”

“What *reasons* do you have for continuing with your exercises?”

“If you decided to eat less red meat, what *could you do* today or tomorrow?”

Open questions typically work better than closed questions. Open and closed questions have the typical definitions and perhaps also this aspect: the clinician may be surprised by the client's answer to an open question, whereas the clinician probably already has a very good guess about the client's answer to a closed question. Open questions ask the client to talk about what is important to him or her, whereas closed questions ask the client to talk about what is important to the health care provider. When the client says change talk, providing reinforcement and encouragement through affirmation, paraphrase, or summary can be useful.

Sometimes, change talk can be solicited by having the client envision the future. The health care provider can ask the client to talk about what he or she imagines in the future if changes are made or if changes are not made. Possible examples are as follows: “What do you imagine will happen in the future if you don't lower your blood pressure this year?” or “How do you think this \_\_\_\_\_ (health-risky behavior) might become worse?” Both these examples pull for reasons to engage in the health-promoting behavior.

Facilitating the client's talking about goals or values and how they fit or do not fit with health behaviors may also evoke change talk. This could sound like these examples: “How does the \_\_\_\_\_ (health-risky behavior) help or hurt your work?” or “How would taking care of your heart fit with what you want to do with your family?”

Sometimes, the health care provider hears a client's misconception, and providing accurate information is important. The health care provider may also have a recommendation or resource that he or she would like the client to consider. These concerns or snippets of advice can fit within a motivational interviewing style by respecting the client as competent. First, the health care provider elicits permission to provide the information, concern, or advice: “I have a concern about your situation. Would you like to hear it?” Or “I have an idea of something that may work for you if you would like to hear it.” If the client agrees, which occurs most times, the health care provider then describes concisely the information or advice and returns the focus back to the client as ultimate decision maker with something such as this: “You are in the best position to decide whether this works for you.” Or “How do you think that fits your situation?” Steve Rollnick,<sup>1</sup> one of the field's experts, has called this way of introducing advice or recommendations elicit-provide-elicite: elicit the client's permission, provide the information, and elicit the client's interpretation of the information. Another expert in the field, Terri Moyers,<sup>11</sup> has taught that if collaboration with the client is extensive, the client's change talk is actively solicited, and the client's autonomy is highly respected, some direct advice offered during the consultation is often heard and accepted by the client even when that same advice would be rejected by the client if given in the context of a directing helping style.

Because most clients are ambivalent about engaging in health-promoting behaviors, some sustain talk by the client is normal and expected. To help the client increase his or her motivation for the health-promoting behavior, however, the health care provider should be active in managing the sustain talk. Often, a first step is to demonstrate to the client that the sustain talk has been heard and understood. This is where the health care provider's skill in expressing empathy through paraphrasing or summarizing is necessary.

**TABLE 99-5.** Examples of Providing an Alternative Meaning for the Client's Observation in Sustain Talk

Observation the client has made	I've tried in the past and haven't succeeded in (stopping smoking, maintaining my exercise, improving my diet).
Meaning client may give this observation	I can't do this. Or I'm not successful. (Notice this statement is sustain talk in the ability category.)
Meaning you may want the client to have	This is important to you. You have tried out several ways that have not worked as well as you want. (The past failures are given a new meaning, and attention is called to desire, which is a different category than ability.)

Sometimes, the client will return to change talk if the health care provider overstates the sustain talk the client has just said. Possible examples are as follows:

Example 1: Client: "I don't really see the ankle swelling as a problem. They just hurt some."

Counselor: "You're not using the ankle swelling to think at all about your heart."

Example 2: Client: "I doubt if there is a problem. I don't have difficulties moving around."

Counselor: "As long as you can move, *everything* is OK."

The health care provider must say these kinds of amplified reflections (called amplified because the health care provider is increasing the emphasis or overstating the sustain talk) in a neutral voice tone. Sarcasm or criticism will very likely increase the client's sustain talk rather than decrease it.

Earlier in this chapter, examples were given of managing sustain talk by first paraphrasing the sustain talk and then focusing on a different category. These double-sided reflections will help manage sustain talk if the first side or phrase is the sustain side and the second side or phrase is the change side. The client is more likely to talk about the side (sustain or change) on which the health care provider finishes his or her statement. Another way to manage sustain talk is to provide an alternative meaning for the client's observation (Table 99-5).

## Enhancing Your Motivational Interviewing Skills

Most health care providers use all three helping styles. Although the directing helping style is most frequently used, most health care providers occasionally use a guiding helping style and even the more specialized motivational interviewing style whether or not they have received formal training in it. Research has demonstrated that reading or attending workshops is probably not sufficient to enhance motivational interviewing skills. Listening to actual recordings of

### BOX 99-1. A Way to Enhance Your Practice

Audiotape a session with a client. By yourself or with a colleague:

- Count the number of open questions and closed questions. You are more likely to be using a motivational interviewing style if at least 50% of your questions are open.
- Count the number of reflections you made. You are more likely to be using a motivational interviewing style if you have at least twice as many reflections as questions and you have at least one reflection every minute. Complex reflections often elicit more change talk than do simple reflections.
- Did you talk less than the client? You are more likely to be using a motivational interviewing style if the client talks approximately twice as much as you.
- Listen for where you did or could have solicited or reinforced any client statements about desire, ability, need, reasons, or steps statements toward the healthy alternative (change talk).
- Identify instances in which the client was engaging in sustain talk. Now that you have more time to think about your response, how else could you have demonstrated that you understood this sustain talk and called attention to possible change talk?
- Look at any instance where you gave the client advice. Did you use an elicit-provide-elicited format or in some other way ask for permission and ask the client to consider how well the advice fit?
- Did you warn the client of any possible consequences, confront the client regarding the behavior, or raise concerns without using elicit-provide-elicited? You are more likely to be using a motivational interviewing style if you avoid warning or confronting the client.

the clinician's consultations with clients is probably necessary. Whether alone, with one or several peers, or with an expert in motivational interviewing, the health care provider can listen for the characteristics listed in Box 99-1. A health care provider who practices with as few as 6 hours of recordings may significantly enhance his or her motivational interviewing skills.

One perhaps memorable way to remember the approach described here are these clinical pearls:

1. Quit your job. Do not be the only expert in the room. Imagine that you do not know, because it will make it easier for you to avoid adopting an expert role and easier for you to be curious about the client's experience.
2. Get on the bus. Be with the client, ride with him or her for a while, and look together at his or her life and dilemma of making this change. Respect that the client is going to get off the bus at whatever stop he or she chooses.
3. Go fishing. This is easier to do if you give up being the expert and the one who has to solve the problem. Treat the client as competent. Then it makes sense to go looking with the client for his or her motivation and the solutions he or she can create.

## KEY WEB RESOURCES

Motivational Interviewing: <a href="http://www.motivationalinterviewing.org/">http://www.motivationalinterviewing.org/</a>	This central resource for trainers of motivational interviewing includes readings, links to other resources, and transcripts of some interviews focused on substance use problems.
MI Nordic: <a href="http://www.motiverandesamtal.org/ICMI">http://www.motiverandesamtal.org/ICMI</a>	Videos show experts in the field presenting at an international conference on motivational interviewing held during the summer of 2010 in Stockholm.
Stephen Rollnick: <a href="http://www.stephenrollnick.com/">http://www.stephenrollnick.com/</a>	Stephen Rollnick provides resources and a discussion forum for motivational interviewing in medical (rather than substance use) health care settings.

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## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. Rollnick S, Miller W, Butler C. *Motivational Interviewing in Health Care: Helping Patients Change Behavior*. New York: Guilford Press; 2007.
2. Resnicow K, Davis R, Rollnick S. Motivational interviewing for pediatric obesity: conceptual issues and evidence review. *J Am Diet Assoc*. 2006;106:2024–2033.
3. Weil A. *Testimony before U.S. Senate Committee on Health, Education, Labor and Pensions*. February 26, 2009.
4. Hettema J, Steele J, Miller W. A meta-analysis of research on motivational interviewing treatment effectiveness (MARMITE). *Annu Rev Clin Psychol*. 2005;1:91–111.
5. Burke B, Arkowitz H, Menchola M. The efficacy of motivational interviewing: a meta-analysis of controlled clinical trials. *J Consult Clin Psychol*. 2003;71:843–861.
6. Dunn C, Deroo L, Rivara F. The use of brief interventions adapted from motivational interviewing across behavioral domains: a systematic review. *Addiction*. 2001;96:1725–1742.
7. Lundahl B, Kunz C, Brownell C, et al. A meta-analysis of motivational interviewing: twenty-five years of empirical studies. *Res Soc Work Pract*. 2010;20:137–160.
8. Rubak S, Sandboek A, Lauritzen T, Christensen B. Motivational interviewing: a systematic review and meta-analysis. *Br J Gen Pract*. 2005;55:305–312.
9. Amrhein P. How does motivational interviewing work? What client talk reveals. *J Cogn Psychother*. 2004;18:323–336.
10. Moyers T, Martin T, Christopher P, et al. Client language as a mediator of motivational interviewing efficacy: where is the evidence? *Alcohol Clin Exp Res*. 2007;31(suppl 3):40S–47S.
11. Moyers T, Miller W, Hendrickson S. How does motivational interviewing work? Therapist interpersonal skill predicts client involvement within motivational interviewing sessions. *J Consult Clin Psychol*. 2005;73:590–598.



# 100

## Emotional Awareness for Pain

Howard Schubiner, MD

An epidemic of chronic pain and related disorders is occurring in the United States and around the world.<sup>1-3</sup> Investigators estimate that 113 million individuals have chronic pain in the United States, and this number is increasing.<sup>4-6</sup> Back pain, neck pain, fibromyalgia, tension and migraine headaches, temporomandibular joint syndrome, and abdominal and pelvic pain syndromes are among the most common reasons for most primary care visits and consume a significant proportion of medical costs.<sup>7</sup> These disorders, along with various commonly associated disorders such as chronic fatigue, irritable bowel syndrome, interstitial cystitis, postural orthostatic tachycardia syndrome, and others, are among the most common concerns expressed to traditional and integrative practitioners.<sup>8</sup>

Many pain syndromes seen in primary care practices are caused by psychophysiological mechanisms.

The traditional biomedical model attempts to identify an underlying local and structural cause of pain. The efficacy of this approach has not been demonstrated for these chronic painful conditions<sup>9,10</sup> however, as is clear when one considers the number of people who suffer with these conditions on a regular basis. Chronic back pain is a good example of a disorder for which the purported causes of pain (herniated disks, spinal stenosis, spondylolisthesis, facet joint dysfunction, and other syndromes) have not been confirmed, nor have specific biomedical treatments been shown to be effective.<sup>11,12</sup> Whiplash is another example of a chronic pain syndrome shown to be unrelated to ongoing injury or a specific disease process in the neck.<sup>13</sup> The disorders considered in this chapter exclude those with objective evidence of structural disease, such as cancer, fractures, and inflammatory and infectious conditions.

Many central nervous system neurotransmitters have been found to be associated with fibromyalgia and migraine headaches.<sup>14</sup> Specific peripheral disease processes have not been identified, however. Little doubt exists that genetic

predispositions occur with many conditions, such as migraine, anxiety, and depression.<sup>15</sup> However, studies have shown that life events are required to trigger these conditions, that is, to cause expression of underlying genetic predispositions.<sup>16</sup> In fact, one study showed that a particular genotype for depression can be activated by a stressful childhood (thus increasing risk for depression) and can be deactivated by a healthy childhood (thus decreasing depression risk).<sup>17</sup>

Because of the inability to identify and treat the underlying cause, attention has shifted to pain management. However, biomedical approaches to pain management, including pain medications (including opiates), injection techniques, and surgical and chemical ablations, have also not been shown to be efficacious.<sup>9-13</sup> Clearly, a new model for these disorders is needed. This chapter describes a mind-body model in which these disorders are considered to be related to individual reactions to stressful events and unresolved emotions.

### Their Pain Is Real

Neuroscientists have identified areas of the brain that process pain, accentuate pain, and reduce pain.<sup>18-21</sup> We now recognize that all pain is real, no matter whether it is induced by a peripheral noxious event (e.g., bone fracture), by events in the nerve tissue (e.g., peripheral neuropathy), or in the brain (as in mind-body syndromes). In fact, clear evidence indicates that pain can originate in the absence of a tissue disorder in the area where pain is being felt, as seen in phantom limb syndrome.<sup>22</sup> A study by Derbyshire et al<sup>23</sup> confirmed that pain initiated by the brain is identical to pain originating in peripheral tissues.

Learned nerve pathways and central sensitization often produce chronic pain.

The anterior cingulate cortex (ACC) is a key area within the brain that, when activated, augments pain.<sup>19,21</sup> Pain also activates the amygdala and the autonomic nervous system (ANS).<sup>24,25</sup> Emotional memories are stored in the amygdala, and people with adverse childhood experiences are known to be more likely to develop migraine, fibromyalgia, interstitial cystitis, irritable bowel syndrome, and chronic pelvic pain.<sup>26-32</sup> Evidence also indicates that the amygdala, the ACC, and the ANS are activated when emotions are experienced.<sup>33,34</sup> To summarize, these areas are involved in the activation of pain pathways, and these pathways are strongly influenced by thoughts and emotions.<sup>19-21,35</sup>

Learned pain pathways can develop after an injury (even a mild one) or can be created during times of significant stress and emotional reactions. Although most injuries heal within a reasonable amount of time, pain pathways can persist (become “wired”), thus creating chronic pain that is often refractory to medical therapies. These pain pathways are often very specific and can involve discrete or large areas of the body. Pain induced by psychophysiologic processes frequently moves or changes, as opposed to the pain caused by a specific injury or disease process.

Built-in central mechanisms for reducing pain exist. Notably, activation of the dorsolateral prefrontal cortex (DLPFC) area results in diminished pain.<sup>18</sup> Positive emotional states are correlated with activation of the DLPFC<sup>36</sup> (Fig. 100-1).

## Psychology of Pain

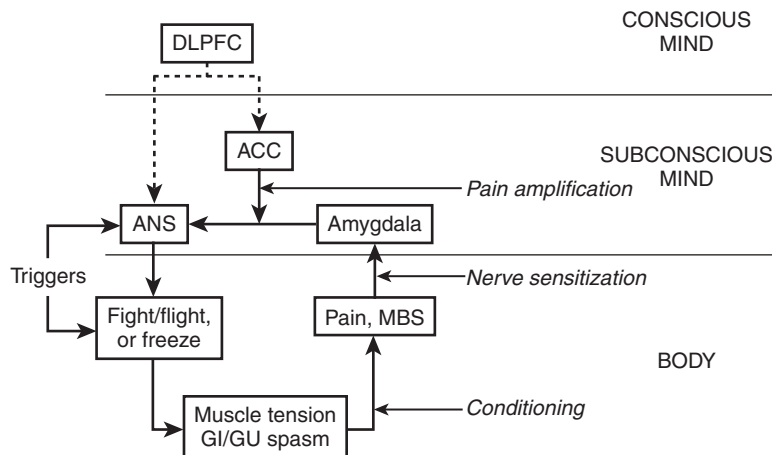
The mind has two major components: conscious and subconscious. We are obviously aware of many of our actions, decisions, thoughts, and feelings. However, most of our thoughts and emotions are actually derived from subconscious processes.<sup>37,38</sup> In addition, these subconscious processes typically form the basis for most of our actions. Thus, many of our activities are routine and programmed by our subconscious minds, such as walking, talking, eating, and driving, as well

as reactions to people, places, smells, and situations. These activities and reactions are carried out by sets of learned nerve pathways.

Another function of the subconscious mind is to protect us from physical threats. Therefore, we continuously monitor our environment for stimuli that could be “dangerous” in some way.<sup>34</sup> Innate pathways cause our bodies to react very quickly to a snake, a thrown object, or other physical threats. Our reactions to these threats are immediate, physical events and do not involve conscious processing (i.e., we are aware of them after they occur).<sup>34,38</sup> The subconscious mind also notices emotional threats and causes our bodies to react to them in a similar fashion. We are all aware that our bodies react to stress with various reactions, including facial flushing, tight stomach muscles, sweaty palms, voice changes, and others. Given the foregoing, we should not be surprised that during times of significant tension and stress, our bodies can develop physical reactions in a myriad of ways, such as the development of neck or back pain, headache, gastrointestinal or genitourinary symptoms, and many other symptoms.

A detailed psychological history typically elicits the underlying psychological causes of psychophysiologic disorders.

People who were subjected to adverse childhood events develop a priming of the brain's emotional responses and a corresponding emotional memory for specific types of threats.<sup>39</sup> Often, these children suffer from stomach upsets, insomnia, anxiety, headaches, and other disorders.<sup>26,27</sup> Later in life, if new emotional or physical threats occur (especially if they are similar to those that occurred in childhood), brain pathways can be activated, and new symptoms often develop, including severe pain.<sup>40</sup> In a typical history, a girl who grows up with an emotionally abusive and controlling parent may develop migraine headaches as a teen when she is subjected to an emotionally abusive and controlling boyfriend.



**FIGURE 100-1**

The neurology of psychophysiologic disorders (*thick solid line, activating; dashed line, deactivating*). ACC, anterior cingulate cortex; ANS, autonomic nervous system; DLPFC, dorsolateral prefrontal cortex; GI/GU, gastrointestinal/genitourinary; MBS, mind-body syndrome.

If she marries a controlling and abusive husband in her 20s, she may develop abdominal or pelvic pain. In her 30s, when subjected to a threatening work situation, she may develop widespread pain that is often diagnosed as fibromyalgia.

These physical reactions are real, and the pain they cause is real. However, they are physiologic, rather than pathologic, responses. In other words, they do not involve tissue destruction and can be reversed. They are responses created by the subconscious mind in an attempt to protect us from some threat (e.g., a controlling boss, an abusive husband, an overwhelming set of responsibilities). These threats activate fear and anger in the “internal child” portion of the mind. We currently use the term psychophysiological disorders (PPDs) to describe them, but they have also been termed psychosomatic or functional disorders, tension myositis syndrome,<sup>41</sup> stress-related illness,<sup>42</sup> and mind-body syndrome.<sup>40</sup>

Another observation commonly made about persons who develop psychophysiological reactions is that they tend to have a highly developed conscience, or “internal parent.”<sup>41</sup> Those who exhibit certain characteristics—being selfless, highly responsible, or self-critical, feeling excessive guilt, lacking assertiveness, being perfectionists, holding themselves to very high standards, caring what others think of them, and holding emotions in—are commonly affected with this group of disorders. Large international studies have shown that women are more likely than men to display these characteristics, possibly because of higher rates of childhood and adult victimization and gender-based socialization.<sup>43,44</sup> These factors may play a role in the higher rates of chronic pain and other PPDs disorders among women (Fig. 100-2).

Ruling out structural alterations is critical before the diagnosis of a psychophysiological disorder is made.

## Diagnosis of Psychophysiological Disorders

PPDs should be suspected in patients who present with symptoms of one or more of the common PPD diagnoses (Box 100-1) and for whom a specific structural condition is

not identified. PPD is therefore suspected in most patients presenting to a primary care physician or health care provider. A medical workup should be conducted to rule out any structural conditions such as tumors, fractures, infections, or inflammatory conditions. Conditions that are present in the asymptomatic population in equal proportions, such as bulging disks, mild spondylolisthesis, or spinal stenosis, do not exclude a diagnosis of PPD. A physical examination to rule out evidence of nerve root compression or signs of other disease processes is mandatory.

Once this is accomplished, the topic of PPDs should be broached with the patient. Talking with patients about PPDs should be done in a way that emphasizes that their symptoms are real and empathizes with their situation and their frustration with not achieving remission of symptoms. The clinician should explain that real symptoms, including severe and chronic pain, can frequently occur in the absence of structural disease processes, and one can use phantom limb syndrome as an example of this phenomenon.<sup>22</sup> Introducing the concept of learned nerve pathways helps patients to connect their

### BOX 100-1. Syndromes Commonly Caused by Psychophysiological Disorders

#### Chronic Pain Syndromes

- Tension headaches
- Migraine headaches
- Back pain
- Neck pain
- Whiplash
- Fibromyalgia
- Temporomandibular joint syndrome
- Chronic abdominal and pelvic pain syndromes
- Chronic tendinitis
- Vulvodynia
- Piriformis syndrome
- Sciatic pain syndrome
- Repetitive stress injury
- Foot pain syndromes
- Myofascial pain syndrome

#### Autonomic Nervous System–Related Disorders

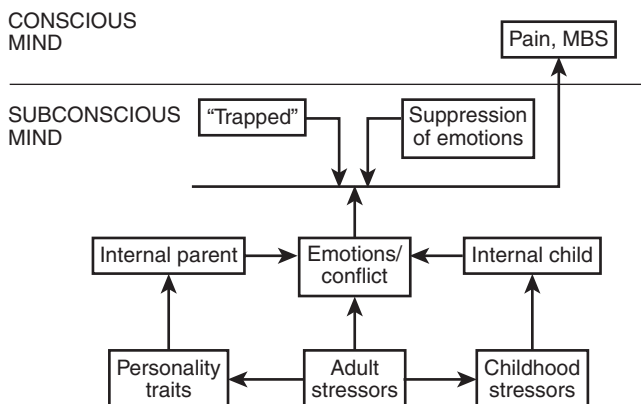
- Irritable bowel syndrome
- Interstitial cystitis (irritable bladder syndrome)
- Postural orthostatic tachycardia syndrome
- Inappropriate sinus tachycardia
- Reflex sympathetic dystrophy (chronic regional pain disorder)
- Functional dyspepsia

#### Other Syndromes

- Insomnia
- Chronic fatigue syndrome
- Paresthesias (numbness, tingling, burning)
- Tinnitus
- Dizziness
- Spasmodic dysphonia
- Chronic hives
- Anxiety
- Depression
- Obsessive-compulsive disorder
- Posttraumatic stress disorder

**FIGURE 100-2**

The psychology of psychophysiological disorders. MBS, mind-body syndrome.



symptoms to central nervous system processes. The practitioner should state that learned nerve pathways are simply sets of nerve connections that have developed through experiences, such as the pathways that allow us to ride a bicycle, throw a ball, or walk and talk a certain way. Once these pathways are learned, they can continue for several years and can be reactivated after many years. Pain and other symptoms are easily learned and are the underlying cause of PPDs. Reassure the patient that no physical, structural disease process is present, and offer hope that the real condition that they suffer from can be reversed. Whether or not a physical injury occurs, stressful situations and powerful subconscious emotions are universal triggers of pain pathways in PPDs. These pathways become engrained in the presence of situations and emotions that remain unresolved. In addition, chronic pain frequently leads to frustration about ongoing pain and fear of an underlying physical disease. These reactions further activate pain pathways in the brain by activation of the amygdala, ANS, and ACC.<sup>45,46</sup> This educational process is extremely important to allay fears of a disease process, explain the reason for the symptoms, and offer hope and the expectation that these symptoms can be resolved. Treatment of PPDs in the absence of understanding and accepting these principles is typically not effective.

## Diagnostic Interview

Many practitioners are not trained to conduct an in-depth psychological interview that begins with a patient's childhood history and attempts to elicit key psychological factors that have created psychophysiological disorders. However, I have published a template for this type of assessment that can be used by patients or practitioners.<sup>40</sup> A brief description of this interview is provided here. As mentioned earlier, before diagnosing a form of PPD, the practitioner should rule out a pathologic medical condition, to ensure that the practitioner and patient are comfortable that they are dealing with a form of PPD. Before the interview, the patient should complete a checklist of symptoms and syndromes that are commonly caused by PPDs (Box 100-2).

Begin the interview by gathering data on the patient's family of origin, and ask probing questions about parents, siblings, and any other important individuals in childhood. Gently inquire about episodes or patterns of the following: emotional, physical, or sexual abuse; criticism, taunting, teasing, blame, humiliation, or judging; and overly high expectations or conditional love. Ask about parental relationships, alcohol or drug abuse, divorce or extramarital affairs, unequal treatment of siblings, and family psychological and physical illnesses. Ask about sibling relationships, with special regard to episodes of cruel behaviors, psychological or physical illness, or acting-out behaviors. Synthesize the patient's childhood experiences and reactions by the patient, in an attempt to understand the effects of upbringing on personality and development. Most people with PPDs have a set of personality traits that include an overly developed conscience (superego) and a deficiency of self-esteem, self-worth, and assertiveness (Box 100-3). Typically, one finds events and responses that prime the ANS and thereby set the stage for the development of PPDs later in life. Some of the common patterns are those of loss, abandonment, fear, guilt, resentment, and anger. In some instances, people with PPDs had very healthy childhoods, and when they are exposed

### BOX 100-2. Common Symptoms of Psychophysiological Disorders

- Heartburn, acid reflux
- Abdominal pains
- Irritable bowel syndrome
- Tension headaches
- Migraine headaches
- Unexplained rashes
- Anxiety or panic attacks
- Depression
- Obsessive-compulsive thought patterns
- Eating disorders
- Insomnia or trouble sleeping
- Fibromyalgia
- Back pain
- Neck pain
- Shoulder pain
- Repetitive stress injury
- Carpal tunnel syndrome
- Reflex sympathetic dystrophy (chronic regional pain disorder)
- Temporomandibular joint syndrome
- Chronic tendinitis
- Facial pain
- Numbness or tingling sensations
- Fatigue or chronic fatigue syndrome
- Palpitations
- Chest pain
- Hyperventilation
- Interstitial cystitis/spastic bladder (irritable bladder syndrome)
- Pelvic pain
- Muscle tenderness
- Postural orthostatic tachycardia syndrome
- Tinnitus
- Dizziness
- Posttraumatic stress disorder

to stressful situations later in life that contradict the values learned in childhood, PPD symptoms can develop.

The next phase of the interview consists of an evaluation of the events that trigger PPD syndromes. A simple approach is to inquire about the onset of each of the PPD symptoms from Box 100-2. Table 100-1 provides sample data filled in for a hypothetical patient. Although the onset may coincide with injury or a viral infection, these events create the nerve pathways that the body experiences on a temporary basis. The PPD symptoms become chronic by the development of learned nerve pathways only if the individual is in a situation in which several of the following circumstances are present: an inherently stressful situation; triggering by current events of emotional memories of priming events from childhood; experiences of guilt, self-criticism, a strong sense of responsibility, or other issues listed in Box 100-3; and an inability to express emotions of fear or anger or feeling trapped in the triggering situation. These situations trigger PPD symptoms that can easily become chronic once they are learned, especially if the symptoms are worrisome, seen as resulting from a disease process, and labeled by health practitioners as something other than a psychophysiological process. Complete



this process with each of the PPD symptoms that have occurred in the lifetime of the patient. Clear patterns frequently emerge that will help the patient understand that the symptoms are, in fact, caused by PPDs and that the patient is not crazy, incompetent, or disabled, but rather someone who has been exposed to series of events that have created physical or psychological symptoms in response to a particular combination of emotions developed in their life. When this understanding occurs, patients can be encouraged to see that they are not to blame for the symptoms, that they are not physically or psychologically damaged, and that they have the opportunity to overcome these symptoms.

Stressful childhood events play powerful roles in the development of psychophysiologic and physical disorders.

If it is appropriate, the interview may be concluded with the following clear messages:

### BOX 100-3. Personality Traits Common to Patients With Psychophysiologic Disorders

- Having low self-esteem
- Being perfectionists
- Having high expectations of themselves
- Wanting to be good or be liked
- Frequently feeling guilty
- Feeling dependent on others
- Being conscientious
- Being hard on themselves
- Being overly responsible
- Taking on responsibility for others
- Often worrying
- Having difficulty making decisions
- Following rules strictly
- Having difficulty letting go
- Feeling cautious, shy, or reserved
- Tending to hold thoughts and feelings in
- Tending to harbor rage or resentment
- Not standing up for themselves

“You have a form of PPD, rather than a structural disease process. PPD is caused by learned nerve pathways that have been triggered by the particular set of stressors that you have encountered. It is not your fault. Almost everyone gets PPD, and anyone would likely develop these symptoms given the events that occurred. You can get better because learned nerve pathways can be reversed. A path for unlearning your pain and other PPD symptoms exists if you are willing to do the work.”

## Treatment Approach

Because PPD is a disorder caused by stress and unresolved emotions, everyone with PPD can experience dramatic improvements or remissions. However, primarily patient-related factors determine successful treatment, rather than practitioner-related factors. In my clinical experience, successfully treated patients are those who are convinced that they have PPD rather than a structural disease process, are confident that they can address the issues that created PPD, are willing and able to devote a significant amount of time to psychological interventions, and have adequate resources as well as a lack of overwhelming obstacles in their lives. The practitioner's job is to help patients develop the first of these attributes; the rest of them are primarily up to the patient.

Two studies documented the efficacy of the therapeutic approach described in the next section. The first was a randomized controlled trial for individuals diagnosed with fibromyalgia.<sup>47</sup> In this small trial, at a 6-month follow-up, those who participated in a 3-week intervention had a mean decrease in pain of 2.5 on a 10-point Likert pain scale. In addition, 45% had a decreased pain level of at least 30%, and 25% had a decrease of at least 50%. A second study described the outcomes of patients with various musculoskeletal pain syndromes, including fibromyalgia, back and neck pain, headache, and other syndromes. Patients had a mean duration of pain of 8.8 years and had even better results. After the month-long intervention, 6-month follow-up pain scores showed that 67% had at least a 30% pain reduction, and 53% had at least a 50% reduction in pain.<sup>48</sup>

## Therapeutic Program

Once a biomedical condition has been ruled out, the interview has demonstrated the linkages between priming and triggering events and the onset of PPD symptoms, and the

TABLE 100-1. Synthesis of the Diagnosis of Psychophysiologic Disorder Chart

AGE	PPD SYMPTOM	POTENTIAL TRIGGERING EVENTS	EMOTIONS THAT WERE TRIGGERED/CORE ISSUES
7	Stomach aches	Parents arguing	Fear of parents separating/loss
16	Irritable bowel syndrome	Parental divorce	Loss of father, mother depressed
28	Migraines	Husband “cheating”	Loss, anger, betrayal
38	Fibromyalgia/fatigue	Divorce/difficult boss	Loss, fear, powerlessness

PPD, psychophysiologic disorder.

#### BOX 100-4. Expressive and Therapeutic Writing Exercises

- Free writing: uncensored expressive writing about an emotionally charged topic
- Unsent letters: expressing thoughts and feelings fully in a letter format
- Dialogues: creating an imaginary conversation between two entities who discuss a relevant issue
- Gratitude: writing about things for which one is grateful
- Forgiveness: writing to express forgiveness toward oneself or others
- Barriers: writing about potential barriers, both internal and external, that may prevent healing
- Creating new responses: writing how one chooses to respond to potentially difficult situations
- Life narratives: creating an alternative life story that emphasizes overcoming obstacles rather than being victimized

patient has been educated and accepts the diagnosis, then the intervention may proceed. There are resources and a comprehensive program designed to empower the patient and guide him or her toward healing (see resources below).<sup>40</sup> These programs typically consist of a mixture of cognitive-behavioral, mindfulness, and emotional expressive techniques. The author's program has been shown to increase an internal locus of control (i.e., patients begin to believe that their thoughts and actions are capable of reversing their PPD symptoms).<sup>47</sup>

Several authors have developed various expressive and therapeutic writing techniques.<sup>49,50</sup> Research on many of these techniques conducted by James Pennebaker and others documented beneficial effects on health and well-being.<sup>50-52</sup> These techniques, along with others, are incorporated into programs designed to reverse PPDs.<sup>40</sup> These techniques are summarized in [Box 100-4](#) and are discussed in Chapter 96, *Journaling for Health*.

Meditations and visualizations are used as part of healing in PPD. Mindfulness meditation has been shown to reduce reactivity to emotional issues and reduce pain,<sup>53,54</sup> and guided imagery is an effective tool to create the images of health and well-being that are essential to this therapeutic model.<sup>55,56</sup> Chapter 95, *Guided Imagery and Interactive Guided Imagery*, and Chapter 98, *Recommending Meditation*, provide practical advice on using these methods.

Affirmations are a key element of this program. The rationale for positive self-talk is the following. Pain resulting from PPDs is triggered by subconscious thoughts and emotions. Although one can often discern the origin of these subconscious processes, these processes can continue to create pain if they remain unchallenged. For example, a common thought of people with back pain is that they will hurt their back if they lift things or exercise. The conscious production of positive thoughts about one's health and well-being activates the DLPFC and deactivates the ACC. These processes, in turn, act to reduce pain. Remarkably, simple, strong assertions can often reverse pain within minutes when one is convinced of the diagnosis of PPD and of one's power in overcoming

#### BOX 100-5. Affirmative Script for Reducing Symptoms of Psychophysiological Disorders

- When pain or other symptoms occur, stop and take a deep breath. Then take a moment to remind yourself that nothing is seriously wrong with your body. You are healthy, and the symptoms of mind-body syndrome will subside soon.
- Tell your mind that you realize that the symptoms are just a way of warning you about underlying feelings of fear, guilt, anger, anxiety, shame, inadequacy, or other emotions. Tell your mind to stop producing the symptoms immediately. Do this with force and conviction, either out loud or silently.
- Take a few deep breaths, and move on with what you were doing.

it. Patients can “speak” to the pain on a consistent basis to reprogram learned pain pathways, particularly if they have been long-standing. [Box 100-5](#) offers an affirmation script for patients to use.

Another key component in healing is to challenge triggers that maintain symptoms. A trigger can be defined as a stimulus that leads to PPD symptoms, yet it would not typically cause a symptom in someone else. Typical examples are weather changes, bright lighting, foods, wine or other alcoholic drinks, family gatherings, visits to certain people, places, movements, driving, and many others. Triggers become activated by subconscious processes in a way similar to that by which pavlovian responses develop (i.e., operant conditioning). Therefore, triggers cause symptoms because they activate learned nerve pathways, rather than causing a physical reaction in the body. Triggers can be attenuated by understanding this process and by actively challenging them. One must be careful to rule out a structural relationship or a true allergic reaction before encouraging patients to challenge these triggers. Avoiding triggers allows them to exert even greater effects, so patients should be encouraged to seek out these triggers and expose themselves to them to overcome them. See [Box 100-6](#) for a script regarding eliminating triggers.

As mentioned earlier, many patients with PPDs have personality traits of being overly responsible, self-critical, and unassertive. Individuals with PPDs often find themselves in situations in which they feel trapped or conflicted. They may be caring for an ailing parent who was abusive, work for a boss who is controlling and manipulative, or have a spouse or child who continually takes advantage of them. In these situations, taking action is often necessary. Pain is often dramatically reduced when a difficult situation is resolved or ameliorated to a significant degree. Clinicians must frequently encourage patients and help them find acceptable methods for dealing with these situations.

Finally, individuals who have endured significant childhood and adult stressors and who have suffered with chronic pain often have a negative view of themselves and low levels of self-esteem and self-efficacy. Therefore, an overarching theme for guiding individuals with PPDs to health is the development of love and kindness toward oneself. This can be accomplished in many ways, such as by positive affirmations, by

### BOX 100-6. Affirmative Script for Reducing Triggers of Psychophysiologic Disorders

- When you notice you are encountering any symptom triggers or any stressful situations, immediately stop and take a deep breath. Then take a moment to remind your mind that this activity or trigger will *not* cause symptoms or problems any more. For example, when I lift heavy items, I always remind myself, "This will not cause any back problems. My back is healthy and strong, and I can do this without pain." Have a deep understanding of mind-body syndromes and the fact that your body is healthy and that you can get better by using these methods.
- Keep reminding yourself that you will not allow your mind to produce symptoms of a psychophysiologic disorder this time.
- Be firm and assertive.
- Repeat whatever positive phrases you choose every time you encounter any of your triggers until your brain unlearns the pathways of PPD.

meditations and visualizations, and by encouraging patients to stand up for themselves and take time to do things for themselves.

An empathic, insight-based treatment approach for psychophysiologic disorders has been demonstrated to be effective.

## Conclusion

Most people with chronic pain do not have a structural cause for this pain and are actually suffering from PPDs. Biomedical approaches to PPDs often lead to an endless cycle of pain and interventions. When a biomedical condition is ruled out, a careful interview usually identifies the priming and triggering events leading to the onset of pain. Education about PPDs will help patients discard the biomedical explanation for their pain and empower the patient to take control of their symptoms and their lives. Even pain that has persisted for many years can be reversed or reduced by this relatively simple approach.

### KEY WEB RESOURCES

Unlearn Your Pain: <a href="http://unlearnyourpain.com">http://unlearnyourpain.com</a>	The Web site of Dr. Howard Schubiner
Dr. John Sarno: <a href="http://johnesarnomd.com">http://johnesarnomd.com</a>	The official Web site of John Sarno, MD
Stress Illness: <a href="http://www.stressillness.com">http://www.stressillness.com</a>	The Web site of Dr. David Clarke
Dr. David Schechter: <a href="http://www.schechtermd.com">http://www.schechtermd.com</a>	The Web site of Dr. David Schechter
PPD/TMS Peer Network: <a href="http://tmswiki.org">http://tmswiki.org</a>	A participant-oriented information site on psychophysiologic disorders, including a list of practitioners who practice in this area and an active forum
RSI-Back Pain: <a href="http://rsi-backpain.co.uk/">http://rsi-backpain.co.uk/</a>	A patient-run information site for people suffering with chronic painful conditions

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Freburger JK, Holmes GM, Agans RP, et al. The rising prevalence of chronic low back pain. *Arch Intern Med.* 2009;169:251–258.
- McClellan SA, Clauw DJ. Biomedical models of fibromyalgia. *Disabil Rehabil.* 2005;27:659–665.
- Schwaiger J, Kiechl S, Seppi K, et al. Prevalence of primary headaches and cranial neuralgias in men and women aged 55–94 years (Bruneck study). *Cephalalgia.* 2009;29:179–187.
- Verhaak PFM, Kerssens JJ, Dekker J, et al. Prevalence of chronic benign pain disorder among adults: a review of the literature. *Pain.* 1998;77:231–239.
- Andersson GBJ. Epidemiological features of chronic low-back pain. *Lancet.* 1999;354:581–585.
- Institute of Medicine. *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research.* Consensus Report, National Academy of Sciences. Washington, DC: Institute of Medicine; 2011.
- Raj PP. The prevalence of chronic pain in the United States remains high, imposing a large economic burden on patients and society. *Pain Pract.* 2004;4(suppl 1):S1–S3.
- Jackson JL, Kroenke K. The effect of unmet expectations among adults presenting with physical symptoms. *Ann Intern Med.* 2001;34:889–897.
- Baumgartner E, Finckh A, Cedraschi C, et al. A 6 year prospective study of a cohort of patients with fibromyalgia. *Ann Rheum Dis.* 2002;61:644–645.
- Wolfe F, Anderson J, Harkness D, et al. Health status and disease severity in fibromyalgia: results of a six-center longitudinal study. *Arthritis Rheum.* 1997;40:1571–1579.
- Deyo RA, Mirza SK, Turner JA, et al. Overtreating chronic back pain: time to back off? *J Am Board Fam Med.* 2009;22:62–68.
- Hadler NM. *Stabbed in the Back: Confronting Back Pain in an Overtreated Society.* Raleigh, NC: University of North Carolina Press; 2009.
- Mallesen A. *Whiplash and Other Useful Illnesses.* Montreal: McGill-Queen's University Press; 2002.
- Clauw DJ, Chrousos GP. Chronic pain and fatigue syndromes: overlapping clinical and neuro-endocrine features and potential pathogenic mechanisms. *Neuroimmunomodulation.* 1997;4:134–153.
- Svensson DA, Larsson B, Waldenlind E, et al. Shared rearing environment in migraine: results from twins reared apart and twins reared together. *Headache.* 2003;43:235–244.
- Caspi A, Sugden K, Moffitt TE, et al. Influence of life stress on depression: moderation by a polymorphism in the 5-HTT gene. *Science.* 2003;301:386–389.
- Taylor SE. Mechanisms linking early life stress to adult health outcomes. *Proc Natl Acad Sci U S A.* 2010;107:8507–8512.
- Schmahl C, Bohus M, Esposito F, et al. Neural correlates of antinociception in borderline personality disorder. *Arch Gen Psychiatry.* 2006;63:659–667.
- Peyron R, Laurent M, Garcia-Larrea L. Functional imaging of brain responses to pain: a review and meta-analysis. *Clin Neurophysiol.* 2000;30:263–288.
- Lieberman MD, Jarcho JM, Berman S, et al. The neural correlates of placebo effects: a disruption account. *Neuroimage.* 2004;22:447–455.
- Klossika I, Flor H, Kamping S, et al. Emotional modulation of pain: a clinical perspective. *Pain.* 2006;124:264–268.
- Flor H, Elbert T, Knecht S, et al. Phantom-limb pain as a perceptual correlate of cortical reorganization following arm amputation. *Nature.* 1995;375:482–484.
- Derbyshire SWG, Whalley MG, Stenger VA, et al. Cerebral activation during hypnotically induced and imagined pain. *Neuroimage.* 2004;23:392–401.
- Das P, Kemp AH, Liddell BJ, et al. Pathways for fear perception: modulation of amygdala activity by thalamo-cortical systems. *Neuroimage.* 2005;26:141–148.
- Fitzgerald KD, Welsh RC, Gehring WJ, et al. Error-related hyperactivity of the anterior cingulate cortex in obsessive-compulsive disorder. *Biol Psychiatry.* 2005;57:287–294.
- Anda RF, Felitti VJ, Bremner JD, et al. The enduring effects of abuse and related adverse experiences in childhood: a convergence of evidence from neurobiology and epidemiology. *Eur Arch Psychiatry Clin Neurosci.* 2006;256:174–186.
- Van Houdenhove BV, Egle U, Luyten P. The role of life stress in fibromyalgia. *Curr Rheumatol Rep.* 2005;7:365–370.
- Goodwin RD, Hoven CW, Murison R, et al. Association between childhood physical abuse and gastrointestinal disorders and migraine in adulthood. *Am J Public Health.* 2003;93:1065–1067.
- Sumanen M, Rantala A, Sillanmäki LH, et al. Childhood adversities experienced by working-age migraine patients. *J Psychosom Res.* 2007;62:139–143.
- Latthe P, Mignini L, Gray R, et al. Factors predisposing women to chronic pelvic pain: systematic review. *BMJ.* 2006;332:749–757.
- Meltzer-Brody S, Leserman J, Zolnoun D, et al. Trauma and posttraumatic stress disorder in women with chronic pelvic pain. *Obstet Gynecol.* 2007;109:902–908.
- Mayer EA, Naliboff BD, Chang L, et al. Stress and irritable bowel syndrome. *Am J Physiol.* 2001;280:G519–G524.
- Eisenberger NI, Lieberman MD, Williams KD. Does rejection hurt? An fMRI study of social exclusion. *Science.* 2003;302:290–292.
- LeDoux J. *The Emotional Brain: The Mysterious Underpinnings of Emotional Life.* New York: Touchstone Books, Simon and Schuster; 1996.
- Lieberman MD, Jarcho JM, Berman S, et al. The neural correlates of placebo effects: a disruption account. *Neuroimage.* 2004;22:447–455.
- Hooley JM, Gruber SA, Scott LA, et al. Activation in dorsolateral prefrontal cortex in response to maternal criticism and praise in recovered depressed and healthy control participants. *Biol Psychiatry.* 2005;57:809–812.
- Wilson TD. *Strangers to Ourselves: Discovering the Adaptive Unconscious.* Cambridge, MA: Belknap Press, Harvard University Press; 2002.
- Wegner DM. *The Illusion of Conscious Will.* Cambridge, MA: Bradford Books, Massachusetts Institute of Technology Press; 2002.
- McEwen BS. Stress, adaptation, and disease: allostasis and allostatic load. *Ann N Y Acad Sci.* 1998;840:33–44.
- Schubiner H, Betzold M. *Unlearn Your Pain.* Pleasant Ridge, MI: Mind Body Publishing; 2010.
- Sarno JE. *The Mindbody Prescription: Healing the Body, Healing the Pain.* New York: Warner Books; 1998.
- Clarke DD. *They Can't Find Anything Wrong: 7 Keys to Understanding, Treating, and Healing Stress.* Boulder, CO: First Sentient Publications; 2007.
- Costa PT, Terracciano A, McCrae RR. Gender differences in personality traits across cultures: robust and surprising findings. *J Pers Soc Psychol.* 2001;81:322–331.
- Schmitt DP, Realo A, Voracek M, et al. Why can't a man be more like a woman? Sex differences in big five personality traits across 55 cultures. *J Pers Soc Psychol.* 2008;94:168–182.
- Bailey KM, Carleton RN, Ylaeyen JWS, et al. Treatments addressing pain-related fear and anxiety in patients with chronic musculoskeletal pain: a preliminary review. *Cogn Behav Ther.* 2010;39:46–63.
- Asmundson GJ, Katz J. Understanding the co-occurrence of anxiety disorders and chronic pain: state of the art. *Depress Anxiety.* 2009;26:888–901.
- Hsu MC, Schubiner H, Lumley MA, et al. Sustained pain reduction through affective self-awareness in fibromyalgia: a randomized controlled trial. *J Gen Intern Med.* 2010;25:1064–1070.
- Burger AJ, Schubiner H, Carty J, et al. Outcomes and predictors of a novel emotional awareness and expression treatment for chronic pain. San Antonio, TX: American Psychosomatic Society; March 10, 2011 [abstract].
- Pennebaker JW. *Opening Up: The Healing Power of Expressing Emotions.* New York: Guilford Press; 1997.
- Gillis ME, Lumley MA, Mosley-Williams A, et al. The health effects of at-home written emotional disclosure in fibromyalgia: a randomized trial. *Ann Behav Med.* 2006;32:135–146.
- Smyth JM, Stone AA, Hurewitz A, et al. Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis. *JAMA.* 1999;281:1304–1309.
- Harris AH. Does expressive writing reduce health care utilization? A meta-analysis of randomized trials. *J Consult Clin Psychol.* 2006;74:243–252.
- Grossman P, Niemann L, Schmidt S, et al. Mindfulness-based stress reduction and health benefits: a meta-analysis. *J Psychosom Res.* 2004;57:35–43.
- Davidson R, Kabat-Zinn J, Schumacher J, et al. Alterations in brain and immune function produced by mindfulness meditation. *Psychosom Med.* 2003;65:564–570.
- Fors EA, Sexton H, Götestam KG. The effect of guided imagery and amitriptyline on daily fibromyalgia pain: a prospective, randomized, controlled trial. *J Psychiatr Res.* 2002;36:179–187.
- Mannix LK, Chandurkar RS, Rybicki LA, et al. Effect of guided imagery on quality of life for patients with chronic tension-type headache. *Headache.* 1999;39:326–334.



# 101

## Energy Psychology

Larry Stoler, PhD, MSSA

The cell is a machine driven by energy. It can thus be approached by studying matter, or by studying energy. In every culture and in every medical tradition before ours, healing was accomplished by moving energy.

*Albert Szent-Gyorgyi, Nobel Laureate in Medicine*

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### Case Study: Fear of a Flu Shot

A patient enters your office, and you recommend that she receive a flu shot. However, this patient is terrified of needles. You learn that because of this fear, the patient has never had a flu shot, despite being at risk. You explain to the patient that you can help her overcome this fear of needles by teaching her how to calm herself using a simple technique. You obtain her consent, and then you ask her to rate her fear of needles from 0 to 10, where 0 means she has no fear at all and 10 is the worst imaginable fear. She says that her fear at that moment, while just thinking about getting the flu shot, is a 9. This is her Subjective Units of Distress (SUDS) rating. Then you instruct her to tap on several acupuncture points on her hand, face, and chest. The procedure takes a couple of minutes. Immediately following this intervention, you observe that she has become calmer: her breathing has slowed down; she is smiling; her body posture is softer. You ask her how high her fear rating is now. She pauses briefly, has a somewhat confused expression on her face, and reports that the fear is hardly there. She reports that her SUDS rating is now 3. You ask her what the fear is based on now. She says that it is the image of the nurse preparing the needle. You ask her to focus on this image and you guide her in repeating the tapping on the same acupoints. When she completes the tapping sequence, you ask her to rate her fear level again, and she reports that she does not feel any fear. Her SUDS rating is 0. You then ask her to imagine receiving a flu shot in full detail. She does this imaginal exercise without any fear. You review with her the tapping sequence she just used and advise her that she can do this as a self-treatment any time she needs to and that she can use it to help her overcome any

fear or limiting beliefs that she encounters in her life. You can tell her in full confidence that because she reached a 0 in this brief treatment, the likelihood is great that she will have little or no fear when she receives her flu shot. You send her over to your nurse, who administers the flu shot. The patient has no adverse reactions. It took you 10 minutes to help this patient.

The SUDS score stands for Subjective Units of Distress and is measured from 0 to 10, with 10 being the maximum amount of subjective feelings of distress and unrest.

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### Case Study: Neck Pain

You see another upset patient. He reports chronic neck and shoulder pain and insomnia. You note from the chart that these conditions were not reported in past annual physical examinations. Except for some mild hypertension, this patient has been in good health. Because you use energy psychology (EP) techniques, you have become more comfortable asking your patients about their emotional lives. When you ask about the origin of these symptoms, the patient becomes visibly more distressed and reports that 4 months ago, while on a road trip, he witnessed a fatal car accident. It was an icy winter day. The road appeared clear, but patches of black ice were present. He was driving cautiously. Suddenly, he had to stop his car to avoid hitting cars in front of him who were avoiding a car that had spun out of control and rolled over off to the side of the road. He was not directly injured in the accident, but he did see that the driver of the car that had rolled over was bleeding profusely from head injuries. He arrived safely to his destination, but heard on the news that that driver had died of his injuries. He did not think about the accident much at first. However, several days later, he began to have nightmares and difficulty sleeping through the night. Then he started to have neck

**BOX 101-1. Overview of Energy Psychology**

1. Uses meridian, chakra, or biofield interventions to treat the symptom
2. Provides rapid, gentle, nontraumatizing treatment for a wide range of emotional and psychological conditions
3. Does not require deep emotional processing of the problem
4. Activates hope because long-standing problems can often be helped
5. Is easily taught as a self-help method

and shoulder pain. Over-the-counter pain remedies have not relieved his pain. You offer him the same treatment as in the previous case, after listening to a detailed account from him regarding precisely how he experienced this traumatic event. You then tailor the treatment to address the aspects of the traumatic event that are most upsetting and salient to him, including his image of the driver bleeding and his instinctive reaction to hold onto the steering wheel of his car very tightly while driving after seeing this accident. As a result of this treatment, the patient quickly calmed down, and his neck and shoulder pain dramatically improved at the same time. You also give him a handout with a self-treatment protocol to follow and ask him to call your office with an update the next day (see Patient Handout). The patient called and said that his neck and shoulder pain were 90% better and that he slept the entire night without any difficulties. Follow-up 3 months later revealed that his problems had completely resolved.

These two examples show how physicians, nurse practitioners, and other health care professionals can use EP methods to help patients overcome significant and debilitating problems (Box 101-1).

## What Is Energy Psychology?

Energy psychology (EP) is the name of a family of treatment methods that address emotional, psychological, and behavioral problems by treating disturbances in the human energy field. These methods emerged in the early 1980s as an outgrowth of the continuing convergence of medical and healing systems of the West and the East that in modern times began with journalist James Reston's 1971 postsurgical treatment with acupuncture while he was accompanying President Nixon to China. EP also reflects profound shifts in scientific thinking as the implications of quantum theory are applied to healing practices.<sup>1</sup> Along with this is a renewed appreciation of the role of consciousness, intention, and energy in wellness and healing.<sup>2</sup> In current practice, the energy dimension of EP treatments focuses on making corrections in the acupuncture meridian system, the chakra system, and the more global human biofield. At the time of this writing, many EP treatment modalities are in use in the United States and increasingly throughout the world. Examples of popular modalities are the Emotional Freedom Techniques (EFT), Thought Field Therapy (TFT), Tapas Acupressure Technique (TAT), Energy Diagnostic and

Treatment Methods (EDxTM), and Advanced Integrative Therapy (AIT), with EFT being the most commonly used method. These approaches are being used by a wide range of professionals and lay people. Psychologists, social workers, and other mental health practitioners—along with physicians, nurses, chiropractors, career coaches, educators, sports performance experts, yoga teachers, and lay people, among other groups—are integrating EP methods into their work (see Chapter 112, Human Energetic Therapies).

In the United States by the late 1990s, EP had gained the attention of increasing numbers of experienced psychologists and other mental health professionals because of its effectiveness as a rapid and comprehensive trauma treatment. These therapists who were already familiar with other effective trauma therapies, such as exposure therapies and Eye Movement Desensitization and Reprocessing (EMDR),<sup>3</sup> began to embrace EP because of the positive results they found in the treatment of patients who were traumatized by sexual abuse, violent attacks, car accidents, natural disasters, terror, and war. In clinical practice, as in the case studies at the beginning of this chapter, patients typically experience rapid and robust relief from trauma symptoms, usually after only a couple of sessions. Significantly, EP treatment is gentle and does not retraumatize the patient. EP treatment typically leads to nearly immediate and simultaneous positive changes in emotions, mind, body, and overall well-being. In practice, this means that upsetting emotions are calmed, disturbing thoughts are neutralized and positive ones spontaneously appear, and physical symptoms abate. Patients often report that they feel lighter, more optimistic, and reconnected to themselves.

Outside the clinic, trauma relief teams using EP interventions on site in trauma zones have obtained similar dramatic results. These trauma relief teams have had a significant impact by helping survivors of the following situations rapidly overcome posttraumatic reactions: the attacks of 9/11, the Indonesian tsunami, earthquakes in Guatemala and Pakistan, Hurricane Katrina in New Orleans, and the war in Serbia and Bosnia. EP is showing great promise as an effective treatment for U.S. military veterans stricken with posttraumatic stress disorder (PTSD). In each instance, EP treatment brought quick resolution of disturbing symptoms, such as nightmares, flashbacks, hypervigilance, and emotional numbness. As an empowerment strategy, patients were taught how to use EP for symptom maintenance and as an effective generalized self-help method. Because EP can be quickly taught to indigenous relief workers who are not mental health professionals, treatments can be locally administered while relying on only a few trained outside professionals. This method of treatment delivery was used successfully in Guatemala and Indonesia, as well as in Rwanda.

In the case of Rwanda, in 2006, members of the Trauma Relief Committee of the Association for Thought Field Therapy Foundation worked with children at the El Shadai orphanage. Many of the children there had witnessed the murder of their parents and other family members during the Rwandan genocide. The therapists worked with 50 children, ages 13 through 18 years. These children suffered typical PTSD symptoms including flashbacks, nightmares, bedwetting, depression, withdrawal, isolation, difficulty concentrating, and aggression. The children's level of PTSD was evaluated using standardized tests. The children's average scores exceeded the cutoffs for a diagnosis of PTSD as outlined in the fourth edition of the *Diagnostic and Statistical*

*Manual of Mental Disorders*. These 50 children were treated with 3 TFT sessions lasting 20 minutes each. After the TFT sessions were administered, most of the children experienced an immediate decrease in the frequency and intensity of flashbacks and other symptoms. The clinical improvement was matched by improvement in the children's test scores. At the conclusion of the 3 sessions, the tests were readministered, and the children's scores were found to be no longer in the PTSD range. These improvements continued to hold a year later when the children were retested.<sup>4</sup>

In general clinical practice, well-trained EP practitioners can help people rapidly recover from a broad range of problems, including the following: panic attacks, phobias, and generalized anxiety; traumatic reactions including PTSD; persistent negative emotional states such as sadness, grief, anger, and depression; and blocks to creative expression and peak performance. EP approaches can be helpful adjuncts to more severe problems such as bipolar disorder and personality disorders, including borderline personality disorder.

In 1999, the Association for Comprehensive Energy Psychology (ACEP) was founded (see the [Key Web Resources box](#)). The purpose of this nonprofit international professional organization, which is headquartered in the United States, is to promote the education, research, and professional practice of EP. In addition, ACEP is a leader in addressing the ethics and scope of practice issues that arise from the spread of this relatively new alternative and integrative therapy. ACEP offers education and certification in its own proprietary comprehensive EP model, and it offers training and certification programs in EFT. Recognizing that EP methods have an important role in mental health contexts, in broader health care settings, and in all areas in which people are working to help others advance themselves and overcome problems (e.g., education, corrections, coaching, sports performance), ACEP developed advanced training programs for both mental health professionals and allied health practitioners.

## What Is the Evidence for Energy Psychology?

Although research is still at an early stage, evidence supporting EP is growing and echoes the positive anecdotal clinical reports. In any new field, research evidence accumulates in a hierarchic fashion from anecdotal reports to outcome studies without control groups to the gold standard randomized controlled trials. The preponderance of evidence across all these studies supports the efficacy of EP interventions. Positive findings have been obtained in studies examining the effectiveness of EP in patients with needle phobias, test anxiety, claustrophobia, public speaking anxiety, and trauma related to automobile accidents.<sup>4</sup>

EP methods show great promise in the treatment of returning veterans. In a randomized controlled trial of EP in combat veterans, 49 veterans had scores higher than the PTSD cutoff. After 6 treatment sessions, 42 of these veterans had scores that were no longer in the PTSD range. These gains were maintained at the 6-month follow-up.<sup>5</sup>

EP treatment often results in rapid and dramatic calming of the cognitive and emotional symptoms associated with distress. Some pilot data suggested that EP treatment produces rapid neurobiologic changes. As an example, Diepold

and Goldstein published a study in which they compared a patient's quantitative electroencephalography pattern before and after a single TFT session. The pattern was abnormal when the subject brought to mind a specific personal trauma, but it was normal when the subject thought about a neutral event. Following a single TFT treatment, no abnormalities were observed in either the traumatic or neutral condition. These positive changes in brain wave patterns remained at 18-month follow-up.<sup>4</sup>

In a health psychology application, TAT was shown to be an effective weight loss maintenance approach compared with a qi gong group and a no-treatment social support and education control. To be included, study participants had to have lost 3.5 kg during a 12-week weight loss program that focused on education and social support. Study subjects participated in a 12-week weight loss maintenance program. TAT was shown to be superior to the two other approaches at the end of the study.<sup>6</sup>

Energy psychology, although a shift from the conventional Western medical belief, appears to be an easy to practice, low-cost with low-harm intervention that can empower patients to recruit internal resources that can resolve stressful emotions. Results have been shown to be sustained over time.

## How Does Energy Psychology Work?

The debate on how EP modalities work is lively. Some investigators, such as Ruden,<sup>7</sup> argue that the clinical results seen in EP treatment can be explained by extending current neuroscience understanding of neuroplasticity in the brain. In a supportive line of inquiry, Kathleen Hui's work<sup>8</sup> at Harvard University demonstrated that stimulating acupoints can lead to modulation of the limbic system. Feinstein argued that EP is an accelerated exposure therapy. In other words, the somatic component of EP treatments, by stimulating the meridian system, accesses a much more rapid information processing system that turns off the body's alarm response and leads to repatterning of negative memory patterns. Presumably, Feinstein's argument could be expanded to include EP methods (e.g., TAT and AIT) that are somatically focused but do not employ percussive tapping on acupuncture points.

Roger Callahan,<sup>9</sup> the developer of TFT, proposed an informational and energetic model suggesting that stimulating meridian points helps to collapse perturbations in the patient's thought field. These energetic perturbations are presumed to be caused by some initial upsetting or traumatic incident. The notion of the existence of a thought field, which is a field of information fundamentally energetic and not localized in brain tissue, appears to be supported by Rupert Sheldrake's work on morphic resonance.<sup>10</sup> In addition, studies on mind effects at a distance offer further support for the possibility that our mind extends beyond the brain.<sup>11</sup> These latter energy- and consciousness-based explanations may better fit actual clinical experience, because many clinicians report positive EP clinical outcomes by activating body energy centers without touching the body or through intention only. Larry Dossey<sup>12</sup> argued that the evidence for nonlocal mind is compelling,

and this nonmechanistic view points to new possibilities for healing. At the same time, it echoes ancient ideas about human interconnectedness.<sup>13</sup> The EP movement may well be one manifestation of this new view.

## How Do I Get Started?

Because EP approaches can be used for self-help, one of the best ways to learn about EP is to begin by trying it out yourself. A basic tenet of EP treatment (similar to acupuncture) is that symptoms occur when we are in a state of energetic imbalance or disharmony. So, a good starting point for self-treatment is a comprehensive energy balancing practice.

A good option is the Four Energy Gates (Fig. 101-1 within the Patient Handout). According to Master Nan Lu, daily practice of these qi gong energy exercises drawn from traditional Chinese medicine can promote overall wellness and contribute to the improvement of emotional and physical symptoms.<sup>14</sup>

To work on a personal issue, follow these four basic steps: begin with a basic balancing practice (the Four Energy Gates); identify the problem; perform an energy clearing or balancing exercise (e.g., the EFT tapping sequence); and evaluate the results and repeat, if necessary (Box 101-2).

For example, let us say that you have an important speaking event coming up and you are experiencing apprehensions about presenting. As the day of the event approaches, you notice that you are avoiding preparing for the talk; you have an unsettled feeling in your belly when you think about it; when you respond to your colleagues' questions about it, your voice trembles; you worry that will embarrass yourself. Of course, these anxieties are common, but you feel your fears are excessive. You decide that you are going to help yourself overcome this problem by using an EP approach. You have already noted the behavioral (avoidance), physical (distress in your belly and shaky voice), emotional (anxiety), and cognitive (worry about embarrassment) components of your anxious reaction. Considering these symptoms, you identify your worry that you will embarrass yourself as the most salient aspect. You establish that your SUDS rating when you think about these worries is a 9. Many EP options are available for addressing this problem. Here is one that is easy to do and is generally very effective. It is based on the EFT, the most popular EP method. If you choose the more comprehensive of the self-treatment protocols, you would begin with the Four Energy Gates practice. This takes approximately 15 to 20 minutes. The acupuncture points used in the Four Energy Gates improve the flow and distribution of your body's Qi. The first three open up the energy flow to the head, middle of your body, and lower body, respectively.

### BOX 101-2. Steps for Energy Psychology Self-Treatment

1. Begin with a balancing practice (four energy gates).
2. Identify the issue (cognitive, emotional, behavioral aspects).
3. Hold the problem in mind while doing the Emotional Freedom Techniques tapping sequence.
4. Evaluate the results and repeat, if necessary. For a shortcut, do only steps 2 to 4.

The last one helps to integrate and harmonize the Qi flow in the body. Many times, just doing the Four Energy Gates can lead to a significant improvement in the problem.

If, after completing the Four Energy Gates, your anxiety remains (you still feel distress when you think about embarrassing yourself when you give the speech) and your SUDS level is not 0, you can then proceed to treat your worry of embarrassing yourself by using the following energy tapping protocol (Fig. 101-2 within the Patient Handout):

1. While tapping firmly and steadily on the side of the hand (sh on the chart), say out loud:  
 “Even though I have this worry that I’ll embarrass myself, I deeply love and accept myself.” Another version you can use is this: “Even though I have this worry that I’ll embarrass myself, I’m attracting love and compassion into my heart.” Repeat these statements three times.
2. Next, tap approximately seven to nine times on each of these acupoints while repeating at each point this phrase, which serves to keep you attuned to the problem: “this worry.” Again, steady and firm tapping works best.
3. Move from one point to the next until you have tapped on all seven points:  
 Eyebrow: eb  
 Side of the eye: oe  
 Under the eye: e  
 Under the nose: un  
 Under the lower lip: ul  
 Under the collarbone: c  
 Under the arm: ua

(Note: You can tap on all the points on the chart, but usually tapping on these seven points is sufficient. Also, do your best to tap on the location shown in the chart. If you are not sure whether you are doing it correctly, do your best and continue with the procedure.)

4. After you have tapped on these points, stop and reevaluate the intensity of the problem. What is the SUDS level now? How much distress remains? To what extent are you able to imagine yourself in the situation and be free from worry and distress? If any upset remains, repeat these steps. However, this time adjust the first statement to this: “Even though I still have some of this worry, I deeply love and accept myself.” The reminder phrase could be “the remaining worry” or “still have some worry.” Complete the tapping sequence and reevaluate. Sometimes, you need to shift the focus of the treatment to a different facet or aspect of the problem, say from the worry of embarrassing to the queasy feeling in your belly. By doing this, usually the problem significantly subsides or disappears after a few rounds of tapping. In some instances, more persistence is required. If you do not experience immediate improvement, keep at it.
5. Usually, when your SUDS reaches 0, and you have no distress when you imagine experiencing the situation, the likelihood is high that you will be able to go through the actual event with little or no distress. However, because the tapping is easy to do, you can always use it as a self-help booster whenever you feel the need. You should test out the treatment as much as possible to be sure that you are completely free of the negative reactions. As you start to notice improvements, push yourself to imagine the target situation at its worst to see whether you experience any distress. If you do, repeat the tapping, targeting those specific reactions.



## How Do I Get Trained?

EP appears simple, and for many issues it can be. Using EP clinically to treat a diverse clinical population with a range of problems requires advanced training, however. Furthermore, knowledge of various ways of working energetically allows you to individualize treatment. EP training for professionals is becoming more rigorous. ACEP sponsors several training programs, and you can also go to the Web sites of other methods to discover ways to learn and become certified in those approaches (see the [Key Web Resources box](#)).

## Importance of Personal Practice and Development

As you use EP methods more frequently, an important shift occurs. You internalize your experience that entrenched and difficult to treat problems can often be transformed quickly. Contrary to the generally held idea that you must work through the deep psychological roots of problems, you can reliably facilitate deep and enduring personal change by addressing the energetic foundations of problems.

In all energy work, indeed in all healing, the practitioner's personal development is critical. Caring, compassion, and technical skill are essential to the healing encounter. So, however, is the internal energetic level of the practitioner. Practitioners should establish a personal practice that

can increase their energy level. For example, performing the Four Energy Gates everyday gradually improves your internal energy and helps you to be more effective. Other examples could include a regular meditation practice, doing yoga, or taking daily walks in nature. Time devoted to your personal practice has many visible and invisible benefits.

As with any healing-oriented practice, work on yourself first by grounding and balancing your own energy. This can be done in various ways, including the four energy gates technique, meditation, breath work, and others.

## Energy Psychology as a First-Line Treatment

Patients come to see their doctors and health care practitioners to seek treatment for disturbing symptoms. That many of these symptoms are not based on any significant disorder is well known. Often, these symptoms are somatic messages related to ongoing stress and disharmony in the patient's life. Having EP as part of your tool set will enable you to alleviate your patients' symptoms by helping them deal with the underlying stress that is at the root of their distress. An added benefit is that by offering EP treatment, you can help patients leave your office feeling better. In addition, they will have an effective, inexpensive, and safe self-help tool that they will be able to use forever.

### KEY WEB RESOURCES

Association for Comprehensive Energy Psychology: [www.energypsych.org](http://www.energypsych.org)

EFT Universe: [www.eftuniverse.com](http://www.eftuniverse.com)

<http://video.google.com/googleplayer.swf?docid=6887426238803490578&hl=en&fs=true&autoplay=1>

TATLife: [www.tatlife.com](http://www.tatlife.com)

Energy Psychology: [www.energypsych.com](http://www.energypsych.com)

Innersource: [www.innersource.net](http://www.innersource.net)

Traditional Chinese Medicine World Foundation: [www.tcmworld.org](http://www.tcmworld.org)

The Association for Comprehensive Energy Psychology is an international nonprofit professional organization whose goals are to promote the education, training, research, and ethical practice of comprehensive energy psychology.

This Web site contains many articles and case examples of the application of The Emotional Freedom Techniques (EFT).

Of particular interest is a short video showing the before and after results of EFT treatment of four severely traumatized veterans.

This is the home site for the Tapas Acupressure Technique.

This is the Web site for Dr. Fred Gallo, who is credited with coining the term energy psychology and who wrote the first textbook on it (*Energy Psychology*). He has developed numerous methods, including Energy Diagnosis and Treatment Methods (EDxTM).

This is Dr. David Feinstein's and Donna Eden's Web site, which includes links to many of Dr. Feinstein's articles, as well as information about Donna Eden's energy medicine workshops and trainings.

This Web site describes the many programs offered by Master Nan Lu. Energy psychology has direct links to traditional Chinese medicine. Master Lu's programs and training are a natural way to deepen your grasp and appreciation of the healing principles behind energy psychology.

### Patient Handout: Energy Psychology Self-Care Patient Handout

Use the 4 Energy Gates (Figure 101-1) for daily self-care. Also, use this practice when dealing with an emotional, personal, or physical problem that is not passing on its own. You can do one or more of the 4 Energy Gates throughout the day, whenever you need a pick-me-up. (*Remember to consult with your physician if you have any serious health concerns.*)

Use the tapping method (Figure 101-2) to address a particular distressing emotional or personal issue.



#### The Four Energy Healing Gates: Universal Pathways to Health



On the web between the thumb and index finger: With firm pressure, make small circles for 4 to 5 minutes. Note: the outside, active hand supports and protects.



On the center line of the body between the breasts: Place one palm over the other, and using light pressure only, circle in a clockwise direction at least 200 times (can also be done counter-clockwise).



Just to each side of the center line, four fingers below the navel: Tap this area with two fingers of each hand for 4 to 5 minutes.



In the center "dimple" of the main muscle of the buttocks: Keeping arms, shoulders and hips relaxed, hold a loose fist and alternately punch this area for 4 to 5 minutes.

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Fig 101-1. Energy Psychology Meridian Tapping Protocol

From: Traditional Chinese Medicine World Foundation. [http://www.tcmworld.org/\\_downloads/FourEnergyGates\\_FullPage.pdf](http://www.tcmworld.org/_downloads/FourEnergyGates_FullPage.pdf)  
Accessed June 20, 2011.

1. Identify the problem that is blocking you. Is it primarily an emotional, cognitive, or behavioral issue? Is it physical (e.g., shoulder pain)? Rate it from 0–10 (10 is the most distress).

2. Then while tapping firmly and steadily on the side of the hand (sh on the chart) say aloud (to yourself):

*“Even though I have this [insert your problem], I deeply love and accept myself.”* Or, use this:

*“Even though I have this [insert your problem], I attract love and compassion into my heart.”*

Repeat 3 times.

3. Next, tap steadily and firmly about 7–9 times on each of the following acupoints, while saying at least once at each point, a brief reminder of the issue you are working on. (See Fig. 101-2.)

Eyebrow – eb

Side of the eye – oe

Under the eye – e

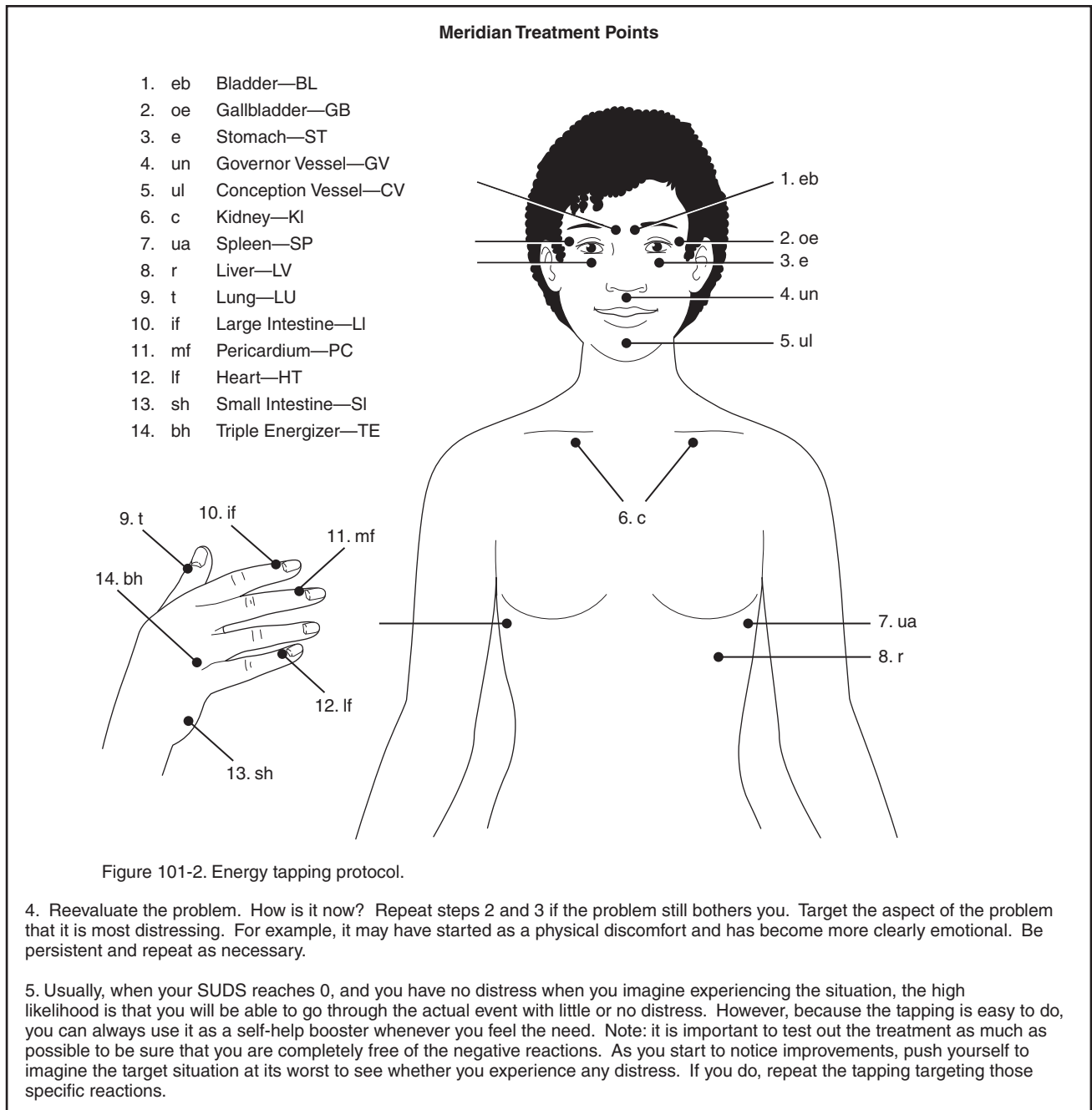
Under the nose – un

Under the lower lip – ul

Under the collarbone – c

Under the arm – ua

(Note: You can tap on all of the points on the chart, but usually tapping on these 7 points is sufficient. Also, do your best to tap on the location shown in the chart. If you are not sure if you are doing it correctly, do your best and continue with the procedure.)



## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. Goswami A. *The Quantum Doctor: A Physicist's Guide to Health and Healing*. Charlottesville, VA: Hampton Roads Publishing; 2004.
2. Shealy CN, Dawson C. *Soul Medicine: Awakening Your Inner Blueprint for Abundant Health and Energy*. Santa Rosa, CA: Elite Books; 2006.
3. Shapiro F, Forrest M. *EMDR: The Breakthrough Therapy for Overcoming Anxiety, Stress and Trauma*. New York: Basic Books; 1997.
4. Feinstein D. Energy psychology: a review of the preliminary evidence. *Psychotherapy (Chic)*. 2008;45:199–213.
5. Feinstein D. *The case for energy psychology*. p 4. Available at: <http://www.psychotherapynetworker.org>, p4; accessed. 4.12.10.
6. Elder C, Ritenbaugh C, Mist S, et al. Randomized trial of two mind-body interventions for weight-loss maintenance. *J Altern Complement Med*. 2007;13:67–78.
7. Ruden RA. A model for disrupting an encoded traumatic memory. *Traumatology*. 2007;13:71–75. <<http://tmt.sagepub.com/content/13/1.toc>>; Accessed 31.10.11.
8. Hui KK, Liu J, Makris N, et al. Acupuncture modulates the limbic system and subcortical gray structures of the human brain: evidence from fMRI studies in normal subjects. *Hum Brain Mapp*. 2000;9:13–25.
9. Callahan RJ. *Tapping the Healer Within: Using Thought Field Therapy to Instantly Conquer Your Fears, Anxieties and Emotional Distress*. Chicago: Contemporary Books; 2001.
10. Sheldrake R. *A New Science of Life: The Hypothesis of Morphic Resonance*. Rochester, VT: Park Street Press; 1995.
11. Radin D. *Entangled Minds: Extrasensory Experiences in a Quantum Reality*. New York: Simon and Schuster; 2006.
12. Dossey L. *Reinventing Medicine: Beyond Mind-Body to a New Era of Healing*. New York: HarperCollins; 1999.
13. Schlitz MJ, Braud WG. Distant intentionality and healing: assessing the evidence. *Altern Ther Health Med*. 1997;3:62–73.
14. Lu N. The four energy gates. Paper presented at the Association for Comprehensive Energy Psychology International Conference, San Diego, CA; June 4-14. 2010.



# Prescribing Probiotics

J. Adam Rindfleisch, MD, MPhil

## What Is a Probiotic?

Our intestines harbor trillions of organisms; in fact, they constitute 95% of the cells in our bodies.<sup>1</sup> Metagenomics and DNA studies indicate that the human gut houses somewhere on the order of 30,000 to 40,000 different organisms,<sup>2</sup> and with each passing year, new physiologic roles for these organisms have been discovered. Some investigators have gone so far as to refer to the enteric flora as “the forgotten organ” of the body.<sup>3</sup>

Since the 1980s, tremendous interest has developed in ways the ecosystem of the gut may be altered, not only to decrease pathogen numbers but also to promote overall health. Many different foods and supplements that contain microbes—namely, species of bacteria or yeasts—are now available over the counter. These products are widely known as probiotics, a hybrid word created by combining the Latin *pro-* (“for”) with the Greek adjective *-biotic* (“life”).<sup>4</sup> For all the commercial and scientific attention these supplements currently receive, only in the 1990s did the word probiotic enter both medical and general lexicons on a regular basis. The word was first put into play in 1965,<sup>5</sup> but its very definition remained elusive for many years. Most experts would now agree that a probiotic is a preparation or product containing a defined single or mixed culture of live microbes that, when ingested in sufficient numbers, will exert beneficial effects on health beyond basic nutrition by altering the gastrointestinal microbiota.<sup>5–8</sup>

For a food or supplement to be considered a probiotic by most definitions, it must meet several criteria, including the following<sup>9</sup>:

1. It must contain live organisms capable of colonizing the gastrointestinal tract, meaning that, among other things, it should be acid and bile tolerant.
2. It should improve the health and well-being of the host.
3. Its organisms should be generally recognized as safe (GRAS) and not pathogenic. (In the case of some *Enterobacter* species that have been used, this may not be the case.)

4. Host-specific strains of organisms should be used; humans should receive strains specific to humans and not to animals.

Increasing evidence indicates that many (but by no means all) products meet these specifications. Thirty to 40 species account for 99% of the bacteria present in the gut and often inform the selection of strains used therapeutically. The two most common genera of bacteria used in probiotics are *Bifidobacterium* (e.g., *Bifidobacterium bifidus*) and *Lactobacillus* (e.g., *Lactobacillus reuteri*). Strains of *Streptococcus* and Enterobacteriaceae are less commonly included.<sup>10</sup> *Saccharomyces boulardii*, a probiotic yeast, has been found to have a wide array of benefits and is gaining popularity.<sup>10,11</sup> *Escherichia coli* Nissle 1917 (the last part of the name is the subspecies designation) was discovered in the feces of World War I soldiers who were resistant to salmonellosis and shigellosis and is widely used in Europe. Products may contain just one species, or they may contain a mixture of different organisms.

The most common probiotic species used are *Lactobacillus* and *Bifidobacterium*. *Saccharomyces boulardii*, a probiotic yeast, has also shown promise for many indications.

## Why Are Probiotics Used to Promote Health?

Probiotic therapy is not a new idea; in fact, its genesis can be traced to ancient times. Reference to such therapy was made in the Persian version of Genesis (18:8), which states, “Abraham owed his longevity to the consumption of sour milk.”<sup>12</sup> The Roman historian Plinius noted that fermented foods could be of benefit to persons with signs and symptoms compatible with what would now be termed gastroenteritis.<sup>7</sup>

The modern use of microbial interference therapy, or probiotics, is tied to the late nineteenth century observation by microbiologists that the resident bacterial flora of people who were healthy was different from that of people who were symptomatically ill.<sup>13</sup> In the early twentieth century, the Russian scientist and Nobel laureate Elie Metchnikoff posited that ingestion of lactobacilli in fermented foods contributed to the longevity of Bulgarian peasants by optimizing the balance between gastrointestinal pathogens and nonpathogens.<sup>14,15</sup> Researchers theorized over the years that the microbiota of the gut somehow influenced health and illness. It stood to reason that changing the microbial mix could lead to health benefits.

Most people in the general population consider the gastrointestinal tract a closed tube through which food-stuffs and then waste products pass, but this is an oversimplification. To explain why probiotics may be used to promote health, a review of some important gut functions is worthwhile. Some of these functions include the following:

1. Permeability (and screening what moves into and out of the bloodstream). The intestinal mucosa has a very large surface area, and it serves as an important interface with “the outside world,” constantly exposed to foreign molecules, bacteria, fungi, and viruses.<sup>8</sup> The mucosal system that begins in the mouth and ends at the anus is, in fact, a permeable system that leaches microbes (translocation) and dietary antigens into the systemic circulation and tissues. Probiotics influence this permeability in many ways.<sup>11</sup>
2. Motility (peristalsis), as directed by the enteric nervous system. The gut flora influences chemical mediators that affect the physiology of the elaborate enteric nervous system and ultimately influence the body’s nervous system as a whole.<sup>16</sup> Research shows that gut microbiota may even influence brain development and subsequent adult behavior in mammals.<sup>17</sup>
3. Immune function. At any given time, most immune system activity occurs within the gastrointestinal tract. Gut-associated lymphoid tissue is influenced by the types of bacteria that are present in the gut and the signaling mechanisms they trigger.<sup>18</sup>

Clearly, intraspecies and interspecies communication between gut microbes occurs (this is known as quorum sensing),<sup>19</sup> and a dialogue between bacteria and host is ongoing as well.<sup>20</sup> In fact, human evolution and the evolution of gut microflora are so intimately interconnected that it is easy to imagine the degree of complexity that now characterizes this commensal relationship.

Although gastrointestinal physiology and the composition of the microbiota are likely highly individualized, some common factors can have a negative effect on them, including the following:

- Poor eating habits
- Chronic physical and emotional stress
- Lack of exercise
- Insufficient rest
- Frequent exposure to antibiotics
- Geographic factors

## How Do Probiotics Work?

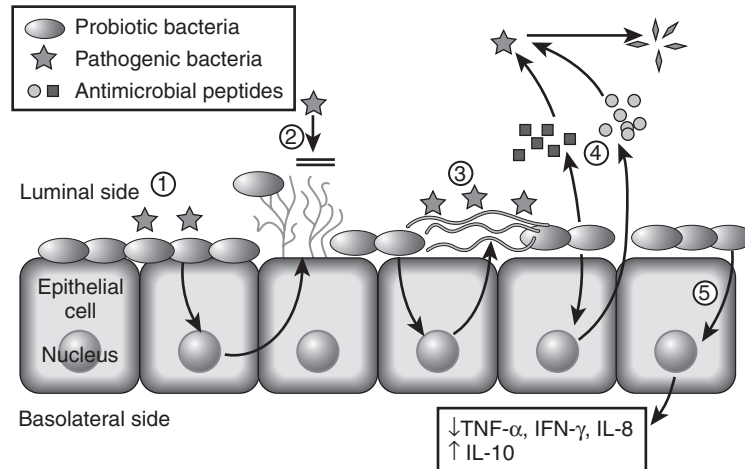
Probiotics have been found to improve health through numerous different mechanisms, many of which may be specific to individual species. Different species predominate, based on the location along the gastrointestinal tract, in part because the rate of gut motility varies greatly from one part of the gut to another. In healthy persons, the transit time from mouth to anus is between 55 and 72 hours, of which 4 to 6 hours comprise the transfer time from the mouth to the cecum, and the remaining time reflects transit through the colon. Some species live close to the gut lining, whereas others live in the center of the lumen.<sup>3,21</sup> Some of the key mechanisms of action of probiotics, as described in the literature, include the following:<sup>1,3,10,11,22</sup>

1. Blockade of toxin receptor sites
  2. Inhibition of the growth of pathogenic microbes
  3. Inhibition of pathogen attachment to receptor sites
  4. Engagement in cross-talk with other flora to enhance resistance to colonization. Biofilms, which are aggregations of ordered and often specialized groups of microorganisms that often perform complex functions, seem to play a role
  5. Enhancement of tight junction bonding and prevention of impaired barrier function
  6. Production of cytochrome P-450–like enzymes and facilitation of detoxification
  7. Exertion of trophic effects by influencing transport pathways and the production of energy and protein, as well as by releasing enzymes that facilitate the maturation of enterocytes
  8. Production of B vitamins and vitamin K
  9. Interaction with the immune system. Potential mechanisms include altering secretory immunoglobulin A levels, decreasing inflammatory effects of natural killer cells, and trapping helper T cells in mesenteric lymph nodes to decrease the inflammatory response
  10. Creation of a physiologically challenging environment (low pH, production of toxic byproducts)
  11. Competitive consumption of nutrients
  12. Reduction of concentrations of oncogenic enzymes in the gut
  13. Direct DNA signaling. Even dead probiotic organisms can exert an influence on some (but not all) aspects of gut physiology; this has been referred to as the probiotic paradox.<sup>23</sup> One study examining the effect of probiotic organisms on a murine model of colitis found that non-viable organisms were just as effective as live microbes. In this study, the beneficial effects of probiotics were attributable not to microbial colonization and generation of metabolic byproducts, but rather to Toll-like receptor signaling mediated by microbial DNA (Fig. 102-1).<sup>24</sup>
- The gut microbiota may actually help shape individual human physiology by influencing expression of genes critical to proper development of the intestines and functions, including nutrient absorption and metabolism, metabolism of toxins, gut maturation, and angiogenesis.<sup>25</sup>

Probiotics have multiple potential mechanisms of action. Different species have very different degrees of efficacy in clinical trials.

**FIGURE 102-1**

Schematic summary of some of the mechanisms of action of probiotics in the bowel. Probiotics can alter pathogenic bacterial adherence to the bowel wall through (1) a physical barrier, (2) an altered epithelial surface glycosylation pattern, and (3) increased mucin production. Other modes of action include (4) secretion of antimicrobial peptides and (5) modulation of the immune system. IFN, interferon; IL, interleukin; TNF, tumor necrosis factor. (Redrawn from Borowiec AM, Fedorak RN. The role of probiotics in management of irritable bowel syndrome. *Curr Gastroenterol Rep.* 2007;9:393–400.)



## What Are Prebiotics, Synbiotics, and Postbiotics?

### Prebiotics

Also known as probiotic enhancers or colon food, prebiotics are nondigestible nutrients that selectively stimulate the growth and activity of one or more colonic microorganisms that act to promote the health and well-being of the host.<sup>26</sup> The prebiotics developed thus far are mainly nondigestible oligosaccharides, which have traditionally been used to add fiber to foods without adding bulk. Prototypes include inulin (a chicory fructan) and fructooligosaccharides, which occur naturally in garlic, onion, leeks, asparagus, chicory, bananas, wheat, oats, soybeans, and artichokes.<sup>27</sup> Inulin and oligofructose stimulate the growth of bifidobacteria at the expense of *Bacteroides*, *Clostridium*, and coliform bacteria.<sup>26</sup> Chicory fructans have also been shown to enhance the absorption and balance of dietary calcium.<sup>28,29</sup> Other oligosaccharides, such as xylose, maltose, and mannose, also show promise as prebiotics. Lactulose is perhaps one of the prebiotics most familiar to medical practitioners.

Common prebiotic foods include garlic, onion, leeks, asparagus, chicory, banana, wheat, oats, soybeans, and artichoke.

### Synbiotics

Synbiotics are products that contain both prebiotic and probiotic ingredients. The thinking is that consuming both at once, instead of just the probiotic alone, may enhance microbe survival during transit through the upper gastrointestinal tract and lead to greater positive effects on the beneficial microbes already established in the intestines. Although most studies have focused exclusively on prebiotics, a growing body of synbiotics research now exists. For example, one trial confirmed that a synbiotic of *Lactobacillus casei* and inulin reduced toxic protein fermentation metabolites in the gut.<sup>30</sup>

Synbiotics have been found to decrease levels of proinflammatory cytokines as well.<sup>31</sup> In vitro studies suggested that prebiotics and synbiotics could play a role in colon cancer chemoprevention by reducing the incidence of aberrant crypt foci, as was shown in rat studies in which intestinal changes were induced by known carcinogens.<sup>32,33</sup> Synbiotics were also found to be effective in improving clinical symptoms of active Crohn's disease.<sup>34</sup> In addition, synbiotics containing *Lactobacillus helveticus*, *Bifidobacterium infantis* and *Bifidobacterium bifidum*, and fructooligosaccharide were found to limit common winter infections in schoolchildren.<sup>35,36</sup>

### Postbiotics

Postbiotics, which have received less overall clinical research thus far, are metabolic byproducts, generated by probiotics, that influence host physiology.<sup>37</sup>

## How Does the Human Microbiota Become Established?

Every person's microbiota is initially determined at birth, specifically by the mode of delivery. A newborn's gut is sterile. When a baby is delivered vaginally, his or her gastrointestinal tract is seeded with organisms from the mother's vagina, whereas the gastrointestinal tract of a baby delivered by cesarean section is largely populated by organisms from the surrounding environment.<sup>38–40</sup> The following factors in the neonatal period also play a role in composition of the ultimate gut microbiota in a child:

- Breast-feeding versus bottle-feeding (higher concentrations of potentially beneficial bifidobacteria are found in the gut when babies are breast-fed, as are fewer potential pathogens<sup>41</sup>)
- Term versus preterm birth
- Administration of antibiotics
- Surrounding environment (level of sanitation)

TABLE 102-1. Therapeutic Benefits of Probiotic Therapy\*

<b>Conditions for Which Probiotics Are of Proven Benefit</b>	Diarrheal illness (viral): <ul style="list-style-type: none"> <li>• Treatment and prevention of viral diarrhea<sup>44,47</sup></li> <li>• Prevention of antibiotic-associated diarrhea<sup>48</sup></li> <li>• Traveler's diarrhea prevention<sup>49</sup></li> </ul> Eczema (particularly when given prenatally) <sup>50,51</sup> Flatulence <sup>52</sup> Hepatic encephalopathy (minimal severity) <sup>53</sup> Irritable bowel syndrome (number needed to treat of 4 with bifidobacteria) <sup>54</sup> Necrotizing enterocolitis prevention in preterm infants <sup>55</sup> Prevention <sup>45</sup> <ul style="list-style-type: none"> <li>• Colds in older adults<sup>56</sup></li> <li>• Infections in daycare facilities (gastrointestinal)</li> <li>• Potentiation of response to influenza vaccine</li> </ul>
<b>Conditions for Which Data Suggest Probiotics Have Benefit</b>	Acute diarrhea prevention <sup>44,58</sup> Bacterial vaginosis <sup>59,60</sup> (combination of <i>L. rhamnosus</i> GR-1 and <i>L. reuteri</i> RC-14 showed most promise in restoring vaginal microbiota) <i>Clostridium difficile</i> infection (namely, recurrences) <sup>11</sup> Diarrhea, persistent (more than 14 days) <sup>61</sup> <i>Helicobacter pylori</i> treatment enhancement <sup>62</sup> Inflammatory bowel disease <sup>63,64</sup> Infant growth (especially children of mothers with HIV infection) <sup>65</sup> Postoperative infections after abdominal surgery <sup>45</sup> Radiation-induced diarrhea <sup>66</sup> Respiratory tract infection (seems mainly to decrease severity, not duration) <sup>67</sup> Ventilator-associated pneumonia <sup>68</sup>
<b>Conditions for Which Probiotic Therapy Holds Promise</b>	Allergic rhinitis <sup>69</sup> Asthma <sup>70</sup> Attention deficit disorder and attention deficit hyperactivity disorder <sup>71</sup> Autism <sup>72</sup> Chemotherapy-induced diarrhea <sup>73</sup> Chronic fatigue-related cognitive function <sup>74</sup> Colic <sup>43</sup> Cancer prevention <sup>45</sup> Colon cancer recurrence <sup>46</sup> Cystic fibrosis <sup>75</sup> Dental diseases, including caries, gingivitis, halitosis <sup>45,46</sup> Diabetes (type 1) <sup>76</sup> Diverticular disease <sup>77</sup> Dyslipidemia <sup>45,78</sup> Food allergies <sup>46,79</sup> HIV-related diarrhea <sup>11</sup> Liver disease <sup>45</sup> Rheumatoid arthritis <sup>45</sup> Genitourinary tract infections <sup>80,81</sup> (especially insertion of <i>Escherichia coli</i> probiotics through a bladder catheter). Nephrolithiasis <sup>82</sup>
<b>Conditions for Which Probiotic Therapy Has Not Proven Beneficial</b>	Lactose intolerance <sup>83</sup> Otitis media <sup>45</sup> Pancreatitis <sup>84</sup> Spondyloarthropathies <sup>85</sup>

Data from references 10, 11, 21, and 43 to 85.

HIV, human immunodeficiency virus.

\*Remember that benefits are strain specific. This list focuses on many of the conditions that have been studied, primarily using meta-analysis and systematic reviews, but it is by no means comprehensive.

- Socioeconomic status
- Geographic factors

Positive effects on colonization of the gut with healthy flora can be listed as yet another clinically proven benefit of breast-feeding.

Investigators have found that supplementation of formula with probiotics can have several benefits for infants, including reducing Enterobacteriaceae and *Clostridium* counts, favorably altering stool pH, altering fecal immunoglobulin A and

short-chain fatty acid concentrations (the latter connected to resistance to pathogen colonization), and decreasing intestinal permeability.<sup>42</sup> Once established, the intestinal microbiota is relatively constant and difficult to alter over the long term.

## What Are Clinical Indications for Prebiotic and Probiotic Use?

Probiotics are intended to be used for prevention and, in some instances, treatment of many different specific maladies, as listed in Table 102-1, which summarizes key findings



of numerous probiotic-focused systematic reviews and meta-analyses.<sup>43-85</sup> Different probiotics are used for different conditions; the reader should keep in mind which species were used in any given study.

## How Should Probiotic Supplements Be Taken?

A simplistic view of probiotic therapy (“Just take any probiotic and follow the label instructions,” or “Simply take acidophilus”) does a disservice to published research in this field and also may not serve the best interests of patients. Clinicians must remember that therapeutic benefits ascribed to probiotic therapy are strain specific.<sup>86</sup> Numerous microbes are promoted as probiotics, and data comparing strains with one another in terms of clinical efficacy for specific maladies are largely lacking. With various studies using different strains in varying doses for numerous illnesses in dissimilar populations over disparate time courses and using different experimental models, one can see how generalizations about administration of probiotic therapy must be avoided and how urgently additional study is needed.

Daily dosages given for prebiotics and probiotics range widely, anywhere from 1 million to 20 billion colony-forming units (CFUs), but recommendations tend toward 1 to 10 billion CFUs for infants and 10 to 20 billion CFUs for older children and adults. A 2008 review of probiotics for diarrhea in children found that doses of at least 10 billion CFUs/day were necessary for effect.<sup>47</sup> To achieve and maintain a therapeutic effect, probiotics must be administered repeatedly to ensure a sufficient and consistent population level over time. Available data regarding the appropriate duration of therapy for various clinical conditions are limited, however.

Table 102-2 lists some of the key probiotics, the doses in which they are administered, and the indications for which they have been found to be effective.<sup>87</sup>

Some manufacturers beg to differ, but to minimize exposure to gastric acid, most experts recommend taking probiotics on an empty stomach. When taken during a course of antibiotic therapy, probiotics should be started as soon as possible and continued for 7 to 14 days after completion of therapy. Some authorities recommend separating antibiotics and bacteria-derived probiotics by 2 hours.<sup>86</sup> The body's microflora typically takes 6 to 8 weeks to recover after exposure to an antibiotic.

TABLE 102-2. Commonly Studied Organisms With Significant Probiotic Potential

PROBIOTIC SPECIES NAME	EXAMPLES OF CONDITIONS WHERE BENEFIT HAS BEEN FOUND	DOSE (COLONY-FORMING UNITS)
<b>Lactobacillus</b>		
<ul style="list-style-type: none"> <li>• <i>Lactobacillus acidophilus</i></li> <li>• <i>Lactobacillus reuteri</i></li> <li>• <i>Lactobacillus rhamnosus</i> GG</li> </ul>	<ul style="list-style-type: none"> <li>Vulvovaginal candidiasis</li> <li>Acute infectious diarrhea in children</li> <li>Acute infectious diarrhea in children</li> </ul>	<ul style="list-style-type: none"> <li>8 oz yogurt with at least <math>10^8</math> CFU/mL daily for 6 mo</li> <li><math>10^{10}</math>–<math>10^{11}</math> twice daily for up to 5 days</li> <li><math>10^{10}</math> in 250 mL oral rehydration solution (infants); <math>10^{10}</math>–<math>10^{11}</math> twice daily for 2–5 days (older children)</li> </ul>
	<ul style="list-style-type: none"> <li>Antibiotic-associated diarrhea</li> <li>Traveler's diarrhea prevention</li> </ul>	<ul style="list-style-type: none"> <li><math>6 \times 10^9</math>–<math>4 \times 10^{10}</math> daily for 1–2 wk</li> <li><math>2 \times 10^9</math> daily from 2 days before leaving and throughout trip</li> </ul>
	<ul style="list-style-type: none"> <li>Irritable bowel syndrome (combined with other lactobacilli)</li> <li>Atopic disease prevention</li> </ul>	<ul style="list-style-type: none"> <li><math>8</math>–<math>9 \times 10^9</math> daily for 6 mo</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Lactobacillus salivarius</i></li> </ul>	<ul style="list-style-type: none"> <li>Vulvovaginal candidiasis</li> </ul>	<ul style="list-style-type: none"> <li><math>10^{10}</math> daily for 2–4 wk before due date for pregnant women; then infant administration for 6 mo</li> <li><math>10^9</math> per suppository, inserted twice daily for 7 days</li> </ul>
<b>Bifidobacterium</b>		
<ul style="list-style-type: none"> <li>• <i>Bifidobacterium bifidum</i></li> <li>• <i>Bifidobacterium infantis</i></li> <li>• <i>Bifidobacterium longum</i></li> </ul>	<ul style="list-style-type: none"> <li>Overall better scores for irritable bowel syndrome treatment</li> <li>Necrotizing enterocolitis</li> </ul>	
	<ul style="list-style-type: none"> <li>Irritable bowel syndrome</li> </ul>	<ul style="list-style-type: none"> <li><math>10^6</math>–<math>10^{10}</math> daily for 4 wk</li> </ul>
	<ul style="list-style-type: none"> <li>Combined with fructooligosaccharides, improvement in some outcomes in ulcerative colitis</li> </ul>	
<b>Other Forms</b>		
<ul style="list-style-type: none"> <li>• <i>Escherichia coli</i> 1917 Nissle</li> </ul>	<ul style="list-style-type: none"> <li>Ulcerative colitis</li> </ul>	<ul style="list-style-type: none"> <li>Acute flares: <math>5 \times 10^{10}</math> twice daily until remission, maximum of 12 wk, followed by once daily for maximum of 12 mo</li> <li>Flare prevention: <math>5 \times 10^{10}</math> daily</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Streptococcus thermophilus</i></li> <li>• <i>Saccharomyces boulardii</i> (yeast)</li> </ul>	<ul style="list-style-type: none"> <li>Antibiotic-associated diarrhea</li> <li><i>Clostridium difficile</i> infection</li> <li>Traveler's diarrhea prevention</li> <li>Ulcerative colitis</li> <li>Crohn's disease</li> </ul>	<ul style="list-style-type: none"> <li><math>4 \times 10^9</math>–<math>2 \times 10^{10}</math> daily for 1–4 wk</li> <li><math>2 \times 10^{10}</math> daily for 4 wk plus vancomycin and/or metronidazole</li> <li><math>5 \times 10^9</math>–<math>2 \times 10^{10}</math> daily from 5 days before leaving and throughout trip</li> <li>Flares: 250 mg three times daily for 4 wk, plus mesalamine</li> <li>Maintenance: 1 g daily for 6 mo, plus mesalamine</li> </ul>

TABLE 102-2. Commonly Studied Organisms With Significant Probiotic Potential—cont'd

PROBIOTIC SPECIES NAME	EXAMPLES OF CONDITIONS WHERE BENEFIT HAS BEEN FOUND	DOSE (COLONY-FORMING UNITS)
<b>Combinations</b>		
<ul style="list-style-type: none"> <li>• <i>L. acidophilus</i> and <i>B. delbrueckii</i> subspecies <i>bulgaricus</i></li> </ul>	Antibiotic-associated diarrhea	$2 \times 10^9$ daily for 5–10 days
<ul style="list-style-type: none"> <li>• <i>L. acidophilus</i> and <i>B. longum</i></li> </ul>	Antibiotic-associated diarrhea	$5 \times 10^9$ daily for 7 days
<ul style="list-style-type: none"> <li>• <i>L. rhamnosus</i> GR-1 and <i>L. fermentum</i> RC-14</li> </ul>	Vulvovaginal candidiasis	$10^9$ bacteria in skim milk, twice daily (taken orally) for 14 days
<ul style="list-style-type: none"> <li>• VSL#3*</li> </ul>	Irritable bowel syndrome Ulcerative colitis	$9 \times 10^{11}$ daily for 8 wk Active flares: $1.8 \times 10^{12}$ twice daily for 6 wk plus conventional therapy
	Pouchitis	$1.8 \times 10^{12}$ bacteria twice daily

From Williams NT. Probiotics. *Am J Health Syst Pharm.* 2010;67:449–458.

\*A cocktail of eight different species: *S. thermophilus*, *B. breve*, *B. longum*, *B. infantis*, *L. acidophilus*, *L. plantarum*, *L. casei*, and *L. delbrueckii* subspecies *bulgaricus*.

This recovery period is decreased to just a few days with probiotic use.<sup>88</sup> Most studies of antibiotic-associated diarrhea have subjects take the probiotic for as long as they take the antibiotic therapy, and continuing for a few weeks after antibiotics are completed is a reasonable recommendation.

Treatment is typically well tolerated, and palatability is an uncommon issue because the capsules can be opened and mixed into drinks or soft foods. Sometimes, the agents are available as powders. If effective, treatment can continue indefinitely. Precautions do exist, however (see later). If a patient has not noticed a benefit after 6 weeks or more of use, a trial of a different species or another approach altogether is worth considering. Often, a trial of *Saccharomyces boulardii* may be merited if bacterial probiotics are not found to be helpful.<sup>11</sup>

Refrigeration is recommended for products that have been heat-dried, because they are more likely to die off with temperature extremes and need refrigeration. Lypophilized preparations (as noted on the bottle) do not need refrigeration and tend to have good overall long-term survival.

Brand choice is important. One study of 14 commercial probiotics sold in the United States found that 93% were incorrectly labeled; nearly 36% did not list strains on the label at all, and nearly 60% had contaminants.<sup>89,90</sup> Another study that tested 58 products from around the world found that only 38% contained the dose stated on the label, and 29% did not contain strains listed on the label.

How may one select a reliable probiotic brand? Consider the following:

- Use products from companies that have actively sponsored probiotics research.
- Consider using a Web site such as [www.consumerlab.com](http://www.consumerlab.com) (a subscription currently costs approximately \$30/year). The laboratory tests different brands of supplements to verify whether they contain what they claim on their labels. Products that are of good quality are listed.

- Make certain products have a Good Manufacturing Practices (GMP) seal.
- Ensure that the product specifies which species it contains and in what quantities.

Although many companies manufacture probiotic cocktails (mixes of several different species), few studies have not reviewed the efficacy of combinations. Benefits vary by microorganism. For example, different bifidobacteria tolerate different pH levels and vary in terms of fecal recovery rates after they have been consumed.<sup>91</sup>

#### General guidelines for taking probiotics:

- Take 2 hours before or after antibiotics.
- Take on an empty stomach.
- Heat-dried formulations should be kept in the refrigerator; lypophilized ones can handle room temperature.
- Most doses range from 1 to 10 billion colony-forming units once or twice daily.

## Do Natural Food Sources Provide Probiotic Exposure?

Yes, but not without a few caveats. European, African, and Asian consumers have long been exposed to probiotics as found in functional foods, typically fermented and nonfermented dairy products such as yogurt, buttermilk, sauerkraut, kefir, and kimchi. However, the organisms typically found within these foods are often not the same microbes for which significant supportive research data exist regarding health benefits. For example, the live cultures in yogurt products frequently emphasize *Lactobacillus delbrueckii* subspecies *bulgaricus* and *Streptococcus thermophilus*, two organisms that may not survive passage through gastric acid and bile to colonize the gut mucosa.

Consumers should be sure to purchase products in which the probiotic organisms are added after pasteurization; otherwise, the bacteria are killed during that process.

Using products that clearly state “contains active cultures” or “living yogurt cultures” is best.<sup>92</sup>

Typically, frozen foods do not contain live cultures, and foods such as frozen yogurt likely do not constitute a good probiotic source. However, work is progressing in the development of probiotic ice creams.<sup>93</sup>

## How Safe Are Probiotics?

Today, diets high in fermented foods remain popular worldwide. They have been used for decades, and little, if any, risk has been identified with them. Probiotic therapy, obtained through supplements or by dietary means, appears to be extremely safe.<sup>10,11,43,45,46,94,95</sup> Many of the safety concerns raised are linked to case reports only, and when compared with many commonly used medications (including antibiotics), probiotics and prebiotics fare much better in terms of adverse effects.

Bacteria do translocate, however, and case reports of bacteremia and liver abscess exist.<sup>96,97</sup> Case reports have been published documenting rare infectious complications with *Saccharomyces boulardii* in nonimmunocompromised patients who were nonetheless ill.<sup>98,99</sup> Caution is advised regarding the use of probiotics in the following settings<sup>100</sup>:

- Immunocompromised patients
- Premature infants. Studies of the use of probiotics for prevention of necrotizing enterocolitis demonstrated minimal risk, however. A 2010 study pooling side effects data for more than 1100 infants found probiotic use to be quite safe.<sup>101</sup>
- Patients with central venous access or other indwelling medical devices in place
- Use of an untested probiotic strain

- Pancreatitis. A 2008 study found increased mortality (relative risk, 2.53; 95% confidence interval, 1.22 to 5.25) in a group of 152 inpatients with severe acute pancreatitis.<sup>102,103</sup> Although systematic reviews have not reported mortality increases with probiotic use in patients with pancreatitis in general, they have not found that using probiotics for treating pancreatitis is beneficial. Avoidance of probiotic use, especially in patients with severe cases of pancreatitis, may be prudent.<sup>84</sup>

As a general rule, most good-quality probiotics are quite safe with few side effects, but use caution in patients with severe pancreatitis, immunocompromised people, and those with indwelling medical equipment.

- Lactose hypersensitivity and yeast allergy. Some authorities recommend that *Lactobacillus* preparations be avoided in persons with hypersensitivity to lactose or milk, and yeasts should not be used in anyone with a yeast allergy. Bifidobacteria have no contraindications listed.<sup>87</sup> Probiotics should be used cautiously in people taking immunosuppressive therapies. The use of *Enterobacter* species is controversial, given the risk of pathogenicity.

A 2011 review concluded that prebiotics and probiotics are, based on the available data, safe to use in infant formula, with no adverse effects or negative impacts on growth.<sup>103</sup> A 2009 review of 11 studies of probiotic use during pregnancy found no adverse outcomes on gestational age, malformation frequency, cesarian section outcomes, or miscarriages, but the investigators cautioned that further research is needed.<sup>104</sup>

### KEY WEB RESOURCES

International Scientific Association for Probiotics and Prebiotics: <a href="http://www.isapp.net/">http://www.isapp.net/</a>	This organization's mission is to disseminate reliable information about these substances.
Usprobiotics: <a href="http://www.usprobiotics.org/">http://www.usprobiotics.org/</a>	This Web site has some nice summaries of the literature, as well as a useful resource page that includes Web casts.
Food Insight: <a href="http://www.foodinsight.org/">http://www.foodinsight.org/</a>	This well-done educational site involves food and nutrition. Users can click “Search” in the upper right corner of screen and gather probiotics information. It also has premade PowerPoint presentations on nutrition in the “For Professionals” section, as well as many resources on various food components, food safety, and weight management.
University of Wisconsin Integrative Medicine: <a href="http://www.fammed.wisc.edu/sites/default/files/webfm-uploads/documents/outreach/im/handout_probiotics_patient.pdf">http://www.fammed.wisc.edu/sites/default/files/webfm-uploads/documents/outreach/im/handout_probiotics_patient.pdf</a>	This is a patient handout on probiotics.
American Gastroenterological Association: <a href="http://www.gastro.org/patient-center/diet-medications/probiotics">http://www.gastro.org/patient-center/diet-medications/probiotics</a>	This is another patient handout on probiotics.

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## References

References available online at [expertconsult.com](http://expertconsult.com).

## References

1. Sult T. Digestive, absorptive, and microbiological imbalances. In: Jones DS, ed. *Textbook of Functional Medicine*. Gig Harbor, WA: Institute for Functional Medicine; 2006.
2. Frank DN, Pace NR. Gastrointestinal microbiology enters the metagenomics era. *Curr Opin Gastroenterol*. 2008;24:4–10.
3. Quigley EM. Prebiotics and probiotics: modifying and mining the microbiota. *Pharmacol Res*. 2010;61:213–218.
4. Hamilton-Miller JMT, Gibson GR, Bruck W. Some insights into the derivation and early uses of the word “probiotic”. *Br J Nutr*. 2003;90:845.
5. Lilley DM, Stillwell RH. Probiotics: growth promoting factors produced by microorganisms. *Science*. 1965;147:747.
6. Fuller R. Probiotics in man and animals. *J Appl Bacteriol*. 1989;56:365.
7. Schrezenmeier J, de Vrese M. Probiotics, prebiotics, and synbiotics: approaching a definition. *Am J Clin Nutr*. 2001;73(suppl):361S.
8. Bourlioux P, Koletzko B, Guarner F, Braesco V. The intestine and its microflora are partners for the protection of the host: report on the Danone Symposium “The Intelligent Intestine”, held in Paris, June 14, 2002. *Am J Clin Nutr*. 2003;78:675.
9. Borchers AT, Selmi C, Meyers FJ, et al. Probiotics and immunity. *J Gastroenterol*. 2009;44:26–46.
10. verna EC, Lucak S. Use of probiotics in gastrointestinal disorders: what to recommend. *Ther Adv Gastroenterol*. 2010;3:307–319.
11. McFarland LV. Systematic review and meta-analysis of *Saccharomyces boulardii* in adult patients. *World J Gastroenterol*. 2010;16:2202–2222.
12. Teitelbaum JE, Walker JA. Nutritional impact of pre- and probiotics as protective gastrointestinal organisms. *Annu Rev Nutr*. 2002;22:107–138.
13. Vanderhoof J. Preface. *Am J Gastroenterol*. 2000;95(suppl):1.
14. Sanders ME. Considerations for use of probiotic bacteria to modulate human health. *J Nutr*. 2000;130:384S.
15. Metchnikoff E. *The Prolongation of Life: Optimistic Studies*. London: William Heinemann; 1907.
16. Gershon MD. The enteric nervous system. In: Jones DS, ed. *Textbook of Functional Medicine*. Gig Harbor, WA: Institute for Functional Medicine; 2006.
17. Heijtz RD, Wang S, Anuar F, et al. Normal gut microbiota modulates brain development and behavior. *Proc Natl Acad Sci U S A*. 2011;108:3047–3052.
18. Bengmark S. Bacteria for optimal health. *Nutrition*. 2000;16:611–615.
19. Smith S. Quorum sensing within the gut. *Microbiol Ecol Health Dis*. 2002;2(suppl):81.
20. Hooper LV, Gordon JI. Commensal host-bacterial relationships in the gut. *Science*. 2001;292:1115–1118.
21. Cummings JH, Bingham SA, Heaton KW, Eastwood MA. Fecal weight, colon cancer risk and dietary intake of non-starch polysaccharides (dietary fiber). *Gastroenterology*. 1992;103:1783–1789.
22. Eun CS, Kim YS, Han DS, et al. *Lactobacillus casei* prevents impaired barrier function in intestinal epithelial cells. *APMIS*. 2011;119:49–56.
23. Adams CA. The probiotic paradox: live and dead cells are biological response modifiers. *Nutr Res Rev*. 2010;23:37–46.
24. Rachmilewitz D, Katakura K, Karmeli F, et al. Toll-like receptor 9 signaling mediates the anti-inflammatory effects of probiotics in murine experimental colitis. *Gastroenterology*. 2004;126:520–528.
25. Hooper LV, Wong MH, Thelin A, et al. Molecular analysis of commensal host-microbial relationships in the intestine. *Science*. 2001;291:881–884.
26. Gibson GR. Dietary modulation of the human gut microflora using prebiotics. *Br J Nutr*. 1998;80(suppl 2):S209.
27. Gibson GR, Roberfroid MB. Dietary manipulation of the human colonic microbiota: introducing the concept of prebiotics. *J Nutr*. 1995;125:1401–1412.
28. Coudray C, Bellanger J, Castiglia-Delavaud C, et al. Effect of soluble and partly soluble dietary fibre supplementation on absorption and balance of calcium, magnesium, iron and zinc in healthy young men. *Eur J Clin Nutr*. 1997;51:375–380.
29. Scholz-Ahrens KE, Schaafsma G, van den Heuvel EG, Schrezenmeier J. Effects of probiotics on mineral metabolism. *Am J Clin Nutr*. 2001;73(suppl):459S–464S.
30. De Preter V, Ghebreretsae AH, Abrahantes JC, et al. Impact of the synbiotic combination of *Lactobacillus casei* Shirota and oligofructose-enriched inulin on the fecal volatile metabolite profile in healthy subjects. *Mol Nutr Food Res*. 2011;55:714–722.
31. Cazzola M, Tompkins TA, Matera MG. Immunomodulatory impact of a synbiotic in T(h)1 and T(h)2 models of infection. *Ther Adv Respir Dis*. 2010;4:259–270.
32. Reddy BS, Hamid R, Rao CV. Effect of dietary oligofructose and inulin on colonic preneoplastic aberrant crypt foci inhibition. *Carcinogenesis*. 1997;18:1371–1374.
33. Reddy BS. Prevention of colon cancer by pre- and probiotics: evidence from laboratory studies. *Br J Nutr*. 1998;80(suppl 2):S219.
34. Le Leu RK, Hu Y, Brown IL, et al. Synbiotic intervention of *Bifidobacterium lactis* and resistant starch protects against colorectal cancer development in rats. *Carcinogenesis*. 2010;31:246–251.
35. Cazzola M, Pham-Thi N, Kerihuel JC, et al. Efficacy of a synbiotic supplementation in the prevention of common winter diseases in children: a randomized, double-blind, placebo-controlled pilot study. *Ther Adv Respir Dis*. 2010;4:271–278.
36. Falony G, Vlachou A, Verbrugge K, De Vuyst L. Cross-feeding between *Bifidobacterium longum* BB536 and acetate-converting, butyrate-producing colon bacteria during growth on oligofructose. *Appl Environ Microbiol*. 2006;72:7835–7841.
37. Szajewska H. Advances and limitations of evidence-based medicine: impact for probiotics. *Ann Nutr Metab*. 2010;57(suppl):6–9.
38. Gronlund MM, Lehtonen OP, Eerola E, et al. Fecal microflora in healthy infants born by different methods of delivery: permanent changes in intestinal flora after cesarean section. *J Pediatr Gastroenterol Nutr*. 1999;28:19–25.
39. Davidson GP, Butler RN. Probiotics in pediatric gastrointestinal disorders. *Curr Opin Pediatr*. 2000;12:477–481.
40. Vanderhoof JA. Probiotics and intestinal inflammatory disorders in infants and children. *J Pediatr Gastroenterol Nutr*. 2000;30:S34.
41. Harmsen HJ, Wildeboer-Veloo AC, Raangs GC, et al. Analysis of intestinal flora development in breastfed and formula-fed infants by using molecular identification and detection methods. *J Pediatr Gastroenterol Nutr*. 2000;30:61–67.
42. Szajewska H, Guandalini S, Morelli L, et al. Effect of *Bifidobacterium animalis* subsp *lactis* supplementation in preterm infants: a systematic review of randomized controlled trials. *J Pediatr Gastroenterol Nutr*. 2010;51:203–209.
43. Thomas DW, Greer FR, Committee on Nutrition. Probiotics and prebiotics in pediatrics. *Pediatrics*. 2010;126:1217–1231.
44. Allen SJ, Martinez EG, Gregorio GV, Dans LF. Probiotics for treating acute infectious diarrhea. *Cochrane Database Syst Rev*. 2010;(11):CD003048.
45. Minocha A. Probiotics for preventive health. *Nutr Clin Pract*. 2009;24:227–241.
46. Natural Standard. *Probiotics*. <[www.naturalstandard.com](http://www.naturalstandard.com)>; Accessed 25.02.11 (subscription required).
47. Guandalini S. Probiotics for children with diarrhea: an update. *J Clin Gastroenterol*. 2008;42(suppl 2):S53–S57.
48. Johnston BC, Supina AL, Ospina M, Vohra S. Probiotics for the prevention of pediatric antibiotic-associated diarrhea. *Cochrane Database Syst Rev*. 2007;(2):CD004827.
49. McFarland LV. Meta-analysis of probiotics for the prevention of traveler's diarrhea. *Travel Med Infect Dis*. 2007;5:97–105.
50. Tang ML, Lahtinen SJ, Boyle RJ. Probiotics and prebiotics: clinical effects in allergic disease. *Curr Opin Pediatr*. 2010;22:626–634.
51. Gerasimov SV, Vasjuta VV, Myhovyh OO, Bondarchuk LI. Probiotic supplement reduces atopic dermatitis in preschool children: a randomized, double-blind, placebo-controlled clinical trial. *Am J Clin Dermatol*. 2010;11:351–361.
52. Bailey J, Carter NJ, Hener JO. FPIN's clinical inquiries: effective management of flatulence. *Am Fam Physician*. 2009;79:1098–1100.
53. Shukla S, Shukla A, Mehboob S, Guha S. Meta-analysis: the effects of gut flora modulation using prebiotics, probiotics, and synbiotics on minimal hepatic encephalopathy. *Aliment Pharmacol Ther*. 2011;33:662–671.
54. Moayyedi P, Ford AC, Talley NJ, et al. The efficacy of probiotics in the treatment of irritable bowel syndrome: a systematic review. *Gut*. 2010;59:325–332.
55. AlFaleh KM, Bassler D. Probiotics for the prevention of necrotizing enterocolitis in preterm infants. *Cochrane Database Syst Rev*. 2008;(1):CD005496.
56. Makino S, Ikegami S, Kume A, et al. Reducing the risk of infection in the elderly by dietary intake of yoghurt fermented with *Lactobacillus delbrueckii* ssp. *bulgaricus* OLL1073R-1. *Br J Nutr*. 2010;104:998–1006.

57. Olivares M, Diaz-Ropero MP, Sierra S. Oral intake of *Lactobacillus fermentum* CECT5716 enhances the effects of influenza vaccination. *Nutrition*. 2007;23:254–260.
58. Sazawal S, Hiremath G, Dhingra U, et al. Efficacy of probiotics in prevention of acute diarrhoea: a meta-analysis of masked, randomised, placebo-controlled trials. *Lancet Infect Dis*. 2006;6:374–382.
59. Senok AC, Verstraelen H, Temmerman M, Botta GA. Probiotics for the treatment of bacterial vaginosis. *Cochrane Database Syst Rev*. 2009;(4):CD006289.
60. Reid G. Probiotic lactobacilli for urogenital health in women. *J Clin Gastroenterol*. 2008;42(suppl):S235–S236.
61. Bernaola Aponte G, Bada Mancilla CA, Carreazo Pariasca NY, Rojas Galarza RA. Probiotics for treating persistent diarrhea in children. *Cochrane Database Syst Rev*. 2010;(11):CD007401.
62. Zou J, Dong J, Yu X. Meta-analysis: *Lactobacillus*-containing quadruple therapy versus standard triple first-line therapy for *Helicobacter pylori* eradication. *Helicobacter*. 2009;14:97–107.
63. Guandalini S. Update on the role of probiotics in the therapy of pediatric inflammatory bowel disease. *Expert Rev Clin Immunol*. 2010;6:47–654.
64. Sang LX, Chang B, Zhang WL, et al. Remission induction and maintenance effect of probiotics on ulcerative colitis: a meta-analysis. *World J Gastroenterol*. 2010;16:1908–1915.
65. Steenhout PG, Rochat F, Hager C. The effect of *Bifidobacterium lactis* on the growth of infants: a pooled analysis of randomized controlled studies. *Ann Nutr Metab*. 2009;55:334–340.
66. Fuccio L, Guido A, Eusebi LH, et al. Effects of probiotics for the prevention and treatment of radiation-induced diarrhea. *J Clin Gastroenterol*. 2009;43:506–513.
67. Vouloumanou EK, Makris GC, Karageorgopoulos DE, Falagas ME. Probiotics for the prevention of respiratory tract infections: a systematic review. *Int J Antimicrob Agents*. 2009;34:197.e1–197.e10.
68. Siempos II, Ntaidou TK, Falagas ME. Impact of the administration of probiotics on the incidence of ventilator-associated pneumonia: a meta-analysis of randomized controlled trials. *Crit Care Med*. 2010;38:954–962.
69. Giovannini M, Agostoni C, Riva E, et al. A randomized prospective double blind controlled trial on effects of long-term consumption of fermented milk containing *Lactobacillus casei* in pre-school children with allergic asthma and/or rhinitis. *Pediatr Res*. 2007;62:215–220.
70. Chen YS, Jan RL, Lin YL, et al. Randomized placebo-controlled trial of lactobacillus on asthmatic children with allergic rhinitis. *Pediatr Pulmonol*. 2010;45:1111–1120.
71. Pelsler LM, Buitelaar JK, Savelkoul HF. ADHD as a (non) allergic hypersensitivity disorder: a hypothesis. *Pediatr Allergy Immunol*. 2009;20:107–112.
72. Kaur IP, Kuhad A, Garg A, Chopra K. Probiotics: delineation of prophylactic and therapeutic benefits. *J Med Food*. 2009;12:219–235.
73. Osterlund P, Ruotsalainen T, Korpela R, et al. *Lactobacillus* supplementation for diarrhoea related to chemotherapy of colorectal cancer: a randomised study. *Br J Cancer*. 2007;97:1028–1034.
74. Sullivan A, Nord CE, Evengard B. Effect of supplement with lactic-acid producing bacteria on fatigue and physical activity in patients with chronic fatigue syndrome. *Nutr J*. 2009;8:4.
75. Weiss B, Bujanover Y, Yahav Y, et al. Probiotic supplementation affects pulmonary exacerbations in patients with cystic fibrosis: a pilot study. *Pediatr Pulmonol*. 2010;45:536–540.
76. Vaarala O, Atkinson MA, Neu J. The “perfect storm” for type 1 diabetes: the complex interplay between intestinal microbiota, gut permeability, and mucosal immunity. *Diabetes*. 2008;57:2555–2562.
77. Rocco A, Compare D, Caruso F, Nardone G. Treatment options for uncomplicated diverticular disease of the colon. *J Clin Gastroenterol*. 2009;43:803–808.
78. Atale-Jafari A, Larijani B, Alavi Majd H, Tahbaz F. Cholesterol-lowering effect of probiotic yogurt in comparison with ordinary yogurt in mildly to moderately hypercholesterolemic subjects. *Ann Nutr Metab*. 2009;54:22–27.
79. Osborn DA, Sinn JKH. Probiotics in infants for prevention of allergic disease and food hypersensitivity. *Cochrane Database Syst Rev*. 2007;(4):CD006475.
80. Abad CL, Safdar N. The role of lactobacillus probiotics in the treatment or prevention of urogenital infections: a systematic review. *J Chemother*. 2009;21:243–252.
81. Trautner BW, Hull RA, Thornby JL, Darouiche RO. Coating urinary catheters with avirulent strain of *Escherichia coli* as a means to establish symptomatic colonization. *Infect Control Hosp Epidemiol*. 2007;28:92–94.
82. Borghi L, Nouvenne A, Meschi T. Probiotics and dietary manipulations in calcium oxalate nephrolithiasis: two sides of the same coin? *Kidney Int*. 2010;78:1063–1065.
83. Shaikat A, Levitt MD, Taylor BC, et al. Systematic review: effective management strategies for lactose intolerance. *Ann Intern Med*. 2010;152:797–803.
84. Zhang MM, Cheng JQ, Lu YR, et al. Use of pre, pro- and synbiotics in patients with acute pancreatitis: a meta-analysis. *World J Gastroenterol*. 2010;16:3970–3978.
85. Brophy S, Burrows CL, Brooks C, et al. Internet-based randomised controlled trials for the evaluation of complementary and alternative medicines: probiotics in spondyloarthritis. *BMC Musculoskelet Disord*. 2008;9:4.
86. Natural Medicines Comprehensive Database. *Lactobacillus*. <[www.naturaldatabase.com](http://www.naturaldatabase.com)>; Accessed 24.02.11 (subscription required).
87. Williams NT. Probiotics. *Am J Health Syst Pharm*. 2010;67:449–458.
88. Dethlefsen L, Huse S, Sogin ML. The pervasive effects of an antibiotic on the human gut microbiota, as revealed by deep 16S rRNA sequencing. *PLoS Biol*. 2008;6:e280.
89. Macrobial A, Underwood MA, Mills DA. Rapid determination of the bacterial composition of commercial probiotic products by terminal restriction fragment length polymorphism analysis. *J Pediatr Gastroenterol Nutr*. 2008;46:608–611.
90. Masco L, Huys G, Debrandt E, et al. Culture-dependent and culture-independent qualitative analysis of probiotic products claimed to contain bifidobacteria. *Int J Food Microbiol*. 2005;102:221–230.
91. Matto J, Malinen E, Suikko ML, et al. Genetic heterogeneity and functional properties of intestinal bifidobacteria. *J Appl Microbiol*. 2004;97:459–470.
92. Weil A. Commercial yogurt: dead or alive? <[www.drweil.com/u/QA/QA290486/](http://www.drweil.com/u/QA/QA290486/)>; Accessed 25.02.11.
93. Di Criscio T, Fratianni A, Mignogna R, et al. Production of functional probiotic, prebiotic, and synbiotic ice creams. *J Dairy Sci*. 2010;93:4555–4564.
94. Ishibashi N, Yamazaki S. Probiotics and safety. *Am J Clin Nutr*. 2001;73(suppl):465S.
95. Saavedra JM, Abi-Hanna A, Moore N, Yolken RH. Long-term consumption of infant formulas containing live probiotic bacteria: tolerance and safety. *Am J Clin Nutr*. 2004;79:261–267.
96. Salminen MK, Tynkkynen S, Rautelin H, et al. *Lactobacillus* bacteremia during a rapid increase in probiotic use of *Lactobacillus rhamnosus* GG in Finland. *Clin Infect Dis*. 2002;35:1155–1160.
97. Notario R, Leardini N, Borda N, et al. Hepatic abscess and bacteremia due to *Lactobacillus rhamnosus* [in Spanish]. *Rev Argent Microbiol*. 2003;35:100–101.
98. Pletincx M, Legein J, Vandenplas Y. Fungemia with *Saccharomyces boulardii* in a 1-year-old girl with protracted diarrhea. *J Pediatr Gastroenterol Nutr*. 1995;21:113–115.
99. Rijnders BJ, Van Wijngaerden E, Verwaest C, Peetermans WE. *Saccharomyces* fungemia complicating *Saccharomyces boulardii* treatment in a non-immunocompromised host. *Intensive Care Med*. 2000;26:825.
100. Sanders ME, Akkermans LM, Haller D, et al. Safety assessment of probiotics for human use. *Gut Microbes*. 2010;1:164–185.
101. Guthmann F, Kluthe C, Buhner C. Probiotics for prevention of necrotising enterocolitis: an updated meta-analysis. *Klin Padiatr*. 2010;222:284–290.
102. Besselink MG, Santvoort HC, Buskens E, et al. Probiotic prophylaxis in predicted severe acute pancreatitis: a randomised, double-blind, placebo-controlled trial. *Lancet*. 2008;371:651–659.
103. Braegger C, Chmielewska A, Decsi T, et al. Supplementation of infant formula with probiotics and/or prebiotics: systematic review and comment by the ESPGHAN Committee on Nutrition. *J Pediatr Gastroenterol Nutr*. 2011;52:238–252.
104. Dugoua JJ, Machado M, Zhu X, et al. Probiotic safety in pregnancy: a systematic review and meta-analysis of randomized controlled trials of *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces* spp. *J Obstet Gynaecol Can*. 2009;31:542–31552.



# Prescribing Botanicals

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A careful examination of the evidence regarding the safety and efficacy of herbal medicines should guide clinicians as they partner with their patients in creating optimal health care. In 1997, 42% of the U.S. population used some form of complementary and alternative medicine (CAM), and 12% of the population used herbal medicine.<sup>1</sup> In 2007, 18% of the U.S. population used herbs for health conditions, and annual expenditures for herbal supplements exceeded \$25 billion.<sup>2,3</sup> Clearly, many of our patients are regularly using herbs and dietary supplements.

## Who Uses Herbs?

Rates of herbal product use vary by age, gender, race, and ethnicity, but substantial numbers of all patient groups report using herbs and dietary supplements, particularly women and people with chronic or recurrent illnesses who also receive care from conventional health care professionals. In national studies, the medical conditions for which herb use is most commonly reported have been upper respiratory infections, arthritis, depression, musculoskeletal pain, memory improvement, and menopausal symptoms.<sup>4,5</sup>

## What Else Are They Taking?

Additionally, more than 27 million people living in the United States may be taking an over-the-counter medication and an herb or a prescription medication and an herb concurrently.<sup>6</sup> Different patient populations are at high risk for drug-herb interactions and include human immunodeficiency virus-positive patients, chronically ill patients, patients with cancer, and older Medicare patients.<sup>7-10</sup>

No universally accepted guideline exists for managing a patient's prescription medication and herbal medicine in the outpatient or inpatient setting.<sup>11</sup> However, the Joint Commission (formerly the Joint Commission on Accreditation of Healthcare Organizations) requires that dietary supplements (herbs, vitamins, minerals) conform to the same hospital standards as prescription medications.<sup>12</sup>

Despite the documented high prevalence of patient use of herbal products, fewer than half of patients who use herbs typically discuss it with their clinicians.<sup>9,13</sup> Therefore, clinicians must have an approach to discussing herb use with patients.

## Talking About Herbs With Patients

Health care providers must be able to talk with patients about many different treatment options, including those that fall outside what the health care provider learned in formal training. Because the use of herbs has the potential for both benefit and harm, providers must approach the topic of herb use in an open and nonjudgmental way. Many cultures have a rich history of using botanical medicines; indeed, herbal medicine is the most common form of traditional medicine in the world. Because so many different herbal practices and products are available in the United States, generalizations are difficult. Nevertheless, by asking a few open-ended questions, the physician should be able to assess the patient's beliefs and cultural practices regarding his or her use of herbal medicines. Examples of such questions are as follows:

- When you were growing up, did you or your family ever use any medicinal plants or herbal remedies to improve your health or treat an illness?
- If I were to walk around your house and look for containers of herbs, vitamins, or dietary supplements, what would I find?
- How do you use herbs or herbal remedies in your home?
- Are you taking any herbs or herbal medicines now? If so, what are you trying to treat, and do you think the herbs are working?

Using herbs in practice is a holistic process. Besides the patient's cultural and social background, the physician should take into account the patient's symptoms, any chronic or acute illness, any prescribed medications, and any non-prescribed medications, as well as judging how adherent the patient will be to the regimen the physician recommends.

## Efficacy

How does the physician know whether an herb actually works for a patient's condition? Does strong historical evidence exist? Does the herb have a biologically plausible mechanism of action based on *in vitro* or animal research? Has the herb undergone controlled clinical trials? If so, which type of product was studied and at what dose? These are important questions to ask when trying to determine efficacy. First, here is a summary of the strengths and weaknesses of different types of evidence used to assess the efficacy of botanical medicines.

*In vitro* studies—objective measurements using isolated tissue or cell culture—are a well-accepted first step for understanding the physiologic or pharmacologic activity of a particular substance. Animal studies are often used in pharmacologic studies because they permit control over certain variables and can help explain potential mechanisms of action. The strengths of *in vitro* and animal studies are the following:

- They allow control over certain variables.
- They generate and test hypotheses for mechanism of action.
- They help determine safety at varying doses and duration.

These studies do have limitations, as follows:

- Results may not accurately predict physiologic effects in humans.
- Parenteral administration may give differing results from oral administration.
- Study of isolated constituents may not reflect use of the whole plant.
- Ethical issues surround the use of animals in medical research.

A long history of use is an important source of information regarding the safe and effective use of plant medicines. These historical data are almost exclusively based on observational data, and even today, a clinician's observations remain an important tool for assessing efficacy and adverse effects in the office. One strength of observational data is that they can provide useful insight when a therapy has been used by multiple cultures, over time, for similar purposes. In addition, the astute clinician may detect a therapeutic effect, or an adverse effect, that is not well known or recognized. An important limitation is the risk of bias if the observers are not studying a defined cohort of patients.

Nonrandomized and nonblinded, or uncontrolled, studies are valuable for generating hypotheses and assisting in the identification of adverse events, although they are best regarded as yielding supportive evidence. Strengths of uncontrolled studies are as follows:

- They are valuable for generating hypotheses.
- They are useful for identifying adverse events.

The limitation is that the presence of multiple uncontrolled variables increases the risk of bias in the results.

Outcomes research generally involves a cohort of patients with the same diagnosis (e.g., diabetes, heart disease) that relates their clinical and health outcomes (e.g., death, events, improvement) to the care they received (e.g., physical therapy, medication). The strengths of outcomes research are as follows:

- It reflects more closely the actual day-to-day practice of clinical medicine.
- It is well suited for whole systems approaches (e.g., traditional Chinese medicine, Ayurveda, naturopathy).

The limitation is that it is difficult to establish efficacy for any particular aspect of treatment.

In randomized double-blind clinical trials, patients are randomly allocated to different treatment groups, and neither the researchers nor the participants know who is receiving the experimental protocol. Considered the gold standard for pharmaceutical research, this type of study can greatly reduce bias. It has the following strengths:

- It provides safeguards against numerous forms of bias.
- The model is applicable for the study of many botanical interventions.

Limitations of randomized double-blind trials are as follows:

- The average randomly allocated patient may not adequately reflect the clinical subgroups seen in clinical medicine.
- This model may not be applicable for answering some clinical questions, such as individualization of therapy.
- The lack of a randomized controlled trial is often interpreted as lack of efficacy; this is a problem in botanical medicine, in which treatments may have been used for centuries but lack current gold standard evidence.

In addition to understanding the limitations of different research methods clearly, the physician must understand exactly what type of product is actually being tested. The complex nature of botanicals—the variations in constituents among species, plant parts, and preparation—makes it essential that authors of research articles provide an adequate description of the product used in the clinical trial. Descriptions should include identification (Latin binomial and authority), plant part (e.g., root, leaf, seed), and type of preparation (e.g., tea, tincture, extract, oil).

Tincture and extract description should include the identity of the solvent and the ratio of solvent to plant material. If the preparation is standardized to a chemical constituent, then that information should also be included. Precise and clear dose and dosage form should be provided.<sup>14</sup> These are critically important issues to consider when conducting and publishing research on botanical medicines. Thus, we must ask the question “Is the product my patient is taking for a particular condition similar to what was clinically tested?” In 2006, the Consolidated Standards of Reporting Trials (CONSORT) developed guidelines in reporting clinical trials of herbal medicine in the peer-reviewed literature that have been adopted by many journals.<sup>15,16</sup>

Increasing numbers of systematic reviews and meta-analyses are now available for busy clinicians to evaluate the evidence of efficacy for numerous botanicals including echinacea,<sup>17</sup> garlic,<sup>18-21</sup> kava,<sup>22</sup> ginkgo,<sup>23,24</sup> horse chestnut,<sup>25</sup> saw palmetto,<sup>26</sup> and St. John's wort.<sup>27</sup> While recognizing the value of meta-analyses in the medical literature, one potential problem exists with this approach in the field of herbal medicine: the pooling of different products to reach a specific conclusion about a particular plant. For example, a review of garlic pooled results from clinical trials using raw garlic, aged garlic extracts, dehydrated garlic, and garlic oil macerates to reach a specific conclusion regarding the benefit of garlic to cardiovascular health.<sup>28</sup> When one evaluates these products from an analytical perspective, the marked chemical differences among them make any general conclusion about the efficacy of garlic (or lack thereof) questionable.

Finally, we must consider what level of evidence of efficacy is acceptable to support the use of a medicinal plant by our patients. This must take into consideration the relative safety of the product, the medical condition being treated, and patients' personal beliefs and preferences.

## Safety Considerations

As with any drug or chemically active constituent, whether an herb is toxic depends on its dose, form of product, what it is taken with, and the underlying condition of the patient. Overall, most herbs commonly used in the United States have a relatively good safety profile, and the incidences of herbal adverse events are low. From 2007 to 2009, the Food and Drug Administration (FDA) received more than 700 adverse event reports about dietary supplements.<sup>29</sup> In general, many case reports are of poor quality or are anecdotal, and frequently the adverse effects are caused not by the supplements themselves, but rather by contaminants.<sup>30</sup>

Adverse effects of botanicals commonly arise not from the supplement itself but from contaminants within it.

Modern use of an herbal product may not reflect the use of herbal preparations in traditional medicine. For example, an excellent safety record of a traditional oral preparation may well have limited relevance to use of the same herb in a concentrated product at a high dose. Moreover, herbs that are apparently safe under normal conditions may be more hazardous in specific conditions (e.g., pregnancy, impairment of renal or liver function), under special circumstances (e.g., during the perioperative period), or when combined with certain conventional drugs.

When considering the safety of botanicals, one must look at the framework for regulating the sale of dietary supplements in the United States. The Dietary Supplement and Health Education Act (DSHEA), which was enacted in 1994, has had a profound influence on how herbal products are sold and marketed to the consumer. To discuss herbal

products with patients, physicians must understand this Act.<sup>31</sup> The following points are important:

- The DSHEA allows dietary supplements to be marketed without prior approval of their efficacy and safety by the FDA.
- The manufacturer of an herbal product is responsible for the truthfulness of claims made on the label and must have evidence that the claims are supported; nevertheless, the DSHEA neither provides a standard for the evidence needed nor requires submission of the evidence to the FDA.
- Manufacturers are permitted to claim that the product affects the structure or function of the body, as long as (1) no claim of effectiveness is made for the prevention or treatment of a specific disease, and (2) a disclaimer appears on the container informing the user that the FDA has not evaluated the product for any claim.
- The manufacturer is responsible for controlling the quality and safety of the product, but if a concern about safety arises, the burden of proof lies not with the manufacturer but with the FDA, which has to prove that the product is unsafe.
- The FDA has released good manufacturing practices (GMPs) for herbal products. GMPs set standards for purity, strength, and potency of the supplements to reflect what is stated on the label.<sup>32</sup>

Even if we physicians are able to identify an herbal product that shows strong efficacy, the concern about the safety of herbal products overshadows our discussions with patients. These concerns include contamination with other products such as heavy metals, pesticides, microorganisms, or misidentified herbal ingredients and adulteration with a prescription drug.<sup>33</sup> The quality of plant material varies considerably, depending on where it is cultivated or gathered, the times and methods of harvest and drying, and environmental conditions such as climate and soil type. The composition of an herbal product may vary considerably among manufacturers, and discrepancies between label information and actual content may occur. Clinicians should be cognizant of potential adverse events from food or drug interactions. For instance, sufficient evidence from interaction studies and case reports demonstrated that St. John's wort (*Hypericum perforatum*) induces the cytochrome P-450 (CYP) 3A4 enzyme system and the P-glycoprotein drug transporter in a clinically relevant manner, thus reducing the efficacy of comedications.<sup>34-36</sup>

In December of 2006, the Dietary Supplement and Nonprescription Drug Consumer Protection Act was passed. It requires the reporting of a serious adverse event as a result of a dietary supplement and labeling of the manufacturer's address and phone number. The manufacturer is required to forward information on serious adverse events to the FDA within 15 days. The health care professional can also report a drug-herb interaction or an adverse effect to MedWatch, a program administered by the FDA. Another excellent resource is to contact the local poison control center; the current nationwide toll-free number for poison control is 800-222-1222.



## Choosing a Brand or Product: A Question of Quality

Once the clinician has determined that an herb is efficacious and safe for a particular patient, he or she must advise the patient on choosing high-quality products. The quality of an herbal preparation partly determines its efficacy, as well as its safety. Even with the DSHEA, loopholes in the regulatory system have allowed poor-quality products to be introduced

into the marketplace. The FDA is addressing some of the problems associated with manufacturing herbal products with its new GMPs.<sup>32</sup> Nonprofit and for-profit organizations have taken on the task of certifying manufacturers that are following good manufacturing practices and testing to see that what is on a label is in the bottle (Table 103-1). Guiding patients toward purchasing the best-quality herbal product is critical; high quality generally translates to better safety and efficacy.

**TABLE 103-1.** Information on Testing Dietary Supplement and Herbal Products

ORGANIZATION	WHAT TO LOOK FOR ON THE LABEL	WEB ADDRESS
<p>The Natural Products Association (formerly the National Nutritional Foods Association) is a trade group that has a Good Manufacturing Practices (GMP) certification process and a Natural Seal certification process that tests for ingredient quality and contaminants.</p>	<p>NPA</p> 	<p><a href="http://www.npainfo.org">http://www.npainfo.org</a></p>
<p>NSF International is a nonprofit public health organization. NSF's certification service includes product testing, Good Manufacturing Practices (GMP) inspections, ongoing monitoring, and use of the NSF mark.</p>	<p>NSF</p> 	<p><a href="http://www.nsf.org">http://www.nsf.org</a></p>
<p>The United States Pharmacopeia (USP) tests for contamination, adulteration, and good manufacturing processes. The USP also examines products for pharmacologic properties.</p>	<p>USP</p> 	<p><a href="http://www.uspverified.org">www.uspverified.org</a>  <a href="http://www.usp.org/USPVerified/dietarySupplements/supplements.html">http://www.usp.org/USPVerified/dietarySupplements/supplements.html</a></p>
<p>ConsumerLab evaluates commercially available dietary supplement products for composition, potency, purity, bioavailability, and consistency of products.</p>	<p>CL</p> 	<p><a href="http://www.consumerlab.com">www.consumerlab.com</a></p>
<p>The U.S. government GRAS acronym stands for the phrase Generally Recognized as Safe. Under sections 201(s) and 409 of the Federal Food, Drug, and Cosmetic Act, any substance that is intentionally added to food is a food additive that is subject to premarket review and approval by U.S. Food and Drug Administration, unless the substance is generally recognized, among qualified experts, as having been adequately shown to be safe under the conditions of its intended use, or unless the use of the substance is otherwise excluded from the definition of a food additive.</p>	<p>GRAS</p>	<p><a href="http://www.cfsan.fda.gov/~dms/grasguid.html">http://www.cfsan.fda.gov/~dms/grasguid.html</a></p>
<p>Health Canada                      In Canada, dietary supplements are regulated by the government in a natural health products category ensuring the safety and efficacy of these products. This link includes all dietary supplements that are licensed for sale in Canada.</p>		<p><a href="http://www.hc-sc.gc.ca">http://www.hc-sc.gc.ca</a></p>

## Dosing

Once the correct herb has been chosen for the correct patient's diagnosis, the clinician confronts confusing questions of dosing. Where is the dosing information on the label of the bottle? How much herb should the patient take and for how long? Is the dose different for a child?

Patients can prepare and use herbal medicines in many ways (Table 103-2). A traditional herbalist individualizes every treatment protocol on the basis of the patient's unique situation and often uses more than one herb or type of preparation. However, tailoring the herbal treatment to the patient can be difficult for the conventional provider in this age of uncertainty about the safety of all herbal products. Traditionally, most herbalists administered crude herbs in the form of teas, decoctions, tinctures, poultices, or compresses. These preparations are relatively inexpensive and easy to use. We encourage our patients to become involved with creating self-care routines (cooking with herbs, making a cup of tea, taking an herbal bath). Most commercial herbal products are sold in solid dosage forms, such as tablets and capsules, although teas, tinctures, and liquid extracts remain popular. Teas (water extracts) have a long history of use but are often limited by taste and rapid spoilage (they have to be made fresh). Hydroethanolic extracts, such as tinctures and fluid extracts, are more concentrated and easier to administer, although the alcohol content can be a problem for some patients.

Growing numbers of herbal preparations are now standardized to a specific constituent, or group of compounds, thus helping to ensure batch-to-batch consistency of the product. The standardizing compound may or may not be one of the “active” ingredients in the product. Most clinical trials are conducted on standardized products. A table from *The ABC Clinical Guide to Herbs* that lists commercial products used in clinical studies is adapted for this chapter (Table 103-3).<sup>37</sup>

The type of herbal preparation a clinician chooses to use depends on various considerations, including the patient, whether the medical problem is acute or chronic, personal preferences, and medicinal properties of the herb. For example, many people find valerian tea unpleasant tasting; recommending a tincture or capsule may improve the chance that the patient will adhere to therapy. Chamomile tea is quite appropriate for people of all ages. If using garlic for cardiovascular health, the patient could simply add garlic to the daily diet or choose a standardized extract.

For dose, the clinician can start by looking at the clinical trials—the product studied, the dose used, and side effects reported. Most herbal clinical trials have been conducted on standardized extracts in solid dosage forms (capsules and tablets). Excellent resources about correct dosages are also available on the Internet (Table 103-4). The clinician should nevertheless be aware that products in the marketplace vary widely in dose

**TABLE 103-2. Preparation of Herbal Products**

Balm or salve	A soothing, lipid-based topical preparation containing beeswax, vegetable, or mineral oil
Bath	An herbal preparation placed in a soaking bath; transdermal absorption extremely limited and mostly relevant to herbs with high volatile oil content. Herbal baths can be useful for skin irritation or enjoyed simply for their pleasant aroma.
Decoction	An extraction of the soluble compounds from hard plant material (e.g., bark or roots) in boiling water. Herbs are generally simmered for at least 10 min.
Essential oil	Volatile oils extracted from a plant, often through distillation. Essential oils are often many times more potent than the plant itself, which also means an increased risk of potentially adverse effects when used internally. Some popular essential oils include eucalyptus, peppermint, and tea tree oil.
Fluid extract	A hydroethanol solution with the strength of one part solvent to one part herb (more concentrated than a tincture; alcohol content can vary)
Glycerite	An herbal compound infused in a solution of glycerin (no alcohol)
Infusion	An extraction of soluble compounds from fresh or dried flowers, leaves, or seeds in hot water. Infusions are generally steeped for a minimum of 5–10 min (a tea).
Maceration	An herbal infusion made with cold or room temperature water
Pills, capsules, or tablets	May contain the whole herb (or particular plant part such as leaf, root, or seed) or the dried extract of a herb
Poultice	An herbal preparation wrapped in cloth and applied to the skin
Powders	An herbal preparation applied in a powder form (talc)
Syrup	Herbs infused in a syrup product
Tincture	A hydroethanolic solution of active plant constituents with a strength of greater than one part herb per one part solvent (alcoholic content can vary)
Tonic	A preparation used to invigorate and restore the body and generally taken on a daily basis (e.g., nettles)

**TABLE 103-3. Commercial Products Used in Clinical Studies Listed in Single Herb Monographs**

HERB	PRODUCTS USED IN CLINICAL STUDIES (MANUFACTURER)	OTHER NAMES (MANUFACTURER/DISTRIBUTOR)
<b>Black Cohosh</b>	Remifemin tablet (Schaper & Brümmer GmbH & Co. KG) CR BNO 1055, an aqueous/ethanolic extract Klimadynon/Menofen (Bionorica AG, Neumarkt, Germany)	Remifemin (originally manufactured by Schaper & Brümmer; now manufactured and distributed by GlaxoSmithKline) Menofen (Vitamin Plus Company)
<b>Echinacea</b>	Echinacea Plus (Traditional Medicinals, Inc.) Echinacin (Madaus AG) Echinaforce (Bioforce AG)	Formerly imported by EchinaGuard (Nature's Way Products, Inc.); no longer in the United States Echinaforce (United States: Bioforce)
<b>Garlic</b>	Aged Garlic Extract (Wakunaga of America Co., Ltd.) Kwai forte 300mg LI 111 (Lichtwer Pharma AG) KwaiN LI 111 (Lichtwer Pharma AG) Sapac (Lichtwer Pharma AG)	Aged Garlic Extract (extract used in Kyolic product line) Kwai HeartFit Garlic (United States: Abkit, Inc.) Kwai Garlic Supplement (United States: Abkit, Inc.)
<b>Ginger</b>	EV. Ext 77 (extract used in retail products) (Ferrosan A/S) Zintona (Herbalist & Doc)	FlexAgility (United States: Enzymatic Therapy) Zinaxin (Ferrosan A/S) Zincosamine (United States: FreeLife International LLC)
<b>Ginkgo</b>	Bio-Biloba (Pharma Nord ApS) EGb-761 (extract used in retail products) (Dr. Willmar Schwabe Pharmaceuticals) Geriaforce (Bioforce AG) LI-1370 (extract used in retail products) (Lichtwer Pharma AG)	Ginkgold (United States: Nature's Way Products, Inc.) Ginkoba (Pharmaton Natural Health Products) Tanakan (Beaufour-Ipsen) Tebonin (Dr. Willmar Schwabe Pharmaceuticals) Ginkai (United States: Abkit, Inc.) Ginkyo (Lichtwer Pharma AG) Kaveri (Lichtwer Pharma AG)
<b>Ginseng, Asian</b>	G115 (extract used in retail products) Gerimax Ginseng extract (Dansk Droge A/S) Pharmaton capsules (Pharmaton Natural Health Products)	Ginsana (Pharmaton Natural Health Products)
<b>Saw Palmetto</b>	IDS 89 (extract used in retail products) (Strathmann AG & Co.) Nutralite Saw Palmetto with Nettle Root (Nutralite) Permixon (Pierre Fabre Médicament) PRO 160/120 (Dr. Willmar Schwabe Pharmaceuticals) Prostagutt (Dr. Willmar Schwabe Pharmaceuticals) Prostaserene (Therabel Research)	Strogen 160-mg caps (Strathmann AG & Co.) Strogen forte (Strathmann AG & Co.) Strogen S (Strathmann AG & Co.) Strogen UN (Strathmann AG & Co.) WS 1473 (Dr. Willmar Schwabe Pharmaceuticals) Prostol (United States: Nature's Way Products, Inc.) SabalSelect (United States: Indena USA, Inc.)
<b>St. John's Wort</b>	Hyperiforce (Bioforce AG) Kira (Jarsin 300) (Lichtwer Pharma AG) Remotiv (Bayer Vital GmbH & Co.) WS 5572 (extract used in retail products) (Dr. Willmar Schwabe Pharmaceuticals)	Kira (United States: Abkit, Inc.) Ze 117 (extract used in retail products) Neuroplant (Dr. Willmar Schwabe Pharmaceuticals) Perika (United States: Nature's Way Products, Inc.)

Adapted with permission from the table "Commercial Products Used in Clinical Studies Listed in Single Herb Monographs." In: Blumenthal M, Hall T, Goldberg A, et al, eds. *The ABC Clinical Guide to Herbs*. Austin, TX: 2003:398-404. Copyright © American Botanical Council 2003. The 8 common herbs here were among 29 in the book, and the brands listed were used in the clinical studies that were reviewed in *The ABC Clinical Guide to Herbs*. Go to [www.herbalgram.org](http://www.herbalgram.org) for more information.

and may not accurately represent either what was historically used or the dose typically seen in clinical trials.

We recommend asking patients to bring to the office all their dietary supplement bottles, teas, tinctures, and so on. This can be a fruitful exercise in starting an open discussion, teaching the patient how to read supplement labels, and catching potential drug-herb interactions and adverse

effects. [Table 103-5](#) contains explanations of the elements of a label on a botanical product bottle.

Always document in the chart any dietary supplement or herbal product your patients are using.

TABLE 103-4. Evidence-Based Resources for Dietary Supplements

RESOURCE	DESCRIPTION	WEB SITE
<b>Government Web Sites</b>		
National Center for Complementary and Alternative Medicine (NCCAM)	The NCCAM provides helpful herbal summaries called Herbs at a Glance. CAM on PubMed is the product of a collaboration between the National Library of Medicine and the NCCAM to facilitate literature searches on various complementary and alternative medicine therapies, approaches, and systems. It contains citations, has links to full text, and allows searchers to limit retrievals by publication type. Look for the Alerts and Advisories, treatment information, resources, links to other organizations (e.g., Food and Drug Administration, Agency for Healthcare Research and Quality, Office of Dietary Supplements). (Free)	<a href="http://www.nccam.nih.gov">www.nccam.nih.gov</a> <a href="http://nccam.nih.gov/research/camonpubmed/">http://nccam.nih.gov/research/camonpubmed/</a>
MedlinePlus: Dietary Supplements	This consumer health database from the National Library of Medicine offers extensive information on dietary supplements. Links are organized using the same alternative medicine medical subject headings used by the National Library of Medicine. Some of the Natural Medicine Comprehensive Database abridged monographs are available under the dietary supplements link.	<a href="http://medlineplus.gov">http://medlineplus.gov</a> <a href="http://www.nlm.nih.gov/medlineplus/druginformation.html">http://www.nlm.nih.gov/medlineplus/druginformation.html</a>
Office of Dietary Supplements (ODS)	Under Health Information in this very helpful site are excellent dietary supplement fact sheets. (Free)	<a href="http://ods.od.nih.gov/index.aspx">ods.od.nih.gov/index.aspx</a>
Health Canada	The Canadian government regulates natural health products in Canada and licenses products with proof of safety and efficacy. This very helpful site lists products licensed in Canada and has useful monographs.	<a href="http://www.hc-sc.gc.ca">http://www.hc-sc.gc.ca</a>
<b>Additional Web Sites</b>		
American Botanical Council	This nonprofit organization has helpful information and continuing medical education resources.	<a href="http://www.herbalgram.org">www.herbalgram.org</a>
AltMedDex	Several hundred excellent monographs and patient information sheets on dietary supplements and medical conditions are updated semiannually. This site is a component of the larger Micromedex product, published by Thomson. A handheld version available. (Subscription required)	<a href="http://www.micromedex.com/products/altmeddex">www.micromedex.com/products/altmeddex</a>
Cochrane Collaboration Complementary Medicine	The Cochrane Library is an electronic resource produced by the Cochrane Collaboration to supply high-quality, comprehensive systematic reviews of research literature from throughout the world. (Subscription required)	<a href="http://www.compmed.umm.edu/cochrane_about.asp">http://www.compmed.umm.edu/cochrane_about.asp</a>
Natural Medicines Comprehensive Database	This database was created by the publishers of the <i>Pharmacist's Letter</i> . You can search by dietary supplement or commercial product name. Monographs include extensive information about common uses, evidence of efficacy and safety, mechanisms, interactions, and dosage. It is extensively referenced and updated daily. In addition, continuing medical education, listserv, and interactions information are available. (Individual subscriber: \$92/yr)	<a href="http://www.naturaldatabase.com">www.naturaldatabase.com</a>
Natural Standard	This is an independent collaboration of international clinicians and researchers who created a database that can be searched by complementary and alternative medicine subject or by medical condition. The quality of evidence is graded for each supplement. A Palm version will soon be available. (Individual subscriber: \$199.00/yr)	<a href="http://www.naturalstandard.com">www.naturalstandard.com</a>
Longwood Herbal Task Force	This site provides peer-reviewed monographs, clinician summaries, and patient information, as well as carefully evaluated links to other sites. (Free)	<a href="http://www.longwoodherbal.org">www.longwoodherbal.org</a>
HerbMed	HerbMed is an herbal database that provides scientific data underlying the use of herbs for health. HerbMedPro, an enhanced version of HerbMed, is available for subscription, licensing, and data streaming. The public site has 20 herbs; HerbMedPro has an additional 233 herbs and continuous updating. (Individual subscriber: \$45.00/yr or 48 hr for \$9.95)	<a href="http://www.herbmed.org">www.herbmed.org</a>

TABLE 103-5. Interpreting Product Labels



NUMBER	EXPLANATION
1.	Brand name
2.	Product/herb name
3.	Herbal products and other “dietary supplements” may make “statements of nutritional support,” often referred to as “structure/function claims,” as long as they are truthful and not misleading, are documentable by scientific data, do not claim to diagnose, cure, treat, or prevent any disease, and carry a disclaimer on the product label to this effect. The disclaimer must also note that FDA has not evaluated the claim. The product manufacturer must also notify the FDA of the structure/function claim within 30 days of bringing the product to market. According to current FDA regulations, examples of acceptable structure/function claims include “supports the immune system” and “supports a healthy heart,” whereas claims such as “helps treat the common cold” and “helps prevent heart disease” are considered unacceptable because these are considered drug claims. Thus, “helps maintain urinary tract health” is acceptable, whereas “helps prevent urinary tract infections” is not.
4.	A structure/function claim requires this disclaimer when it appears on the label of a dietary supplement, as well as in any brochures or advertising. The disclaimer must be in bold type and in a box.
5.	Number of tablets, capsules, and net weight of each in package
6.	Directions for Use and Cautions
Items 7–10 are part of the “Supplement Facts Panel”	
7.*	“Serving Size” is the suggested number of tablets, capsules, softgels, tea bags, liquid extract, or tincture to take at one time.

TABLE 103-5. Interpreting Product Labels—cont'd

NUMBER	EXPLANATION
8.*	"Amount per Serving" first indicates the nutrients present in the herb and then specifies the quantity. The following items must be declared if in excess of what can legally be declared as zero: calories, fat, carbohydrates, sodium, and protein. In addition, the following nutrients must also be declared if present in quantities exceeding what can legally be declared as zero: vitamins A, C, D, E, K, B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub> , B <sub>6</sub> , B <sub>12</sub> , folic acid, biotin, calcium, iron, phosphorus, iodine, magnesium, zinc, selenium, copper, manganese, chromium, molybdenum, chloride, and potassium. Most herbal products contain negligible amounts of these nutrients.
9.*	"Percent Daily Value" (%DV) indicates the percentage of daily intake provided by the herb. An asterisk under the "Percent Daily Value" heading indicates that a Daily Value is not established for that dietary ingredient.
10.*	Herbs should be designated by their standardized common names as listed in the book <i>Herbs of Commerce</i> , published in 1992 by the American Herbal Products Association. If the common name is not listed in <i>Herbs of Commerce</i> , then the common name must be followed by the herb's Latin name. The plant part must be listed for each herb. The amount in milligrams of each herb must be listed unless the herbs are grouped as a proprietary blend—then only the total amount of the blend need be listed. For herbal extracts, the following information must be disclosed: (1) the ratio of the weight of the starting material to the volume of the solvent (even for dried extracts in which the solvent has been removed, the solvent used to extract the herb must be listed), (2) whether the starting material is fresh or dry, and (3) the concentration of the botanical in the solvent.
11.	Standardization. If a product is chemically standardized, the product label may list the component used to measure standardization (e.g., ginsenosides in Asian ginseng, valerianic acids in valerian) and the level to which the product is standardized (e.g., 4% ginsenosides). Therefore, if a product contained 100mg of Asian ginseng extract per capsule and the extract was standardized to 4% ginsenosides, one capsule would contain 4 mg of ginsenosides. In most, but not all, cases, the component used to measure standardization is bioactive, although the standardization component may not be responsible for the intended primary activity of the herbal supplement; other active compounds may be responsible. Products can also be standardized to "marker compounds" for purposes of quality control. Those markers may or may not be active.
12.	A list of all other ingredients, in decreasing order by weight, must appear outside the Supplement Facts box. In herb formulas containing multiple herbal ingredients, the herbs must be listed in descending order of predominance.
13.	The proper location for storage of herbal products is typically labeled as a cool, dry place.
14.	All herbal products and other dietary supplements should be kept out of the reach of children.
15.	The herb should be used before the expiration date for maximum potency and effectiveness. Expiration dates are often arbitrarily established by the manufacturer, regardless of the ingredients and their relative stability. Such dates are routinely set at 2 years from the date of manufacture of the finished dietary supplement, although this period may be longer or shorter, depending on the manufacturer's policies, stability testing, dosage form, and other variables.
16.	The product must list the manufacturer or distributor's name, city, state, and zip code.

\*Data from the table "Interpreting Product Labels." In: Blumenthal M, Hall T, Goldberg A, et al, eds. *The ABC Clinical Guide to Herbs*. Austin, TX: American Botanical Council; 2003:xxiv. Copyright © American Botanical Council 2003. Go to [www.herbalgram.org](http://www.herbalgram.org) for more information on additional resources and continuing medical education for health care providers.  
FDA, Food and Drug Administration.

## Conclusion

In conclusion, the clinician should remember the following:<sup>38</sup>

- Ask all patients about botanicals and the supplements they use. (Offer examples of types of products meant in the question.)
- Record the responses in the patient's record so anyone consulting it can check for possible safety concerns such as herb-drug interactions.
- Advise patients about the safety and effectiveness of the products they are or are considering using.

- If unable to answer all the patient's questions about some botanicals, be prepared to refer the patient to evidence-based sources of information (see [Table 103-4](#)).
- Report a possible adverse effect to MedWatch, as previously discussed.

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Eisenberg DM, Davis RB, Ettner SL, et al. Trends in alternative medicine use in the United States, 1990-1997: results of a follow-up national survey. *JAMA*. 1998;280:1569-1575.
- Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children: United States, 2007. *Natl Health Stat Report*. 2008;12:1-23.
- Rea P. *Supplement Business Report*. Boulder, CO: New Hope Natural Media; 2009.
- Gardiner P, Graham R, Legedza AT, et al. Factors associated with herbal therapy use by adults in the United States. *Altern Ther Health Med*. 2007;13:22-29.
- Kelly JB, Kaufman DW, Kelley K, et al. Recent trends in use of herbal and other natural products. *Arch Intern Med*. 2005;165:281-286.
- Gardiner P, Graham RE, Legedza AT, et al. Factors associated with dietary supplement use among prescription medication users. *Arch Intern Med*. 2006;166:1968-1974.
- Elmer GW, Lafferty WE, Tyree PT, Lind BK. Potential interactions between complementary/alternative products and conventional medicines in a Medicare population. *Ann Pharmacother*. 2007;41:1617-1624.
- Nahin RL, Pecha M, Welmerink DB, et al. Concomitant use of prescription drugs and dietary supplements in ambulatory elderly people. *J Am Geriatr Soc*. 2009;57:1197-1205.
- Liu C, Yang Y, Gange SJ, et al. Disclosure of complementary and alternative medicine use to health care providers among HIV-infected women. *AIDS Patient Care STDs*. 2009;23:965-971.
- Miller MF, Bellizzi KM, Sufian M, et al. Dietary supplement use in individuals living with cancer and other chronic conditions: a population-based study. *J Am Diet Assoc*. 2008;108:483-494.
- Norstrom PE, Brown CM. Use of patients' own medications in small hospitals. *Am J Health Syst Pharm*. 2002;59:349-354.
- Comprehensive Accreditation Manual for Hospitals Proposed Revisions to Medication Use Standards*. Oakbrook Terrace, IL: Joint Commission on Accreditation of Health Care Organizations; 2003:3.2-3.6.
- Mehta DH, Gardiner PM, Phillips RS, McCarthy EP. Herbal and dietary supplement disclosure to health care providers by individuals with chronic conditions. *J Altern Complement Med*. 2008;14:1263-1269.
- Low Dog T. Clinical trial reviewer's guidance and checklist. In: Barret M, ed. *The Handbook of Clinically Tested Herbal Remedies*. Vol 1. New York: Haworth Herbal Press; 2004.
- Gagnier J, Boon H, Rochon P, et al. Improving the quality of reporting of randomized controlled trials evaluating herbal interventions: implementing the CONSORT statement [corrected]. *Explore (NY)*. 2006;2:143-149.
- Gagnier JJ, Boon H, Rochon P, et al. Reporting randomized, controlled trials of herbal interventions: an elaborated CONSORT statement. *Ann Intern Med*. 2006;144:364-367.
- Linde K, Barrett B, Wolkart K, Bauer R, Melchart D. Echinacea for preventing and treating the common cold. *Cochrane Database Syst Rev*. 2006;(1):CD000530.
- Lissiman E, Bhasale AL, Cohen M. Garlic for the common cold. *Cochrane Database Syst Rev*. 2009;(3):CD006206.
- Reinhart KM, Talati R, White CM, Coleman CI. The impact of garlic on lipid parameters: a systematic review and meta-analysis. *Nutr Res Rev*. 2009;22:39-48.
- Khoo YS, Aziz Z. Garlic supplementation and serum cholesterol: a meta-analysis. *J Clin Pharm Ther*. 2009;34:133-145.
- Reinhart KM, Coleman CI, Teevan C, et al. Effects of garlic on blood pressure in patients with and without systolic hypertension: a meta-analysis. *Ann Pharmacother*. 2008;42:1766-1771.
- Pittler MH, Ernst E. Kava extract versus placebo for treating anxiety. *Cochrane Database Syst Rev*. 2003;(1):CD003383.
- Birks J, Grimley Evans J. Ginkgo biloba for cognitive impairment and dementia. *Cochrane Database Syst Rev*. 2006;(1):CD003120.
- Zeng X, Liu M, Yang Y, et al. Ginkgo biloba for acute ischaemic stroke. *Cochrane Database Syst Rev*. 2005;(4):CD003691.
- Pittler MH, Ernst E. Horse chestnut seed extract for chronic venous insufficiency. *Cochrane Database Syst Rev*. 2006;(1):CD003230.
- Tacklind J, MacDonald R, Rutks I, Wilt TJ. *Serenoa repens* for benign prostatic hyperplasia. *Cochrane Database Syst Rev*. 2009;(2):CD001423.
- Linde K, Berner MM, Kriston L. St John's wort for major depression. *Cochrane Database Syst Rev*. 2008;(4):CD000448.
- Mulrow C, Lawrence V, Ackermann R, et al. Garlic: effects on cardiovascular risks and disease, protective effects against cancer, and clinical adverse effects. *Evid Rep Technol Assess (Summ)*. 2000;20:1-4.
- Talati AR, Gurnani AK. Dietary supplement adverse event reports: review and analysis. *Food Drug Law J*. 2009;64:503-513.
- Ernst E. Serious adverse effects of unconventional therapies for children and adolescents: a systematic review of recent evidence. *Eur J Pediatr*. 2003;162:72-80.
- U.S. Food and Drug Administration. *Dietary Supplement Health and Education Act of 1994*. <http://www.fda.gov/RegulatoryInformation/Legislation/FederalFoodDrugandCosmeticAct/FDCA/SignificantAmendmentstotheFDCA/ucm148003.htm>; Accessed 03.11.11.
- U.S. Food and Drug Administration. *Dietary Supplement Current Good Manufacturing Practices and Interim Final Rule Facts*. <http://www.fda.gov/RegulatoryInformation/Legislation/FederalFoodDrugandCosmeticAct/FDCA/SignificantAmendmentstotheFDCA/ucm148003.htm>; Accessed 03.11.11.
- Miller GM, Stripp R. A study of western pharmaceuticals contained within samples of Chinese herbal/patent medicines collected from New York City's Chinatown. *Leg Med (Tokyo)*. 2007;9:258-264.
- Mannel M. Drug interactions with St John's wort: mechanisms and clinical implications. *Drug Saf*. 2004;27:773-797.
- Izzo AA. Drug interactions with St. John's wort (*Hypericum perforatum*): a review of the clinical evidence. *Int J Clin Pharmacol Ther*. 2004;42:139-148.
- Zhou SF, Lai X. An update on clinical drug interactions with the herbal antidepressant St. John's wort. *Curr Drug Metab*. 2008;9:394-409.
- Blumental M. *The ABC Clinical Guide to Herbs*. Austin, TX: American Botanical Council; 2003.
- Kemper KJ. *Steps to Advising Patients on Herbal Products*. Winston-Salem, NC: Wake Forest; 2005.



# 104

## Detoxification

Luke Fortney, MD

### What Is Detoxification and Why Do It?

Detoxification, as reviewed here, is the constellation of physiologic and psychological processes by which the body identifies, neutralizes, and eliminates toxic substances, metabolic byproducts, habits, and patterns. Alcohol and other narcotic withdrawal therapies are serious medical conditions requiring close supervision and are not discussed here.

For an increasing number of people living in a more polluted and stressful world, body systems can become overburdened and strained by various contaminants that may lead to health problems.<sup>1</sup> In general, these toxins can be identified within the following general categories<sup>2</sup>:

- *Antinutrients* such as high-fructose corn syrup, trans fats, caffeine, alcohol, and processed foods
- *Internal metabolic toxins* such as nitrogen, carbon dioxide, bile, urea, and stool
- *Medications* used improperly, inappropriately, or too often
- *Heavy metals* such as mercury, arsenic, lead, cadmium, tin, and aluminum
- *Chemicals* such as pesticides, herbicides, cleaning products, solvents, and glues
- *Allergens* such as food, mold, dust, pollen, and chemicals
- *Infectious organisms* such as bacteria, viruses, yeast, and parasites

Further, the following social, emotional, and spiritual challenges affect health and well-being<sup>3,4</sup>:

- *Stress*, such as lack of personal time, too much work, excessive worry, too little rest, and financial strain
- *Unhealthy mental states*, such as addictions, overeating, and destructive mental patterns
- *Ambient distractions*, such as pervasive noises, smells, lights, and images

- *Overstimulation* from advertisements, radio, computers, television, smart phones, and pagers
- *Lack of spiritual connection*, a loss of meaning and purpose
- *Isolation*, the lack of social support and community
- *Nature deprivation*, being disconnected from natural environments
- *Negative emotions* and persistent self-defeating thoughts, such as anger, fear, guilt, and hopelessness

Although too infrequently acknowledged, the body and mind already possess the capacity to handle these challenges. This process of maintaining biologic and mental balance is called homeostasis. The major systems that work together synchronously to maintain health and balance include the following:

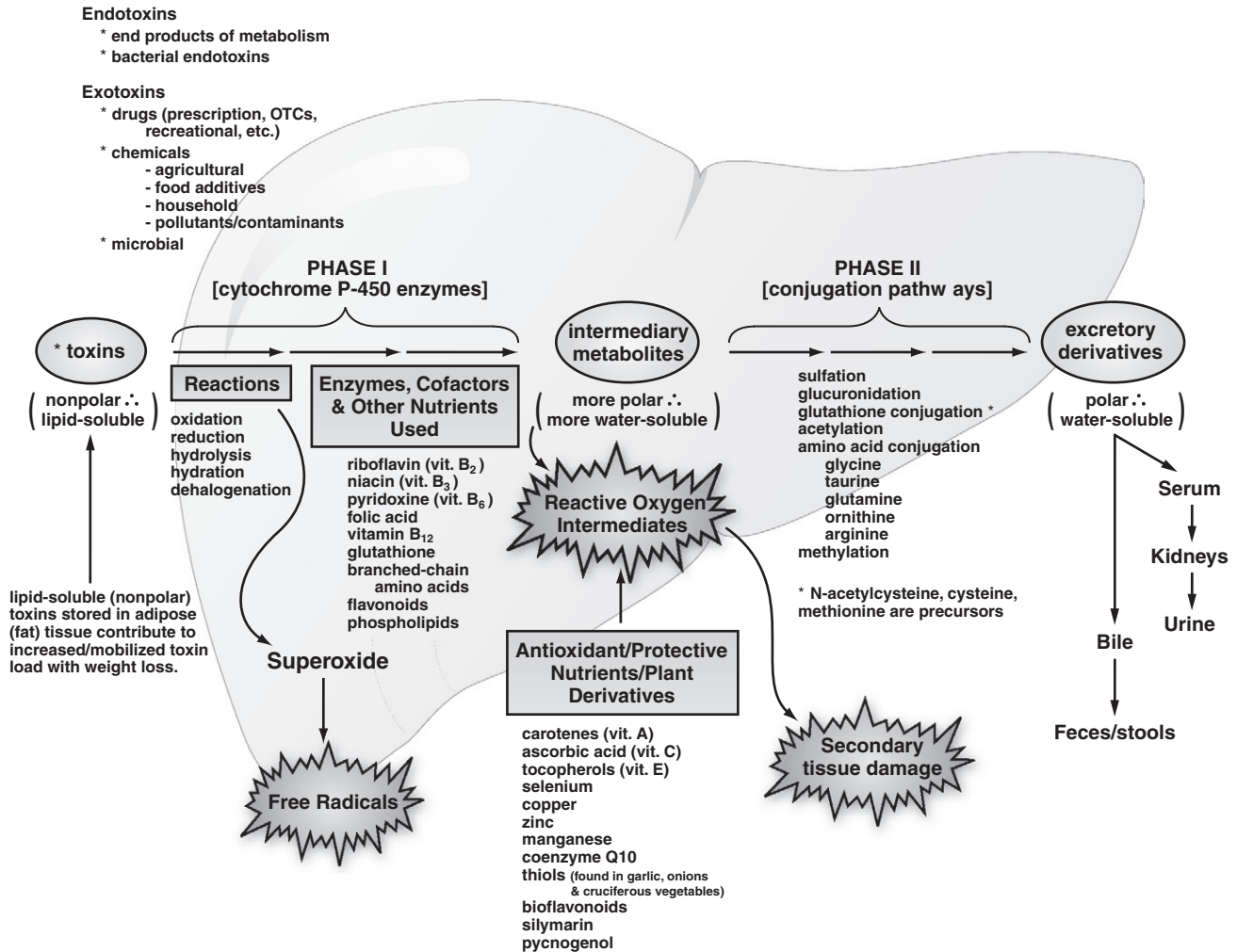
- Liver and gallbladder (Figs. 104-1 to 104-3)
- Kidneys
- Gut
- Skin
- Lungs
- Lymphatics and circulation
- Mind and brain

Symptoms that may reflect an overtaxed or dysfunctional detoxification system are vague and nonspecific, but when seen in constellation they suggest a problem with the body's ability to restore itself. When potentially serious medical conditions have been ruled out by a reasonable allopathic workup, symptoms that may be attributed to a detoxification problem with the body often include the following<sup>1,5,6</sup>:

- Fatigue with sleep disruption and brain fog
- Mood disturbance, especially depression, anxiety, fear, and anger

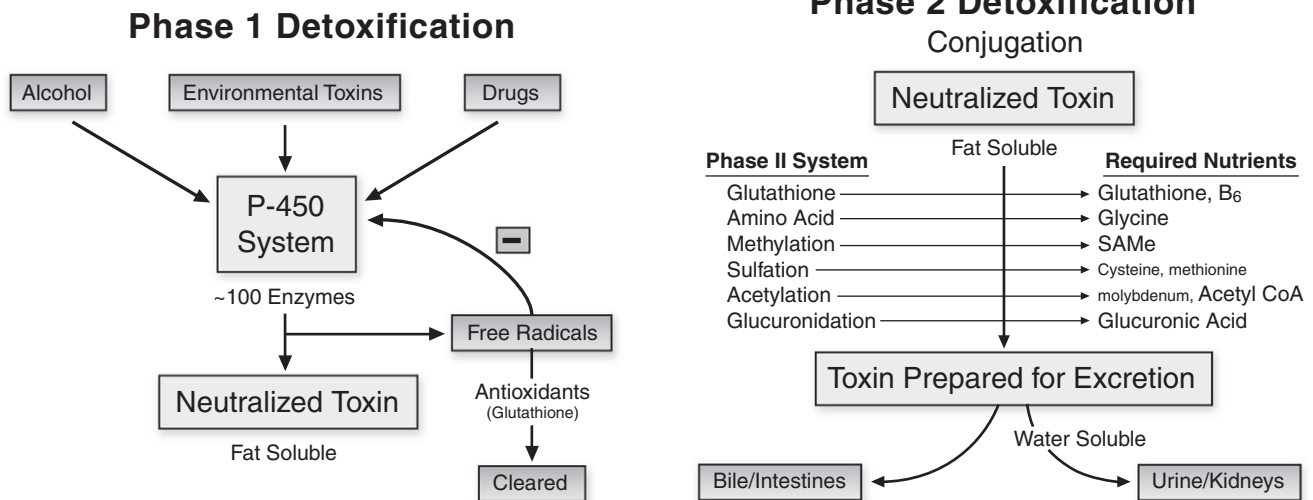


**FIGURE 104-1**  
Liver detoxification. OTCs, over-the-counter (drugs); vit., vitamin.



**FIGURE 104-3**  
Phase 2 detoxification. CoA, coenzyme A; SAME, S-adenosylmethionine. (From Bland JS, Costarella L, Levin B, et al. Environment and toxicity. In: *Clinical Nutrition: A Functional Approach*. Gig Harbor, WA: Institute for Functional Medicine; 1999:261.)

**FIGURE 104-2**  
Phase 1 detoxification. P-450, cytochrome P-450.



- Muscle aches and joint pain
- Sinus congestion, dark circles under the eyes, and postnasal drip
- Headaches with neck and shoulder pain
- Bloating and gas
- Irritable bowel, foul-smelling stools, and dark urine
- Weight changes and loss of muscle tone
- Heartburn, recurrent colds, and persistent infections
- Infertility and low libido
- Premature aging and weakness
- Fluid retention and excess weight
- Rashes and canker sores
- Bad breath and adverse body odor

Although convincing scientific data supporting detoxification therapies are lacking, the question for a patient suffering from any of these symptoms remains this: “*What can I do to find relief?*” Unfortunately, many gimmicky, expensive, unnecessary, and potentially harmful products, programs, and practitioners exaggerate their detoxification claims. In general, patients should avoid dramatic and extreme approaches in favor of reasonable, safe, and health-promoting lifestyle changes that empower patients and avoid dependency and unrealistic expectations. The five basic components of any detoxification program should include the following:

- Exercise every day, such as yoga and walking (especially in natural environments)
- Regular sweating, through exercise, a sauna, a steam room, or a hot room yoga class
- Healthy nutrition, rich in organic fruits and vegetables and filtered water (see Figs. 104-1 to 104-3)
- Self-reflection, such as meditation and breathing-focused relaxation techniques
- Body work, such as massage and acupuncture

## Testing for Toxins

Although testing the body for various chemicals has the appeal of suggesting certainty in naming alleged culprits to explain various symptoms, random testing for toxins remains largely unfounded with few exceptions, and evidence does not support regular or widespread use. The Centers for Disease Control and Prevention (CDC) conduct a biomonitoring program that tests random sample populations for environmental toxins, or body burden. Results continue to demonstrate the ubiquitous nature of toxic body burden across all demographic groups.<sup>7-10</sup> These findings indicate the widespread presence of societal chemicals and suggest that chemical body burden can be presumed for any presenting patient.<sup>11-16</sup> Given the expense, variable quality, questionable validity, and unknown significance of body burden, routine testing is not recommended at this time.<sup>10,17,18</sup> Moreover, the health significance of specific chemical exposures—at what levels, during which times, and at what frequency—is poorly understood.<sup>19</sup> Indiscriminate and unfounded causal

statements about exposure, harm, and treatment efficacy should be approached cautiously and skeptically. The focus should be on reducing the amount of toxicity we place in our living environments (see Chapter 105, Integrative Strategies for Planetary Health).

## Chelation Therapy

Using safe and effective methods to prevent disease, treat symptoms, and achieve homeostasis is the primary goal of a good detoxification regimen. Appropriately, well-placed controversy and concern exists over many detoxification therapies, including chelation for the removal of various heavy metals from the body.<sup>20</sup> The safety of widespread chelation therapy remains in question. A study from the Emergency Department at Emory University in Atlanta found common adverse effects associated with intravenous chelation that included diaphoresis, hypotension, tachycardia, leukopenia, thrombocytopenia, electrocardiographic abnormalities, and increased serum creatinine.<sup>21</sup> The clinical significance of chelation therapy is also uncertain. A review by the Cochrane Database concluded that, at present, evidence of the effectiveness or ineffectiveness of chelation therapy in improving clinical outcomes of patients with atherosclerotic cardiovascular disease is insufficient.<sup>22</sup> However, the CDC did recommend that the calcium disodium edetate (CaNa<sub>2</sub>EDTA) challenge test be considered for children who have blood lead levels of 1.21 to 2.12 mcmol/L (25 to 44 mcg/dL) to determine whether chelation is indicated.<sup>23</sup> Another option could include use of modified citrus pectin such as Pectasol, which may also have benefit in children whose test results are higher than acceptable levels for lead and other heavy metals.<sup>24-28</sup> The dose in one study was 5 g three times daily for 4 weeks.

Unfortunately, pectin is a viscous fiber that is not absorbed into the bloodstream, and food sources (citrus, apples, legumes, cabbage) do not help chelate heavy metals. Modified citrus pectin is absorbed and does help reduce this burden.

In general, what can or should be done to address the ubiquitous nature of chemical body burden is uncertain. Caution and skepticism in the use of chelation therapy are therefore recommended. Further information regarding chelation therapy can be found online (see the Key Web Resources box, later).

## Sauna Therapy

The body stores lipophilic toxins such as pesticides in adipose and subcutaneous fat. Taking a relaxing sauna or steam bath is an effective therapy to help the body detoxify.<sup>29</sup> The traditional sauna increases the air temperature to 160°F to 200°F (approximately 70°C to 90°C) with 25% humidity, compared with a steam room, which is heated to 120°F to 130°F at 100% humidity. The exogenous heat diverts blood to the skin, where sweating releases excess sodium, nitrogen, and toxins.<sup>30-32</sup> In addition to its use in Scandinavia and many cultures around the world for hundreds of years, research since

the 1960s has demonstrated the health-promoting effects of regular sauna use including stress reduction, detoxification, lower blood pressure, and decreased pain.<sup>33</sup> Appropriate sauna use is safe for most people of all ages, although caution should be used in people who have undergone recent surgery, who have unstable cardiovascular conditions such as recent myocardial infarction or cerebrovascular accident, or who have multiple sclerosis, acute lung infections, or pregnancy complications.<sup>34</sup> Further, some evidence indicates that a lower-temperature infrared sauna may offer similar health benefits. Lower-temperature infrared saunas are typically heated to 120°F and are a good option for those who cannot tolerate the higher temperatures of a traditional sauna or steam room. For further reading on the many health effects of sauna therapy, please refer to an excellent book entitled *The Holistic Handbook of Sauna Therapy*, by Nenah Sylver.<sup>35</sup>

## Exercise

Reasonable and safe approaches to body burden detoxification include increasing awareness and adherence to healthy lifestyle behaviors such as regular exercise, healthy nutrition, stress reduction, mind-body practices, spiritual connection, and avoidance of harmful behaviors such as smoking. Exercise has been shown to enhance adipose tissue circulation and therefore increases the release of stored toxins.<sup>36</sup> Cardiovascular exercise also supports detoxification through sweating. Starting with gentle but regular forms of exercise, such as walking or bicycling for 30 or more minutes a day, is best. Ideally, a person should set a goal of 60 or more minutes of vigorous movement of any kind on a daily basis. Hot room yoga is particularly beneficial for detoxification, but any and all forms of movement are encouraged.

## Nutrition

Nutrition is arguably the first and most important step in promoting health and supporting the body's efforts to remove harmful substances. What a person avoids eating is equally important as what is included in a healthy diet. By avoiding artificial additives and unhealthy fats, reducing excess calories (including less salt, saturated fat, and sugars), and adhering to a diverse whole food organic diet, a person will be better able to support the body's detoxification process, in large part by avoiding further environmental pollution<sup>37–39</sup> (see Chapter 86, The Antiinflammatory Diet).

## Safe and Environmentally Friendly Fish and Seafood Choices

Consuming fish and seafood a few times per week has many benefits, but concerns also exist about contaminants that may affect our health and the environmental impact of fishing practices. Resources that you can use to help guide your choices in safe fish and environmentally sustainable seafood choices are provided in the Key Web Resources box.

**TABLE 104-1.** The Environmental Working Group's List of the "Dirty Dozen" (Foods Highest in Pesticides Used) and the "Clean 15" (Foods Lowest in Pesticides Used)

DIRTY DOZEN (BETTER TO BUY ORGANIC)	CLEAN 15 (LESS IMPORTANT TO BUY ORGANIC)
1. Celery	1. Onions
2. Peaches	2. Avocado
3. Strawberries	3. Sweet corn
4. Apples	4. Pineapple
5. Blueberries	5. Mangoes
6. Nectarines	6. Sweet peas
7. Bell peppers	7. Asparagus
8. Spinach	8. Kiwi
9. Cherries	9. Cabbage
10. Kale and collard greens	10. Eggplant
11. Potatoes	11. Cantaloupe
12. Grapes (imported)	12. Watermelon
	13. Grapefruit
	14. Sweet potato
	15. Honeydew melon

Data from the Environmental Working Group: <http://www.ewg.org>.

## Pesticides in Produce

When deciding whether to invest in organic produce, it can be helpful to understand which conventional fruits and vegetables are highest and lowest in pesticide content. The Environmental Working Group puts out a guide that lists the "Dirty Dozen" (foods highest in pesticides used) and the "Clean 15" (foods lowest in pesticides used), as shown in [Table 104-1](#) (see also the Key Web Resources box).

## Fasting

Occasional and sensible fasting may be helpful as well. Several variations of fasting exist, some involving drinking only water or juices or other nonsolid foods. During fasting, the main source of energy used by the body comes from hydrolyzing fatty acids from triglycerides stored in adipose tissue.<sup>40–43</sup> Because many toxins are sequestered in fat, fasting may be helpful in releasing these toxins from the body. Initially, a person may feel worse during a fast because of the mobilization of toxins. Resting and drinking plenty of fluids are therefore helpful during a fast.

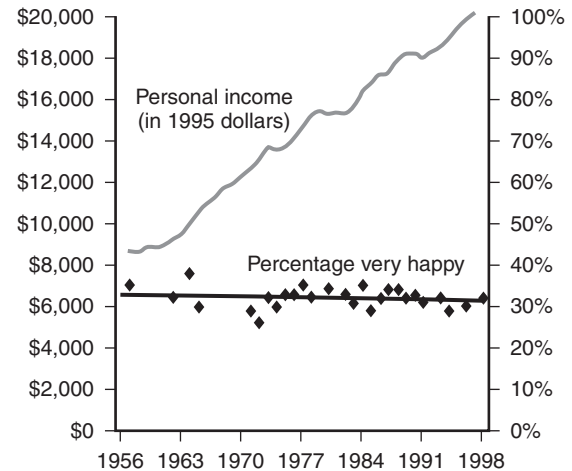
## Manual Therapies

Manual therapies such as massage may be helpful in mobilizing and eliminating toxins from the body by stimulating the lymphatic system, among other possible benefits. Together with exercise and sauna therapy, massage can greatly enhance the ability of the lymphatic, cardiopulmonary, and hepatorenal circulatory systems to mobilize and eliminate toxins. For example, massage has been shown to reduce excessive fluid volume by 65% in patients with lymphedema.<sup>44,45</sup> Other forms of body work such as acupuncture may be helpful as well, in part by increasing the relaxation response, as well as treating Qi stagnation and myofascial restrictions.

## Mind-Body Connection

Finally, any detoxification review or program that ignores the mind-body connection is remiss. Stress is arguably the most significant toxin confronting patients on a daily and long-term basis. As measures of happiness decline in the United States (Fig. 104-4), various mind-body syndromes such as fibromyalgia, migraine headache, chronic fatigue, irritable bowel, multiple chemical sensitivities, and others continue to affect more people.<sup>46,47</sup> Unfortunately, support and awareness are lacking for mind-body interventions that cultivate understanding, behavior changes, insight, and accountability for patients and health care workers.<sup>48</sup> Various chapters in this text offer helpful tools to support a healthy mind and heart.

**FIGURE 104-4**  
U.S. Department of Commerce, Bureau of the Census.



## THERAPEUTIC REVIEW

See the Patient Handout at the end of this chapter.<sup>49</sup>

### KEY WEB RESOURCES

University of Wisconsin Department of Family Medicine: [www.fammed.wisc.edu/integrative/modules](http://www.fammed.wisc.edu/integrative/modules)

This Web site provides a regularly updated, self-guided 7-day detoxification plan.

Environmental Working Group: [www.ewg.org](http://www.ewg.org); <http://www.ewg.org/safefishlist>

This group offers excellent resources regarding information on harmful toxins in the environment with recommendations on how to avoid them, including information on toxins in fish and pesticides in produce.

Environmental Defense Fund seafood selector: <http://www.edf.org/page.cfm?tagID=1521>

This organization offers ratings of the best (least contamination) and worst (most contamination) for seafood consumption, as well as a pocket guide for selecting seafood.

Centers for Disease Control chemical exposure report: <http://www.cdc.gov/exposurereport/>

This national report details the health effects of human exposure to environmental chemicals.

Doctor's Data, Inc.: [www.doctorsdata.com](http://www.doctorsdata.com)

This laboratory offers toxicology testing, as well as drinking water analysis. It also contains information on chelation therapy.

Bioneers: [www.bioneers.org](http://www.bioneers.org)

This organization offers advice on sustainable living that supports nature's resources.

National Center for Complementary and Alternative Medicine: [www.nccam.nih.gov](http://www.nccam.nih.gov)

This National Institutes of Health Web site provides information on many topics, including chelation therapy.

## Acknowledgments

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## References

References are available online at [expertconsult.com](http://expertconsult.com).

### Patient Handout: Seven Day Detoxification Program Patient Handout

Many detox approaches are available, and very little evidence suggests that one is superior to the next. However, a 7-day commitment to healthy activities can relieve many symptoms by helping the body find balance. Most importantly, be creative and adapt to your needs. The following plan (found online at [www.fammed.wisc.edu/integrative/modules](http://www.fammed.wisc.edu/integrative/modules)) offers general guidelines for self-guided detoxification.

#### Getting Started

- This regimen is not intended to be an exhaustive resource, nor is it a test of will and endurance. It is designed to be a safe, easeful, useful, empowering, and accessible health guide taking into account personal variability and preference *with individual adaptations made as necessary*. However, *this process does require planning and preparation, so read through it and make preparations ahead of time*.
- In addition to physiologic approaches, this plan equally emphasizes mind-body approaches that can aid the relaxation response and unravel negative and unconscious mental patterns that often result in pain and discomfort.
- The most important part of going through a detox program is to first ask why you are doing it. Being clear about your intentions helps avoid inflated expectations and disappointment. Write down your reasons for going through a detoxifying program in language that is meaningful to you.
- The five basic ingredients of this detox regimen are self-reflection, exercise, sauna, nutrition, and manual therapy. The program offered here is designed to support and enhance your own ability to heal and experience well-being. It is intended for most people with few exceptions and is self-directed.
- The program has a strong emphasis on using organic, sustainable, local, responsible, gentle, natural, whole, balanced, and easeful products and methods that honor the global and spiritual aspect of health.

#### Precautions and Expectations

- **Healing crises** commonly occur during a detoxification regimen. Common and temporary symptoms of detoxification include feeling lousy, headache, lightheadedness, diarrhea, cramps, bloating, body aches, fatigue, mood changes, and weakness. These crises are caused by a combination of factors including the mobilization of toxins, low blood sugar, low fluids, electrolyte imbalance, withdrawal from various substances (such as alcohol, caffeine, sugar, nicotine), and even changes in your daily routine.
- Most often the best approach is to **continue with the detox**. However, you may need to stop or alter the detox if you experience ongoing distressing symptoms.
- **Dehydration** is common during a detox. Make sure that you drink a lot of fluids.
- **Address your particular needs** as you go along, such as more frequent snacks, larger meals, increase protein and healthy fats, less work, more rest, and less striving.
- In general, continued use of **prescribed daily medications** is recommended. If needed, use as needed medications sparingly for headaches or other problems you encounter.
- **Communicate with your health care provider**, therapist, or other healing practitioners about any concerns that arise during the detox as needed.

**In the end**, you will likely find that you feel better, have more energy, and may require less medication.

Below are three examples of 7-day detoxification programs. You can choose the one that best matches your needs and lifestyle. They progress from simple (#1) to more involved (#3).

#### Version #1 (short)

##### For 7 or more days:

- Eat only fruits and vegetables in any combination, amount, and preparation using healthy oils and spices as needed.
- Drink plenty of filtered water, juice, tea, and broth.
- Move and exercise the body in any variety, intensity, and duration.
- Keep a journal and practice any variety of self-reflection.

#### Version #2 (short)

- Days 1 and 2:** Eliminate meat, eggs, dairy, wheat, alcohol, caffeine, chocolate, and sugar. Eat only organic vegan foods in any arrangement, preparation, and amount using cooking oils and seasonings.
- Day 3:** In addition, eliminate grains, nuts, beans, and legumes. Eat only fruits and vegetables in any combination, amount, and preparation using oils and spices as needed.
- Day 4:** Avoid eating any solid food. Drink plenty of water, broth, juice, and tea.
- Day 5:** (same as Day 3)
- Days 6 and 7:** (same as Days 1 and 2)

#### Version #3 (Long version. Supplements and bowel regimen are optional.)

##### Days 1 and 2

For the entire detox week, eliminate flesh foods/meat (e.g., fish, beef, pork, lamb, poultry), refined sugars (white/brown sugar and especially high-fructose corn syrup), and especially artificial sweeteners such as *saccharine*, *aspartame*, and *Splenda* (natural sweeteners such as honey, maple syrup, and molasses are okay to use in small amounts). Also avoid alcohol, tobacco, caffeine, cigarettes, chocolate, and recreational drugs for the entire week. It is advised to avoid dairy, wheat, and eggs during the detox week as well (instead try soy/almond/rice milk, soy cheese, soy yogurt, stanol/sterol spreads). Cooking preferences are guided by recipes that include soups, steaming, sautéing, etc.

**Encouraged foods** for days 1 and 2 include fresh/frozen/dried vegetables, fruit, and mushrooms (maitake, shiitake, oyster, and/or enoki, etc). Healthy grains are also recommended for days 1 and 2 (brown/wild rice, quinoa, buckwheat, oatmeal, millet, seeds, nuts, legumes, and flaxseed).

In addition, the following suggestions are encouraged:

- Use cold-pressed organic extra virgin olive oil as guided by your recipes and meals.
- Use spices and healthy seasonings as guided by your recipes.
- Drink 8–10 glasses of filtered water, including vitalizing beverage, detox broth, smoothies, and diluted juices.
- Drink tea throughout the day, such as peppermint, decaf green, chamomile, licorice, ginger, rooibos, and digestive tea.
- For snacks eat mixed nuts, dried and fresh fruit, vegetables, and detox broth (see Table 104-1).
- Consider using the optional herbs and supplements at recommended dosages.
- Consider 15–30 minutes of sauna or steam room therapy.

Continued

- Consider 30–60 minutes of light exercise such as walking, running, biking, skiing, jump rope, stretching, yoga, pilates.
- Practice any variety of self-reflection, including meditation and breathing exercises.
- Journaling is encouraged to reflect on the detox process.

**Day 3**

For day 3 also eliminate grains, nuts, seeds, legumes, beans, and mushrooms. *Eat only fruit and vegetables* fresh/frozen/dried in any combination and amount using healthy recipes. Just like days 1, 2, 6, and 7, the following items are suggested:

- Olive oil
- Spices and seasonings
- Filtered water, tea, vitalizing-beverage, detox broth, smoothies, and diluted juice
- Optional herbs and supplements at recommended dosages
- Sauna or steam room heat therapy
- Light exercise
- Journaling, self-reflection, or meditation

*A new suggestion to add on day 3 is massage therapy to help mobilize toxins and stimulate the lymphatic circulation.*

**Day 4 (Modified Fasting)**

**Eliminate all solid food** (i.e., using only water, tea, juices, and broth with modifications as needed). Most importantly, **PAY ATTENTION TO THE NEEDS OF YOUR BODY!** *Sensitive, ill, weak, and thin people should avoid or modify this day of fasting if needed, such as drinking more juice and broth as needed.*

**Other suggestions include:**

- Rest and relaxation; avoid exercise and sauna use today.
- Do minimal or no work today and avoid being overly active.
- Stop all previous supplements for today.**
- Drink plenty of fluids and keep up with bowel and bladder fluid losses (tea with honey, vitalizing beverage, diluted fruit/vegetable juice, and detox broth).
- Use journaling, self-reflection, or meditation.

**Optional bowel cleansing regimen (One at a time):**

- Take 500–1000 mg of bentonite clay or activated charcoal capsules by mouth three times per day with water, **only for the day of fasting today** (*toxin binder for the gut*)
- Drink 300 mL of **magnesium citrate** (one bottle) in the morning for bowel elimination
- Use 1–2 saline **Fleet Enemas** in the afternoon or evening

**Day 5 (Same as Day 3 except for Energy Work)**

For day 5, add back *fruit and vegetables* in any combination, preparation, and amount using healthy recipes. Again, encouraged foods include fresh/frozen/dried vegetables and fruit (*but no mushrooms, grains, seeds, beans, legumes, or nuts*). Just like days 1–3, the following items are suggested:

- Olive oil
- Spices and seasonings
- Filtered water, tea, vitalizing-beverage, detox broth, smoothies, and diluted juice
- Optional herbs and supplements restarted at recommended dosages
- Sauna or steam room heat therapy
- Light exercise
- Journaling, and self-reflection, or meditation

*A new suggestion to add on day 5 is an **energy work session** such as acupuncture or Reiki to help balance your system.*

**Days 6 and 7 (Same as Days 1 and 2)**

In addition to fruits and vegetables, **add back** mushrooms, beans, legumes, seeds, nuts, and healthy grains. The following suggestions continue to be encouraged:

- Olive oil
- Spices and seasonings
- Filtered water, tea, vitalizing-beverage, detox broth, smoothies, and diluted juice
- Optional herbs and supplements at recommended dosages
- Sauna or steam room heat therapy
- Light exercise
- Journaling, self-reflection, or meditation

**Detox broth recipe**

Use fresh organic ingredients if possible. This is an excellent aid for fasting on Day 4. Ingredients can be varied according to taste and availability.

- 1 large soup pot or kettle
- 1 strainer
- 1 large bowl or container for straining the soup
- 3–4 quarts of filtered water (fill pot after all ingredients are in)
- 1 large chopped onion (white or yellow)
- 3–5 small bunches of various chopped greens (kale, parsley, cilantro, chard, or dandelion)
- 2 stalks of sliced celery
- 1 cup of fresh or dried seaweed (nori, dulse, wakame, kelp, or kombu)
- 1/2 small-medium head of chopped cabbage (any variety)
- 2 peeled carrots
- 2 stalks of peeled burdock root
- 1 large peeled daikon root
- 1 cup of squash (any variety) chopped into cubes
- 3 chopped root vegetables (turnip, parsnip, or rutabaga)

- 2–3 cups fresh/dried mushrooms (maitake, shiitake, oyster, or enoki)

Add all ingredients to the large pot at once and bring to a low boil for 40–60 minutes (add water to fill). Strain the stock to remove the solid material (keep the liquid broth and dispose the left over solid parts). Salt to taste. Store in the original soup pot or a tightly sealed container for use all week. Keep the remaining broth cooled in the refrigerator, and reheat for use. Enjoy as a sipping broth throughout the detox week, especially during the day of fasting on day 4.

Recipe Courtesy of Mark Hyman, MD

#### Smoothie recipe with supplements

Use organic ingredients when possible. This makes about 1 liter which is divided into 4 servings, or 2 days worth, a glass in the AM and PM.

- About 2 tablespoons (20 mL) of organic cold pressed extra virgin olive oil
- 1/2 avocado
- About 4 tablespoons (20 g) of **whey protein powder** (optional)
- About 4 tablespoons (20 g) of **modified citrus pectin** (Pectasol, optional)
- 1/2 cup of orange juice (or 100% organic juice of choice)
- 1/2 cup of vanilla flavored soy milk, rice milk, or almond milk
- About 4 tablespoons (40 g) of flaxseed (or psyllium)
- 8–10 ice cubes (or 1/2 cup of filtered water)
- 1 organic banana (sliced)
- 1 organic apple or pear with peel (sliced)
- 1/2 cup organic frozen or fresh blueberries (and/or seasonal berries of choice)

Place ingredients in a blender and grind up until smooth, adding more water as needed. Store remaining mix in the refrigerator. *Be creative; this can be varied according to taste and availability of various fruit.* Enjoy 1 tall glass twice a day with or between meals.

#### Digestive tea recipe

- 1/2 teaspoon (t) of whole fennel seeds
- 1/2 t of whole coriander seeds
- 1/2 t of whole cumin seeds

Add seeds to about one quart boiling water. Let the seeds steep for about 10 minutes. Enjoy after meals throughout the detox week. Other recommended teas include ginger, licorice, peppermint, chamomile, rooibos, and decaf green teas.

Recipe Courtesy of Kris Helgeson, FNP

#### Vitalizing beverage

This is an excellent aid for fasting on day 4.

- 1–2 tablespoons fresh lemon and/or lime juice (about 1/2 crushed or squeezed lemon/lime)
- 1–2 tablespoons of real maple syrup
- 1/10 teaspoon cayenne pepper (a small pinch)
- Purified, spring, or mineral water (carbonated water can also be used)

In a tall glass combine the juice, syrup, and cayenne. Fill the glass with water and stir well. Add crushed ice as desired. Enjoy throughout the detox, especially during fasting on day 4. Diluted fruit juice of any variety (1/2 real juice and 1/2 water) is also recommended.

Recipe Courtesy of Paramahansa Yogananda (adapted)

- **Hydrolyzed whey protein powder** 10 g powder two times per day mixed in smoothies or juice. Whey protein contains bonded cysteine that increases glutathione, a potent antioxidant, immune modulator, and detoxifier.
- **Pectasol powder** (modified citrus pectin-MCP, **NOT pectin fiber**) 10 g powder two times per day mixed in smoothies. MCP is absorbed in the gut and chelates heavy metals in the body that flow to the kidneys and liver where they are eliminated. It is easier to find online.
- **Milk thistle crude extract capsules** about 500–1000 mg three times per day with meals. This is a safe and beneficial herb used for 7 days for liver support.
- **Dandelion root capsules**, about 500–1000 mg three times per day with meals. This is a safe and beneficial herb for kidney and gallbladder support. It may increase urination.
- **Multivitamin tablet**, one daily with a meal.
- **Turmeric capsules**, about 500–1000 mg three times per day with meals. This is a safe and beneficial herb used for 7 days for inflammation and gut support.
- **Probiotics (Includes both lactobacillus and bifidobacteria)**, one capsule three times per day. This is a safe and beneficial supplement used for 7 days to colonize the gut with healthy supportive bacteria.
- **Fish Oil omega-3 essential fatty acids**, 1000 mg total of EPA and DHA daily in liquid or capsule form. Vegetarian options include 2 tablespoons (T) daily of ground flaxseed or flax oil mixed in with smoothies. This supplement is used to reduce inflammation in the body.
- **Extra virgin, cold-pressed, organic olive oil**, 2 tablespoons in smoothies twice a day (and used in any amount in food for cooking). This healthy oil is rich in essential fatty acids.

**DAY OF FASTING ONLY: Activated charcoal or bentonite clay capsules**, about 500–1000 mg three times per day to bind gut toxins, but only taken during fasting. Always take about 1 hour *before* or *after* anything else by mouth.

## References

- Kokayi K, Altman CH, Calley RW, Harrison A. Findings of and treatment for high levels of mercury and lead toxicity in ground zero rescue and recovery workers and lower Manhattan residents. *Explore (NY)*. 2006;2:400–407.
- Hyman M. *The Detox Box*. Louisville, CO: Sounds True; 2006.
- Myers DG. The funds, friends, and faith of happy people. *Am Psychol*. 2000;55:56–67.
- World Health Organization. *Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health*. Final report of the Commission on Social Determinants of Health. Geneva: World Health Organization; 2008.
- Miller CS. Medicine's blind spot. *Fam Med*. 1999;31:280–282.
- Green MM. Six trauma imprints treated with combination intervention: critical incident stress debriefing and thought field therapy. *Traumatology*. 2002;8:18–30.
- Centers for Disease Control and Prevention. *Third National Report on Human Exposure to Environmental Chemicals*. Atlanta: Centers for Disease Control and Prevention; 2005.
- Thornton JW, McGally M, Houlihan J. Bio-monitoring of industrial pollutants: health and policy implications of the chemical body burden. *Public Health Rep*. 2002;117:315–323.
- Centers for Disease Control and Prevention. *National Report on Human Exposure to Environmental Chemicals: 2009 and 2011*. <[www.cdc.gov/exposurereport](http://www.cdc.gov/exposurereport)>; Accessed 08.03.11.
- Paustenbach D, Galbraith D. Biomonitoring and biomarkers: exposure assessment will never be the same. *Environ Health Perspect*. 2006;114:1143–1149.
- Blount BC, Valentin-Blasini L, Osterloh JD, et al. Perchlorate exposure of the U.S. population, 2001–2002. *J Expo Sci Environ Epidemiol*. 2007;17:400–407.
- Blount BC, Pirkle JL, Osterloh JD, et al. Urinary perchlorate and thyroid hormone levels in adolescent and adult men and women living in the United States. *Environ Health Perspect*. 2006;114:1865–1871.
- Janssen S, Solomon G, Schettler T. *Chemical Contaminants and Human Disease: A Summary of Evidence*. Science and Environmental Health Network. [http://guamagentorange.info/yahoo\\_site\\_admin/assets/docs/CHE\\_Toxicants\\_and\\_Disease\\_Database.160121218.pdf](http://guamagentorange.info/yahoo_site_admin/assets/docs/CHE_Toxicants_and_Disease_Database.160121218.pdf); 2006 Accessed 10.01.12.
- Rogan WJ. Pollutants in breast milk. *Arch Pediatr Adolesc Med*. 1996;150:981–990.
- Solomon GM, Weiss PM. Chemical contaminants in breast milk: time trends and regional variability. *Environ Health Perspect*. 2002;110:A339–A347.
- Environmental Working Group. *Pharmaceuticals Pollute US Tap Water*. <<http://www.ewg.org/node/26128>>; 2008 Accessed 11.03.11.
- Frisch M, Schwartz BS. The pitfalls of hair analysis for toxicants in clinical practice: three case reports. *Environ Health Perspect*. 2002;110:433–436.
- Eastern Research Group. *Hair Analysis Panel Discussion: Exploring the State of the Science*. Atlanta: Agency for Toxic Substances and Disease Registry; 2001.
- U.S. Government Accountability Office. *Chemical Regulation: Options Exist to Improve EPA's Ability to Assess Health Risks and Manage Its Chemical Review Program*. U.S. Government Accountability Office report to congressional requesters: GAO-05-458. <<http://www.gao.gov/new.items/d05458.pdf>>; 2005 Accessed 11.03.11.
- Miller AL. Dimercaptosuccinic acid: a nontoxic water soluble treatment for heavy metal toxicity. *Altern Med Rev*. 1998;3:199–207.
- Morgan BW, Kori S, Thomas JD. Adverse effects in 5 patients receiving EDTA at an outpatient chelation clinic. *Vet Hum Toxicol*. 2002;44:274–276.
- Villarruz MV, Dans A, Tan F. Chelation therapy for atherosclerotic cardiovascular disease. *Cochrane Database Syst Rev*. 2002;(4) CD002785.
- Campbell JR, Schaffer SJ. Predicting the outcome of the CaNa2EDTA challenge test in children with moderately elevated blood lead levels. *Environ Health Perspect*. 1999;107:437–440.
- Eliasz I, Hotchkiss AT, Fishman ML, et al. The effect of modified citrus pectin on urinary excretion of toxic elements. *Phytother Res*. 2006;20:859–864.
- Eliasz I, Weil E, Wilk B. Integrative medicine and the role of modified citrus pectin/alginate in heavy metal chelation and detoxification: five case reports. *Forsch Komplementmed*. 2007;14:358–364.
- Guess BW, Scholz MC, Strum SB, et al. Modified citrus pectin (MCP) increases the prostate-specific antigen doubling time in men with prostate cancer. *Prostate Cancer Prostatic Dis*. 2003;6:301–304.
- Wisner RM, Shields GM, Beckmann SL. Treatment of children with the detoxification method developed by Hubbard. *Proc Am Public Health Assoc*. <<http://www.detoxacademy.org/pdfs/childtox.pdf>>; 1995 Accessed 11.03.11.
- Zhao ZY, Liang L, Fan X, et al. The role of modified citrus pectin as an effective chelator of lead in children hospitalized with toxic lead levels. *Altern Ther Health Med*. 2008;14:34–38.
- Gard ZR, Brown EJ. Literature review and comparison studies of sauna/hyperthermia in detoxification. *Townsend Lett*. 1999; Aug/Sept:76–86.
- Lovejoy HB, Bell ZG Jr, Vizena TR. Mercury exposure evaluations and their correlation with urine mercury excretions, the elimination of mercury by sweating. *J Occup Med*. 1973;15:590–591.
- Schnare DW, Ben M, Shields MG. Body burden reductions of PCBs, PBBs and chlorinated pesticides in human subjects. *Ambio*. 1984; 13:378–380.
- Schnare DW, Denk G, Shields M, et al. Evaluation of a detoxification regimen for fat-stored xenobiotics. *Med Hypotheses*. 1982;9:265–282.
- Hannuksela ML, Ellahham S. Benefits and risks of sauna bathing. *Am J Med*. 2001;110:118–126.
- Crinion W. Components of practical clinical detox programs: sauna as a therapeutic tool. *Altern Ther Health Med*. 2007;13:S154–S156.
- Sylvester N. *The Holistic Handbook of Sauna Therapy*. Stone Ridge, NY: Center for Frequency; 2004.
- Bulow J. Adipose tissue blood flow during exercise. *Dan Med Bull*. 1983;30:85–100.
- Lietzmann C. Nutrition ecology: the contribution of vegetarian diets. *Am J Clin Nutr*. 2003;78(suppl):657S–659S.
- McMichael AJ, Powles JW, Butler CD, et al. Food, livestock production, energy, climate change, and health. *Lancet*. 2007;370:1253–1263.
- Carlsson-Kanyama A, Ekstrom MP. Food and the life cycle energy inputs: consequences of diet and ways to increase efficiency. *Ecol Econ*. 2003;44:293–307.
- Cahill GJ, Owen OE, Morgan AP. The consumption of fuels during prolonged starvation. *Adv Enzyme Regul*. 1968;6:143–150.
- Sorrentino D, Stump DD, Zhou SL, et al. The hepatocellular uptake of free fatty acids is selectively preserved during starvation. *Gastroenterology*. 1994;107:1415–1424.
- Saudek CD, Felig P. The metabolic events of starvation. *Am J Med*. 1976;60:117–126.
- Toxicologic consequences of oral aluminum (editorial). *Nutr Rev*. 1987;45:72–74.
- Little L, Porche DJ. Manual lymph drainage (MLD). *J Assoc Nurses AIDS Care*. 1998;9:78–81.
- Badger C, Preston N, Seers K, Mortimer P. Physical therapies for reducing and controlling lymphedema of the limbs. *Cochrane Database Syst Rev*. 2004;(4): CD003141.
- Hsu MC, Schubiner H, Lumley MA, et al. Sustained pain reduction through affective self-awareness in fibromyalgia: a randomized trial. *J Gen Intern Med*. 2010;25:1064–1070.
- Lumley MA, Stout RL, Cohen JL, et al. An emotional exposure-based treatment of traumatic stress for people with chronic pain: preliminary results for fibromyalgia syndrome. *Psychotherapy (Chic)*. 2008;45:165–172.
- Krasner MS, Epstein RM, Beckman H, et al. Association of an educational program in mindful communication with burnout, empathy, and attitude among primary care physicians. *JAMA*. 2009;302:1284–1293.
- University of Wisconsin Integrative Medicine. *Detoxification Handouts*. <[www.fammed.wisc.edu/integrative/modules](http://www.fammed.wisc.edu/integrative/modules)>; Accessed 11.03.11.





# 105

## Integrative Strategies for Planetary Health

Nancy L. Sudak, MD, and James Harvie, PEng

Awareness of the ecologic impact of modern human activities necessitates urgent action on the part of governmental officials, public interest groups, and individuals. Integrative holistic practitioners intuitively understand that partitioning body from mind and spirit is unnatural; the separation of human health from the health of communities and the planet is similarly shortsighted. Holistic integrative practitioners, who are uniquely oriented toward an expansive worldview, are ideal educators for patients and colleagues about the steps that can be taken to mitigate ecologic health impacts and advocate for policies and practices that promote resilience at individual, community, and planetary levels. Understanding some general concepts is helpful, but extensive scientific knowledge is not required to implement ecologic preventive health strategies. Once individuals become aware of the enormity of environmental degradation, they may feel a call to action to protect humans and the planet from further harm (see Chapter 113, Creating a Greener Clinic: The Impact of Global Warming on Health).

This chapter provides a practical overview of some of the major issues eroding global ecologic services and of preventive strategies through a lens of climate change, the food system, and toxic chemicals.

Although acute toxicity is problematic, this chapter focuses on the long term. The chapter does not address the myriad established environmentally related occupational exposures, and it assumes an everyday workplace that is not dissimilar from our homes with respect to use of products, technologies, and consumption of foods and water. The important social health impact of our current materials economy is similarly beyond the scope of this chapter.

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### A Systems Approach

Human populations are tied to ecologic functions, and from a wellness perspective, differentiating between human and environmental effects is not useful. What food we grow, and

how we grow it, has consequences with respect to nutrition, greenhouse gas emissions, water and air quality, and socioeconomic health.<sup>1</sup> Similarly, the toxic persistent cycle demonstrates the potential for distant releases to cause local exposures and the role of prevention at the local level in promoting global restoration. [Figure 105-1](#) helps illustrate that when we pour something undesired down the drain, our action has multiple unseen effects, and although a burden may have been relieved on the home front, another burden occurs elsewhere. We must therefore understand that being healthy when living on an unhealthy planet is impossible.

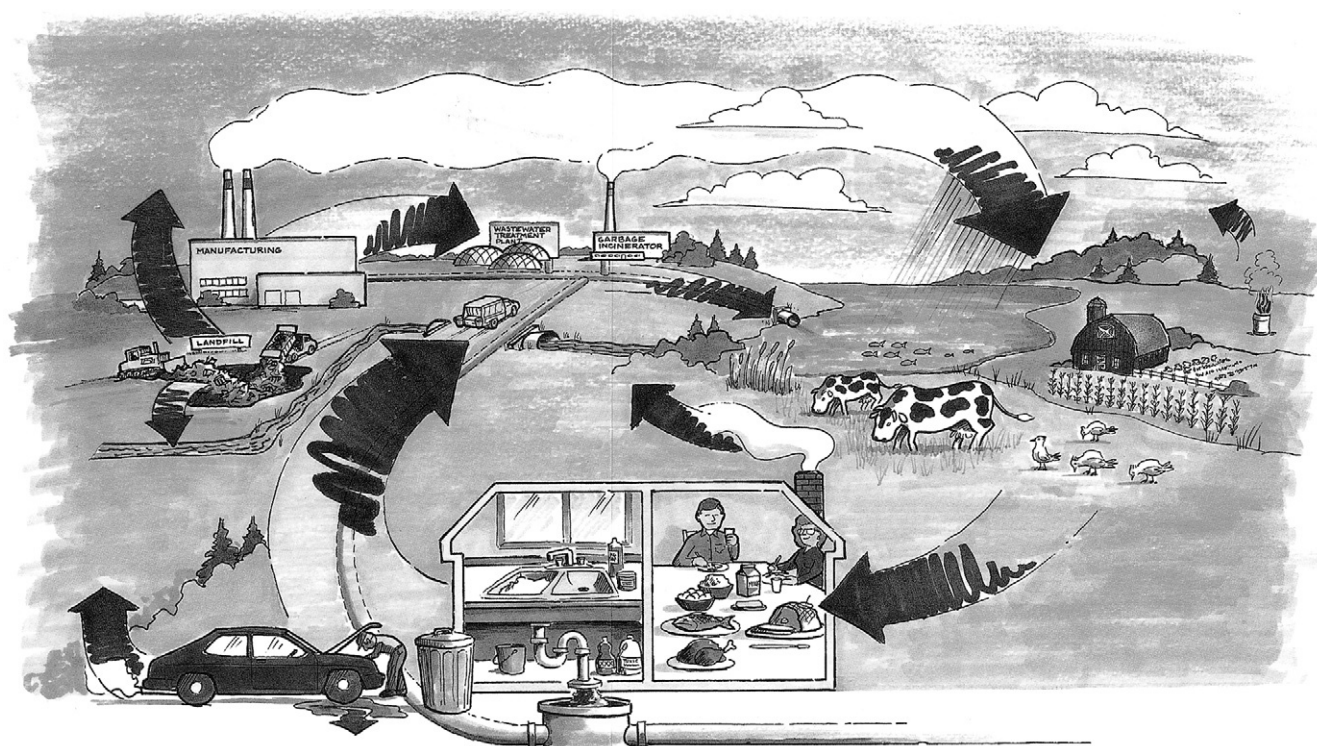
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### The Precautionary Principle

An important concept that has evolved from the study of environmental health is the precautionary principle, a decision-making tool used if an activity raises the threat of harm, but cause and effect are not definite. The precautionary principle proposes that the burden of proof that an activity or product is *not* harmful should fall on the purveyors of a potentially harmful activity. This principle embodies the Hippocratic premise, “First do no harm,” and is gaining widespread acceptance because it eliminates the barrier of uncertainty to allow for protective action. Rather than asking how much toxic damage is acceptable in a baby or an ecosystem, a precautionary approach asks how much exposure can be avoided.<sup>2</sup> For example, although we know that many industrial chemicals have adverse health effects and that our body burdens are noteworthy, we may not fully understand whether safe threshold limits exist or have the benefit of studies that demonstrate synergism among various chemical combinations. It is also reasonable to consider the biochemical diversity among detoxification mechanisms in human beings<sup>3</sup> and to acknowledge that what may be tolerated in one individual may have a devastating health impact on another. When consequences are not known with certainty,

**FIGURE 105-1**

Toxic persistent cycle. (From Western Lake Superior Sanitary District. *Safe Solutions to Toxic Problems: A Guide to Eliminating Persistent Toxic Substances from the Lake Superior Basin*. Duluth, MN: Western Lake Superior Sanitary District; 2007. <[http://www.wlssd.com/Safe\\_Solutions\\_Toxic\\_Problems.pdf.pdf](http://www.wlssd.com/Safe_Solutions_Toxic_Problems.pdf.pdf)>.)



but are judged from available evidence to pose significant risk, avoidance is the most prudent course of action.

The precautionary principle proposes that the burden of proof that an activity or product is *not* harmful should fall on the purveyors of a potentially harmful activity. When consequences are not known with certainty, but are judged from available evidence to pose significant risk, avoidance is the most prudent course of action.

The burden of scientific proof has become an obstruction to protecting health and the environment, because many people will be irreversibly sickened during the lengthy process required to prove that a substance is harmful. In fact, under current regulatory practice, proponents of harmful activities are served by investment in research that prolongs uncertainty. Many smokers died of lung cancer before cause and effect were definitively established between cigarette smoking and lung cancer. Application of the precautionary principle has become a critical component of environmental agreements throughout the world because it proactively combines scientific rigor from all current available evidence with the primary concern of protecting public health. When human health and environmental health are at stake, protective action is the most ethical course of action, even when it precedes scientific certainty. The challenge is that application of the precautionary approach is still limited in

scope. The following two examples demonstrate the importance of these considerations:

### Nanotechnology

*Nanomaterials* are engineered particles made to have extremely small dimensions to take advantage of unique physical and chemical properties that exist at the nanoscale. As a result of their unique size, the physical and chemical properties of nanomaterials differ from their larger-scale particles and may act unpredictably and in ways that are currently not understood. For example, evidence indicates that nanomaterials can pass through skin and blood-brain barriers.<sup>4</sup> Scientific bodies have recommended that nanomaterials be treated and regulated as new chemicals<sup>5</sup> and that the precautionary principle be applied.<sup>6</sup> Nonetheless, hundreds of consumer products and food additives already on the marketplace contain nanomaterials. These products are typically undisclosed and untested for their impacts on human and environmental health.

### Genetically Engineered Foods

Genetically engineered (GE) foods were first introduced to the marketplace in 1994, when producers in the United States brought out the Flavr Savr tomato. In 1996, GE soy became the first GE crop to be widely grown. GE technologies incorporate genetic material into the food supply and result in foods that would not otherwise occur in nature. Up to 70% of packaged foods in U.S. supermarkets may contain

ingredients from GE corn,<sup>7</sup> soy, canola,<sup>8</sup> or sugar.<sup>9</sup> In 2009, GE beets were introduced to the U.S. market. U.S. residents have therefore been consuming GE foods without benefit of adequate studies to ensure that these foods will have no adverse impacts on human or animal health or on the environment. Health concerns associated with GE foods include both potential human and ecologic impacts. These include allergies,<sup>10</sup> antibiotic resistance,<sup>11–18</sup> food toxicity,<sup>19–23</sup> threats to nontarget species by contamination,<sup>24–27</sup> and gene dispersal.<sup>28–34</sup> Moreover, GE crop use promotes the increased use and toxicity of pesticides.<sup>35–38</sup>

In 1992, the U.S. Food and Drug Administration declared that GM crops are generally regarded as safe (GRAS) and therefore do not require any safety evaluations or labeling of GMOs.<sup>39</sup> Problematically, technology stewardship agreements state that the purchase of genetically modified seeds from patent owners (such as Monsanto) for purposes of research is explicitly prohibited unless that research is approved by the technology proponents. Leading researchers released a statement concluding that “as a result of restricted access, no truly independent research can be legally conducted on many critical questions regarding the technology, its performance, its management implications, ... and its interactions with insect biology.”<sup>40</sup> We continue to face a paucity of studies specifically designed to assess the potential for health effects from GE foods or feed. In 2005, a Parliamentary Assembly of the Council of Europe noted the health and safety issues around GE crops and the lack of studies assessing these threats by stating that “the health risks to humans (allergies, nutritional effects, etc.) so far have hardly been examined... [and] there is as yet no reliable information concerning their medium- and long-term environmental effects.”<sup>41</sup>

In 2011, the Parliamentary Assembly adopted a resolution<sup>42</sup> that highlights the contrast between the U.S. approach to GMOs, which assumes safety without research, to the European approach, which hinges on the precautionary principle. Moreover, the resolution recommended that member countries “take the necessary steps to label products containing GMOs or derived from animals fed with GMOs” and “that the European Union guarantee the right of its member states to decide whether or not to cultivate genetically modified plants and, if such cultivations exist, to establish GMO-free zones.” In 2009, a leading U.S. Catholic health system introduced a policy aimed at preferentially purchasing GE-free foods.<sup>43</sup> By 2011 the American Academy of Environmental Medicine (AAEM),<sup>44</sup> the American Nurses Association, the Illinois Public Health Association,<sup>44a</sup> and the American Public Health Association<sup>44b</sup> endorsed resolutions calling, in part, for the labeling of GMO foods. Specifically, the AAEM stated, “with the precautionary principle in mind, because GM foods have not been properly tested for human consumption and because there is ample evidence of probable harm, the AAEM asks, in part, that physicians educate their patients, the medical community, and the public to avoid GM foods when possible and provide educational materials concerning GM foods and health risks.”<sup>44</sup>

## Concepts in Ecotoxicology

### Persistence

- Persistence is the tendency of a substance to resist degradation.

### Bioconcentration

- Persistent chemicals accumulate in an organism and at higher levels of the food chain.
- Substances dispersed into air or water reappear in higher concentrations in foods derived from animals that are long-lived (dairy products and meats) or high on the food chain (large predatory fish).
- Accelerated accumulation of toxic burden occurs when humans consume dairy products, meat, and fish.
- Bioconcentrated substances may readily pass from mother to fetus and nursing infant at vulnerable periods of development.

### Transient Exposures

- Chemicals that are not persistent or bioaccumulative can also be a threat if they are encountered in sufficient concentrations, particularly during windows of vulnerability.
- Epigenetic programming is commonly disrupted by environmental exposures, particularly during sensitive windows of development.<sup>45</sup>

### Endocrine Disruption

- Endocrine disruption occurs when a substance acts as a hormone agonist or antagonist and thereby interferes with the body's normal hormonal functions.
- Malformed reproductive organs, endometriosis, and cancer are examples of associated conditions.
- A few known human endocrine disruptors include diethylstilbestrol (DES), dioxin, polychlorinated biphenyls (PCBs), dichlorodiphenyl trichloroethane (DDT) and other pesticides, bisphenol A (BPA), and phthalates.
- Unlike some chemicals, these disruptors have no threshold of toxicity, and their effects do not correlate linearly with magnitude of exposure; thus, miniscule exposures can result in dramatic modulation of function.
- A newly recognized class of compounds called obesogens interferes with the body's adipose tissue biology, endocrine hormone systems, or central hypothalamic-pituitary-adrenal axis. Obesogens are suspects in derailing the homeostatic mechanisms important to weight control.<sup>46</sup>

### Effects of Chemical Mixtures

- No animal or individual experiences one toxin at a time, but toxicity studies are conducted individually.
- Although chemical mixtures represent a huge unknown area in toxicology, chemicals interact with one another to produce effects that may be inhibitory, additive, or synergistic.

### Body Burden

- The body burden is the total amount of toxic chemicals, both naturally occurring and human made, carried in the body at a given point in time.
- This term may refer to single or multiple chemicals.

## Highest Risk in Children<sup>47</sup>

- Children have higher consumption of air, food, and water per body weight.
- Their breathing zones are closer to the ground, where toxic residues settle in dust.
- Children have higher gastrointestinal absorption of heavy metals and other toxicants.
- They have immature glomerular and hepatic function.

## Pressing Ecologic Problems in Today's World: Three Examples

Exploring ecologic health can feel daunting when we begin to comprehend the profound impact of modern life on the planet and its inhabitants. Remaining ignorant with respect to ecologic issues or adopting a mindset that an individual has little power to influence the solution is not uncommon. Patients have questions about these issues and look for answers and understanding about how to process these concerns, become empowered, and feel hopeful. However, until health care practitioners engage populations, we will continue to harm ourselves and all life on Earth. The following three issues are critically important to understand as we engage with our patients and the broader community.

### Chemical Exposures and Associated Policies

Since 2000, studies conducted by the U.S. Centers for Disease Control and Prevention (CDC)<sup>48</sup> have begun to document the scale of our toxic body burden, as measured in human blood and urine. Many toxic chemicals have also been identified in umbilical cord blood, thereby demonstrating in utero exposure. Substances for use outside of the food and drug industries may be introduced into the marketplace without assessment for toxicity. Thus, the burden of harm is on consumers, rather than on product purveyors. Of the more than 80,000 chemicals in use today, approximately 5000 are used pervasively.

At the heart of many of the issues associated with toxic chemicals is the Toxic Substances Control Act of 1976 (TSCA), which was created with the intent to identify and regulate dangerous chemicals. A 2009 report by the U.S. Government Accountability Office (GAO) included the TSCA on its “High Risk” areas of government needing immediate reform. The GAO concluded that the Environmental Protection Agency (EPA) “does not have sufficient chemical assessment information to determine whether it should establish controls to limit public exposure to many chemicals that may pose substantial health risks.”<sup>49</sup>

### Food and Water Concerns

Since the early twentieth century, we have radically altered the way we produce and distribute food. The industrialization of our food system is fundamentally affecting the health of individuals and the planet. Not only are the foods we promote misaligned with dietary guidelines, but also methods of production and distribution divorced from natural ecologic processes are helping promote increased antibiotic-resistant bacteria, poisoned air and water, foodborne pathogens, and

collapsing rural communities. Because poor nutrition is a risk factor for four of the six leading causes of death in the United States (i.e., heart disease, stroke, diabetes, and cancer), the public health, medical, nursing, and hospital communities have recognized the need to address the food system by promoting nutritious foods from sustainable food systems<sup>50–53</sup> (Boxes 105-1 and 105-2).

Like food, water is essential for life and good health. A lack of water to meet daily needs is a reality today for one in three people around the world.<sup>54</sup> Although most of the U.S. population has access to fresh treated water, increasing concerns are associated with contaminated water<sup>55–57</sup> and with water scarcity resulting from drought or resource depletion as agriculture, industry, and households become increasingly affected by climate change. Adding to the complexity is the role of water privatization in which water companies are purchasing aquifers, water supplies, and watersheds that had previously been held in the common domain.

### Climate Change

According to the Intergovernmental Panel on Climate Change, warming of the climate system is now unequivocal, and evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.<sup>58</sup> The direct and indirect impacts on human health are not inconsequential and include asthma, loss of life, the range of

#### BOX 105-1. Key Principles of Chemical Policy

Key Principles of a Health-Oriented Chemicals Policy

- Immediately initiate action on the worst chemicals. Persistent bioaccumulative toxins are uniquely hazardous.
- Require basic information for all chemicals. Manufacturers should be required to provide basic information on the health hazards associated with their chemicals, how they are used, and the ways that the public or workers could be exposed.
- Protect the most vulnerable.
- Hold industry responsible for demonstrating chemical safety.
- Promote safer alternatives.
- Ensure the right to know.

Adapted from the Safer Chemicals, Healthy Families Coalition: [www.saferchemicals.org](http://www.saferchemicals.org).

#### BOX 105-2. Sustainable or Healthy Food System Characteristics

- Proximate (obtained close to home)
- Healthy, as part of a balanced diet
- Fairly traded
- Nonexploitive
- Environmentally beneficial
- Accessible and affordable
- Meeting animal welfare standards
- Socially inclusive
- Encouraging knowledge of food and food culture

infectious disease vectors, respiratory diseases, allergies, and childhood development problems.<sup>59,60</sup> In 2003, more than 35,000 people died in Europe as a result of heat stress. Clearly, the health care system will be required to carry a significant burden in treating climate-related health care costs. Approximately 30% of global emissions leading to climate change are attributable to agricultural activities, including land use changes such as deforestation.<sup>61,62</sup>

We must recognize that health care itself has a sizable greenhouse gas footprint. The National Health System (NHS) of the United Kingdom is a global health care climate mitigation leader through its comprehensive assessment of its climate footprint and the development of a climate mitigation and adaptation strategy.<sup>63</sup> The 2004 NHS greenhouse gas footprint was calculated as representing 3% of the total U.K. greenhouse gas footprint. In a similar, albeit less comprehensive, analysis, investigators estimated that U.S. health care greenhouse gas emissions in 2007 represented 8% of total U.S. emissions.<sup>64</sup> Consistent with the U.K. calculations, prescription drugs represented a significant contribution to the U.S. health care footprint: 14% of total health care greenhouse gas emissions.

Because pharmaceutical interventions are used extensively for nutrition-related diseases such as stroke, heart disease, and diabetes, and given that our food system is a significant climate emissions contributor, we suggest that a dietary-focused primary prevention strategy would have health and climate benefits (see Chapter 113, *Creating a Greener Clinic: The Impact of Global Warming on Health*). Research indicates that we must increase the resilience of our social and ecologic systems considerably to cope with future climate change and other components of global change.<sup>65</sup>

## Personal and Planetary Health in Everyday Life

Aside from specific occupations and their own unique set of environmental exposures, relative commonality exists in the nature of the foods we eat, the water we drink, and the products we use on our bodies and in our homes. Moreover, because white collar employment now comprises approximately 50% of the workplace, from an environmental health perspective, our workplaces may be almost indistinguishable from our homes.

### Household Products

Many people are unaware of the magnitude of toxic exposure they receive through ordinary household products. Nearly every type of common household cleaner, deodorizer, drain clog substance, and laundry product has been identified as having some toxic properties.<sup>66</sup> Health effects associated with indoor cleaners include cancer, reproductive disorders, and respiratory or skin damage. Cleaning chemicals eventually enter the environment and may have deleterious effects, such as depletion of the ozone layer, diminution of drinking water quality, and accumulation in aquatic life. Some of the less safe chemicals are persistent and remain in the environment for many years or even indefinitely. Many cleaning chemicals are considered hazardous materials owing to their flammability, corrosivity, or toxicity, and they present safety and cost concerns in their handling, storage, and disposal.<sup>67</sup>

**FIGURE 105-2**

Green Seal Standard logo. (Courtesy of Green Seal, Inc., Washington, D.C.)



Almost all home cleaning products can be effectively replaced by common household ingredients. Recipes for specific uses are abundant on the Internet and are available in most public libraries. Typical suggested alternative ingredients are vinegar, baking soda, corn starch, salt, borax (toxic if ingested), lemon juice, olive oil, essential oils, mild liquid nondetergent soaps, reusable nonimpregnated steel wool, and nonchlorine, non-sodium hypochlorite scouring powder. For people less interested in making their own products, many “green” cleaning products are available in the marketplace.<sup>68</sup> Environmentally preferable products (EPPs) have been designated by the Green Seal Standard for Industrial and Institutional Cleaners (GS-37)<sup>69</sup> (Fig. 105-2). Patients should be informed that the safety of a product is not guaranteed even when products are found on the shelves of their trusted stores. Learning to avoid toxic substances does require concern, the ability to read labels, and some scientific literacy. Physicians can help patients by compiling recipes for effective nontoxic cleaning solutions or lists of preferred commercial home cleaners. Hosting demonstrations and lectures in the clinic or hospital setting also sends an important message of public health to patients.

Because of the toxic persistent cycle, discarding toxic household products can be complicated. As a rule, these substances should not be poured down the drain, flushed down the toilet, or thrown in the trash. Because many common household products are considered hazardous waste, local environmental agencies, university extension services, or public works departments should be contacted for instructions on proper disposal. Some waste facilities have specialized departments that accept and properly manage toxic substances.

### Personal Care Products

Most consumers would be surprised to learn that the government does not require health studies or premarket testing for cosmetics and other personal care products. Personal care products include soaps, hair dyes, body lotions, perfumes, cosmetics, and other similar products. Teenage girls use an average of 17 personal care products per day (compared with adult women, who use an average of 12 products per day).<sup>70</sup>

Serious health effects associated with personal care products include carcinogenicity and reproductive or developmental toxicity. Manufacturers are currently reformulating products in Europe to comply with an amendment to the European Union's Cosmetics Directive to ban the use of chemicals that are known or strongly suspected of causing cancer, mutation, or birth defects, but this effort was voluntary within the United States as of 2011. Patients should be counseled to reduce their use of personal care products and to avoid products with heavy fragrance, aerosols, and dark hair dyes (which may contain lead acetate).

Use of milder soaps and avoidance of nail polish, hair-spray, and other phthalate-containing substances (known endocrine disruptors) should be encouraged. Despite the apparent confidence they engender in consumers, commonly used antibacterial soaps are harmful to our ecologic system, and they provide no added protection to household consumers. Triclosan is a bactericide used in a growing number of consumer products, including antibacterial soaps, toothpaste, shampoos, lotions, and deodorants. Even at low levels, it is acutely toxic to some aquatic organisms, particularly certain algae species, and it has been detected in surface waters.<sup>12,71,72</sup> Triclosan and tricarban are good examples of avoidable toxic substances with pervasive impacts and little to no consumer benefit. Triclosan is problematic for its persistence, its activity as an endocrine disruptor, and its potential to promote antibiotic-resistant organisms. As a protective measure to the people and aquatic species exposed, an informed consumer may simply learn to avoid the purchase and use of antibacterial (or antimicrobial) personal care products such as soaps, gels, cleansers, toothpaste, cosmetics, or other “antibacterial” or “antimicrobial” items such as cutting boards, towels, shoes, clothing, and bedding.

### Cellular and Cordless Phones

In 1900, our experience of electromagnetic radiation was limited to natural sources. Since 1950, however, we have become increasingly reliant on electric technologies involving various electromagnetic frequencies. Accordingly, concern about health hazards (most notably cancer) has escalated. Conflicting results have emerged with respect to health risks and electromagnetic radiation exposure through microwaves, computers, and televisions. However, a study released in April 2007 revealed an increased risk of ipsilateral acoustic neuroma and high-grade glioma in long-term users (more than 10 years) of cell phones.<sup>73</sup> These same concerns have also been generated by cordless phones.<sup>74</sup> A large subsequent study was performed in 2010 by the Interphone Study Group and concluded that there is no increased risk of cancer in long term cell phone user. However, this study has been criticized for design flaws generated by selection bias, exposure bias, and age-range bias.<sup>74a</sup> In 2011 the World Health Organization (WHO) issued a press release stating that the International Agency for Research on Cancer and the WHO classified radiofrequency electromagnetic fields as possibly carcinogenic to humans, based on an increased risk for glioma associated with wireless phone use.<sup>74b</sup>

Based on the foregoing studies and the pervasive nature of cell phone and cordless phone use, the University of Pittsburgh (Pennsylvania) Cancer Institute issued practical recommendations regarding cell phone and cordless phone use,<sup>75</sup> including avoiding the use by children (whose brains absorb cell phone radiation more readily than those of adults), keeping the phone as far away from the body as possible, avoiding use when the signal is weak, purchasing phones with the lowest possible specific absorption rate (SAR), and other important suggestions.

### Household Pesticides

The use of pesticides is widespread, and homeowners use substantially more per acre than does the agriculture sector. House dust typically contains 10 to 100 times the pesticide content of outdoor air. In the Nonoccupational Pesticide

Exposure Study, a cross-section of homes was found to contain pesticide residues, including residues of substances banned years earlier.<sup>76</sup> The Ontario College of Family Physicians completed an extensive literature review of pesticides and determined that, “Exposure to all the commonly used pesticides ... has shown positive associations with adverse health effects. The literature does not support the concept that some pesticides are safer than others; it simply points to different health effects with different latency periods for the different classes.”<sup>77</sup> The College urged a focus on reducing exposure to all pesticides rather than targeting specific pesticides or classes. The investigators encouraged family doctors to learn about high-risk groups (women of childbearing age, occupationally exposed patients, children) and to teach methods of reducing pesticide exposures. Physicians are ideally suited to bringing these issues to the grounds of hospitals, schools, and government facilities and to suggest safer yet effective alternatives for landscaping and lawn care. Finally, the College suggested that physicians convey health concerns to politicians who make regulatory decisions about pesticide use and public health. As of 2010, every province and territory in Canada has pesticide-related legislation in place to protect its citizens from unnecessary exposure.

Various reduction strategies exist through application of integrated pest management (IPM), an approach to pest management that focuses on preventing and managing pest problems through nontoxic methods by using a hierarchy of strategies, with chemical controls as a last resort. Homeowners who use a pest control or lawn maintenance company should clearly communicate an IPM plan to the contractor. Many contractors now employ IPM, but homeowners are encouraged to request a thorough explanation of individual company IPM policies.

### Furnishings

That furnishings of the typical U.S. home contain toxins is not intuitively obvious. However, substances such as wrinkle-resistant fabrics, permanent press sheets, curtains, and clothing, as well as modern furniture made from pressed composite wood, contain and emit formaldehyde and other substances. Carpeting is usually made of synthetic fibers that have been treated with pesticides, fungicides, and adhesives. Many office carpets emit a chemical called 4-phenylcyclohexene, an additive to the latex backing used in more commercial and home carpets, which is thought to be one of the chemicals responsible for “sick” office buildings.<sup>78</sup> Modern furniture also contains a significant amount of plastics and foam, which are highly flammable petroleum-based products requiring chemical flame retardants (polybrominated diphenyl ethers [PBDEs]). This is a topic of growing concern in environmental health. Perfluorinated compounds (PFCs), associated with fabric protectors and stain guards, constitute another type of persistent bioaccumulative toxin (PBT) of increasing concern. Vinyl (polyvinylchloride [PVC]) plastic coverings contain phthalates and release dioxin and furans during manufacture and breakdown.

Patients, let alone design professionals, may have trouble discerning the differences among various product components. As a general rule, products constructed from solid wood, metal, and natural fibers such as cotton and wool tend to be safe alternatives.

## Meat, Poultry, and Seafood

Confined (or concentrated) Animal Feedlot Operations (CAFOs) epitomize the extreme of our industrialized food system. These operations confine large quantities of livestock to a closed area where all food and water inputs are carefully controlled. CAFOs are defined as more than 1000 beef cattle, 2500 hogs, or 100,000 broiler hens; they generate an estimated 575 billion pounds of manure annually.<sup>79</sup> The largest 2% of U.S. livestock farms now produces 40% of all animals in the United States.<sup>80</sup> In 2002, half of all hogs in the United States were raised on large-scale farms that managed more than 5000 hogs.<sup>81</sup> Ten companies produce 92% of the nation's poultry.<sup>82</sup> Although not exclusive to CAFOs, many different feed additives are provided, including growth hormones, antibiotics in feed and water, and arsenic. Public health and medical associations have called for a moratorium on CAFO construction because of concerns that include runoff, community impacts, air quality, worker health and safety, and issues of antibiotic resistance.<sup>83–85</sup> The Food and Agriculture Organization identified meat production alone as responsible for 18% of global greenhouse gas emissions.<sup>86</sup> The wide variety of public health and infectious disease has called attention to increasing concerns with antibiotic resistance.<sup>87–91</sup> The CDC noted that 90,000 patients died as a result of hospital-acquired infections, and more than 70% of the bacteria that cause hospital-acquired infections were resistant to at least one of the drugs most commonly used to treat them. Investigators estimated that more than 70% of all antibiotics consumed in the United States are used as feed additives for poultry, swine, and beef cattle for nontherapeutic purposes.<sup>92</sup> The strong consensus is that agricultural antibiotic use contributes to antibiotic resistance in humans, and more than 300 organizations, including the American Medical Association, have advised that restrictions on agricultural use of antibiotics are necessary.<sup>93</sup> Investigators have recommended that health professionals become aware of these trends as they promote healthier sustainable diets.<sup>94</sup>

Although fish is a good source of protein and omega-3 fatty acids, some species should be avoided because of PBT content. Mercury is the PBT most commonly associated with fish contamination; others are PBDEs, dioxin, furans, and PCBs. Mercury is bound to the protein component and cannot be removed. Most other PBTs accumulate in fat, which should be removed. Most fish advisories are based on federal guidelines developed to protect the average 160-lb man; patients should be advised to recognize this fact. Many Web sites have developed “fish calculators” that allow users to determine “allowable” fish intake on the basis of individualized weight, age, and sex. Patients who catch and eat their own fish should be advised to become familiar with local fish consumption advisories, which are typically developed for specific inland lakes. Many fish stocks are in serious decline as a result of overfishing. In addition, evidence indicates that salmon produced from the aquaculture industry has higher levels of PCBs than does wild-caught fish.<sup>95,96</sup> Table 105-1 lists fish choices that are of concern with respect to both overfishing and contamination. Fish listed in boldface in the table are contaminated with mercury, dioxin, PCBs, or pesticides,<sup>97</sup> or they are high on the food chain.

## Organic Food Considerations

Conscientious health care practitioners are well aware of the challenges involved in encouraging patients to consume healthy foods. Warning patients about food contaminants adds a layer of complexity to the discussion. However, the issue of contaminated food is particularly relevant during vulnerable periods of life and should not be overlooked. This information can be introduced in the clinic setting and followed up with handouts, community presentations, and resource lists for patients (see the [Key Web Resources box](#)). Practitioners need not feel the burden of expressing every pertinent aspect of this problem to the patient. They should enlist the expertise of community professionals.

Growing children consume far more food and water per body weight than adults, and their biologic detoxification mechanisms are not fully developed. As a result of these differences and the qualities of foods eaten in high amounts by typical children, a child experiences a substantial burden of pesticide exposure in the first decade.<sup>98</sup> Consequently, elimination of pesticide residues is a sensible precautionary strategy. Although families may have budgetary challenges that do not allow for a complete transition to an organic diet, avoidance of the most contaminated foods is a useful approach. Table 105-2 lists types of produce that have been found to

**TABLE 105-1. Fish Choices of Environmental Concern\***

- Caviar: wild paddlefish and sturgeon eggs
- Chilean sea bass/toothfish
- Cod: Atlantic
- **Grouper**
- Halibut: Atlantic
- **Marlin**
- Monkfish/goosefish
- **Orange roughy**
- **Rock cod/boccacio/Pacific rockfish**
- **Salmon: farmed or Atlantic**
- **Shark**
- Shrimp/prawns: imported
- Skate
- Snapper
- **Sturgeon: wild**
- **Swordfish**
- **Tilefish**
- Tuna: blue-fin

\***Bold type** indicates contamination with mercury, dioxin, polychlorinated biphenyls, or pesticides.<sup>98</sup> These fish are high on the food chain.

**TABLE 105-2. Foods With High Pesticide Content**

- Apples
- Bell peppers
- Celery
- Cherries
- Imported grapes
- Nectarines
- Peaches
- Pears
- Potatoes
- Red raspberries
- Spinach
- Strawberries

be highest in tested pesticide residues and are best to avoid when substitutes are available.<sup>99</sup>

## Drinking Water

According to the EPA, the United States has one of the safest water supplies in the world.<sup>100</sup> We are fortunate that public regulation of drinking water has provided a public health benefit, but this relativistic assessment does not address potential exposure to unregulated contaminants found in the drinking water supplies or the relative safety of existing standards. The EPA has drinking water regulations for more than 90 contaminants. The Safe Drinking Water Act (SDWA) set up a process for identification of new contaminants that may require regulation in the future.

The EPA must periodically release a Contaminant Candidate List (CCL).<sup>101</sup> The contaminants on the list are known or anticipated to occur in public water systems. However, they are currently unregulated by existing national primary drinking water regulations. The most current list, published in 2011, contains many different industrial chemicals such as perchlorate (used in the manufacture of rocket fuel) and toluene, as well as a long list of pesticides, and even the pharmaceutical hormone estrogen. The water supply for approximately 15% of the U.S. population derives from sources separate from public supplies, such as wells, cisterns, and springs.<sup>102</sup> These sources are unregulated and require the homeowner to test the water for safety.

Many patients interested in a precautionary approach install water filters or treatment systems. Numerous systems are commercially available. Ideal water filtration devices are certified to remove specified contaminants. NSF International, an independent standard-setting organization, certifies water treatment systems.<sup>103</sup> Water filtration is especially advisable for patients who have private wells in proximity to industrial sites, landfills, combined annual feedlot operations, contaminated soils, or agricultural areas.

Patients may be under the misguided impression that bottled water is purer than tap water. A 1999 report, however, found that some bottled water contained bacterial contaminants and that several brands contained synthetic organic chemicals or inorganic contaminants.<sup>104</sup> The report also noted that bottled water regulations have gaping holes, and both state and federal bottled water regulatory programs are severely underfunded. Bottled water costs up to 10,000 times more than tap water (notwithstanding the energy use and pollution costs associated with transport across the country). Bottled water produces up to 1.5 million tons of plastic waste per year. In 2006, the U.S. population consumed more than 30 billion bottles of water, of which more than 80% went to a landfill or were incinerated. According to the Ocean Conservancy Institute, more than 6% of marine debris consists of plastic bottles. Water is essential to human life and is an inherent right, but access to affordable safe and sustainable water is becoming increasingly difficult around the world. By supporting and promoting publicly owned water infrastructures, the health care community can provide the moral voice for the right to affordable, safe, and sustainable drinking water. Drinking water concerns represent a challenging issue that jeopardizes our planetary health.

## Conclusion

Rachel Carson was one of the first scientists to raise an alarm about the unconditional belief in “better living through chemistry” and reminded us of humans' intimate relationship with the environment. Clearly, many modern chemicals provide humans with products that are extraordinarily effective and convenient. We are beginning to realize, however, that despite the short-term benefits, these products have a host of recognized long-term impacts that have been either purposely or inadvertently ignored. This lesson parallels what we have learned about our unfettered use of energy and the industrialization of our food system. We are reminded

### BOX 105-3. Key Advocacy Strategies

#### Develop and Adopt an Ecologic Health Mission Statement and Plan

Work with your clinic or institution to develop or tailor an existing ecologic health mission statement and plan. Use the plan meaningfully to guide purchasing and other practices.

#### Model Behavior in Home and Practice

Adopt policies and practices within your clinic and institution consistent with your ecologic health mission. As products and services become obsolete, change to those that are more ecologically benign. Consider the Green Guide for Health Care (see [Key Web Resources box](#)).

#### Educate

Provide resources and information to patients and colleagues within clinic or institution as hard copies or on website.

#### Meet With Your Hospital CEO

Numerous hospitals and clinics are adopting ecologically sustainable practices and policies. One physician's voice is important support for new or existing “green” or environmental teams; many physicians' voices add potency to the message.

#### Meet With Elected Officials

Elected officials and their staff are interested in meeting with constituents to hear their views. A physician's voice brings considerable moral authority. Most visitors are paid lobbyists representing industry and corporations, not typically the voice of community and health. Call and make appointments, and if that is not possible, speak to senior staff. Elected officials are busy; stay on point to keep your message relevant and concise. Ask for their specific position and try to gain a commitment. Follow up with a letter, and keep the ball rolling.

*Continued*



**BOX 105-3. Key Advocacy Strategies—cont'd****Offer Your Voice to a Community Organization**

Most community-based organizations have limited resources and welcome occasional help. Offer to write an article for their newsletter, be a spokesperson at media events, or meet with them and an elected official.

**Media**

Although media are changing, sharing your views on issues with the public is important. We need more health advocates. Letters to the editor and opinion editorials are widely read and shared. Call your newspaper to learn about word length and other submission guidelines.

**Host Community Events: Book Signing, Movie Viewing**

Many ecologic health multimedia resources are available. Host a community movie viewing or book reading and help integrate an ecologic health message.

**Grand Rounds**

Grand rounds are an important way to bring the latest science to your colleagues.

that we are part of a system with intricate feedback loops, and as we interfere with these relationships, we may create unintended consequences. These relationships suggest the necessity for an important global shift in our consciousness from one that has been oriented toward an efficient, linear, Western scientific model to one with greater appreciation of an interconnected resilient systems model.

As integrative physicians, this thinking is not new. We have recognized the value of pharmaceutical interventions, but we have worked first to explore primary prevention interventions and naturally sustainable treatment options.

**PREVENTION PRESCRIPTION**

- Substitute nontoxic alternatives for chemical pesticides for home and garden.
- Choose organically grown, locally raised produce and animal products.
- Eat low on the food chain
- Select “green cleaners.”
- Purchase bath and beauty products that are free of phthalates and other toxic compounds.
- Purchase furniture and building materials that are produced from simple components (wood, metal, cotton materials).
- Avoid polyvinylchloride (vinyl) products.
- Purchase “green” computers and home electronics with a priority for those that may be returned to the manufacturer for recycling at the end of the product's life.
- Avoid polytetrafluoroethylene (Teflon) and stain treatment products.
- Avoid plastic bottles made of polycarbonate number 7.
- Avoid antimicrobials.
- Prefer metal, ceramic, or glass containers, especially for hot and acidic foods.
- Conserve energy and consume less.

Reports by the United Nations Millennium Assessment, the Intergovernmental Panel on Climate Change, and global governmental scientific bodies add a layer of urgency to holistic thinking and provide clarity that human activities are affecting ecologic systems. Our action today is imperative and requires an approach that moves from a model of disease treatment to one of ecologic prevention (Box 105-3).

**KEY WEB RESOURCES**

Cell Risk (list of cell phones with the lowest and highest specific absorption rate or radiation): <http://www.cellrisk.com/>  
 HealthCare Without Harm: The Campaign for Environmentally Responsible HealthCare: [www.noharm.org](http://www.noharm.org)  
 Practice Greenhealth: [www.practicegreenhealth.org](http://www.practicegreenhealth.org)  
 Green Guide for Health Care (offers tools for creating healthy, healing environments): [www.gghc.org](http://www.gghc.org)  
 Pesticide Action Network pesticide guide (*What's on My Food*): [www.whatsonmyfood.org](http://www.whatsonmyfood.org)  
 Pesticide Action Network physician network: [www.panna.org/healthnetwork](http://www.panna.org/healthnetwork)  
 Safer Chemicals Safer Families: [www.saferchemicals.org](http://www.saferchemicals.org)  
 Monterey Bay Aquarium Seafood Watch: [www.montereybayaquarium.org/cr/seafoodwatch.aspx](http://www.montereybayaquarium.org/cr/seafoodwatch.aspx)  
 Our Stolen Future (database with focus on endocrine disruption): [www.ourstolenfuture.org](http://www.ourstolenfuture.org)  
 The Collaborative on Health and the Environment: [www.healthandenvironment.org](http://www.healthandenvironment.org)  
 Science and Environmental Health Network: [www.sehn.org](http://www.sehn.org)  
 Physicians for Social Responsibility: [www.psr.org](http://www.psr.org)  
 Environmental Working Group: Skin Deep (a safety assessment of reports and ingredients in personal care products; includes searchable database): <http://www.ewg.org/skindeep/>  
 Campaign for Safe Cosmetics: [www.safecosmetics.org](http://www.safecosmetics.org)  
 The Story of Stuff (includes videos on the negative effects of over-consumption): [www.thestoryofstuff.com](http://www.thestoryofstuff.com)  
 Council of Canadians: Water: <http://www.canadians.org/water/index.html>

**References**

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Harvie JM. A new health care prevention agenda: sustainable food procurement and agricultural policy. *J Hunger Environ Nutr*. 2009;4:409–429.
- Brent RL, Tanski S, Weitzman M. A pediatric perspective on the unique vulnerability and resilience of the embryo and the child to environmental toxicants: the importance of rigorous research concerning age and agent. *Pediatrics*. 2004;113:935–944.
- Bland J. *Functional Medicine Update* (audiotape). Gig Harbor, WA: Institute for Functional Medicine; 2005.
- Oberdörster G, Oberdörster E, Oberdörster J. Nanotoxicology: an emerging discipline evolving from studies of ultrafine particles. *Environ Health Perspect*. 2005;113:823–839.
- Royal Society and Royal Academy of Engineering. Policy. In: *Nanoscience and Nanotechnologies: Opportunities and Uncertainties*. London: Royal Society, 2004:85–87. <<http://www.nanotec.org.uk/report/chapter10.pdf>>; Accessed 12.12.10.
- Intergovernmental Forum on Chemical Safety. *Sixth Session of the Intergovernmental Forum on Chemical Safety: Final Report*. Geneva: World Health Organization; 2008. <[http://www.who.int/entity/ifcs/documents/forums/forum6/f6\\_execsumm\\_en.doc](http://www.who.int/entity/ifcs/documents/forums/forum6/f6_execsumm_en.doc)>; Accessed 10.12.10.
- Associated Press. US sour on EU biofood vote. *CBS News*. July 4, 2003. <<http://www.cbsnews.com/stories/2003/06/25/tech/main560287.shtml>>; Accessed 05.11.11.
- Lambrecht B. *Dinner at the New Gene Café*. New York: St. Martin Press; 2001.
- Food firms jarred by sugar-beet restriction. *Wall Street Journal*. August 16, 2010. <<http://online.wsj.com/article/SB10001424052748704296704575431802903998146.html>>; Accessed 05.11.11.
- Nordlee JA, Taylor SL, Townsend JA, et al. Identification of a Brazil-nut allergen in transgenic soybeans. *N Engl J Med*. 1996;334:688–692.
- Union of Concerned Scientists. *Risks of Genetic Engineering*. <[http://www.ucsusa.org/food\\_and\\_environment/genetic\\_engineering/risks-of-genetic-engineering.html](http://www.ucsusa.org/food_and_environment/genetic_engineering/risks-of-genetic-engineering.html)>; Accessed 12.12.10.
- Gebhard F, Smalla K. Transformation of *Acinetobacter* sp. strain BD413 by transgenic sugar beet DNA. *Appl Environ Microbiol*. 1998;64:1550–1554.
- Tappesser B, Jäger M, Eckelkamp C. *Survival, Persistence, Transfer: An Update on Current Knowledge on GMOs and the Fate of their Recombinant DNA*. Freiburg, Germany: German Environmental Protection Agency, Institute for Applied Ecology; 1998. <<http://online.sfsu.edu/~rone/GEessays/Survival%20PersistenceTransfer.htm>>; Accessed 05.11.11.
- van der Vossen J, Havekes WALM, Koster DS, et al. Development and application of an in vitro intestinal tract model for safety evaluation of genetically modified foods. In: *Food Safety Evaluation of Genetically Modified Foods as a Basis for Market Introduction*. The Hague: Ministry of Economic Affairs; 1998:81–99.
- Netherwood T, Martín-Orúe SM, O'Donnell AG, et al. Assessing the survival of transgenic plant DNA in the human gastrointestinal tract. *Nat Biotechnol*. 2004;22:204–209.
- U.S. Food and Drug Administration. *Guidance for Industry: Use of Antibiotic Resistance Marker Genes in Transgenic Plants. Draft guidance*. <<http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/Biotechnology/ucm096135.htm>>; 1998. Accessed 12.12.10.
- Heritage J. The fate of transgenes in the human gut. *Nat Biotechnol*. 2004;22:170–172.
- Widmer R, Seidler J, Watrud LS. Sensitive detection of transgenic plant marker gene persistence in soil microcosms. *Mol Ecol*. 1996;5:603–613.
- Inose T, Murata K. Enhanced accumulation of toxic compound in yeast cells having high glycolytic activity: a case study on the safety of genetically engineered yeast. *Int J Food Sci Technol*. 1995;30:141–146.
- Grichko VP, Philby B, Glick BR. Increased ability of transgenic plants expressing the bacterial enzyme ACC deaminase to accumulate Cd, Co, Cu, Ni, Pb, and Zn. *J Biotechnol*. 2000;81:45–53.
- Gurian-Sherman D. *Unintended Effects of Genetically Engineered Food Plants*. Center for Food Safety. <[http://www.centerforfoodsafety.org/pubs/Briefing\\_Unintended\\_Effects7.26.2004.pdf](http://www.centerforfoodsafety.org/pubs/Briefing_Unintended_Effects7.26.2004.pdf)>; Accessed 05.11.11.
- Yount L. *Biotechnology and Genetic Engineering*, 3rd ed. New York: Facts on File; 2008. <<http://www.scribd.com/doc/71923642/Biotechnology-and-Genetic-Engineering>> Accessed 04.02.12.
- Tokar B. Briefing Report: Deficiencies of Federally Regulated Oversight of Genetically Engineered Crops. Institute for Social Ecology Biotechnology Project. <<http://environmentalcommons.org/RegulatoryDeficiencies.html>>; 2008. Accessed 04.02.12.
- Watkinson A, Freckleton RP, Robinson RA, Sutherland WJ. Predictions of biodiversity response to genetically modified herbicide-tolerant crops. *Science*. 2000;289:1554–1557.
- Hilbeck A, Meier MS, Raps A. *Review on Non-Target Organisms and Bt Plants. Report for Greenpeace International, Amsterdam*. Zurich: EcoStrat GmbH, Ecological Technology Assessment & Environmental Consulting; 2000.
- Hoagland RE, Reddy KN, Zablotowicz RM. Effects of glyphosate on *Bradyrhizobium japonicum* interactions in Roundup-Ready soybeans. In: *Weed Science Society of America Annual Meeting Abstracts*. Vol. 39. Stoneville, MS: Weed Science Society of America; 1999. <<http://www.biotech-info.net/bradyrhizobium.html>>; Accessed 05.11.11.
- Losey J, Rayor LS, Carter ME. Transgenic pollen harms monarch larvae. *Nature*. 1999;399:214.
- National Research Council, Board on Agriculture. *Genetically Modified Pest-Protected Plants: Science and Regulation*. Washington, DC: National Academy Press; 2000.
- U.S. District Court for the District of Columbia. *Greenpeace, IFOAM and Center for Food Safety lawsuit against EPA on Bt Crops*. <<http://www.centerforfoodsafety.org/pubs/ComplaintBtCropsEPA9.27.1997.pdf>>; Accessed 05.11.11.
- Nichols J. The Three Mile Island of biotech? *The Nation*. December 30, 2002. <<http://www.thenation.com/doc/20021230/nichols>>; Accessed 05.11.11.
- Gillis J. Corn for growing far afield? A mishap with gene-altered grain spotlights the odds of contamination. *Washington Post*. November 16, 2002.
- Gillis J. Farmers grow a field of dilemma drug-making crops' potential hindered by fear of tainted food. *Washington Post*. December 23, 2002.
- National Academies' National Research Council. *Environmental Effects of Transgenic Plants: The Scope and Adequacy of Regulation*. Executive summary. Washington, DC: National Academy Press; 2002:15, 68.
- Committee on the Biological Confinement of Genetically Engineered Organisms and National Research Council. *Biological Confinement of Genetically Engineered Organisms*. Washington, DC: National Academy Press; 2004.
- Benbrook C. Genetically engineered crops and pesticide use in the United States: the first nine years. *BioTech InfoNet*. Technical paper no. 7. <[http://www.biotech-info.net/Full\\_version\\_first\\_nine.pdf](http://www.biotech-info.net/Full_version_first_nine.pdf)>; 2004. Accessed 12.12.10.
- Nandula VK, Reddy KN, Duke SO, et al. Glyphosate-resistant weeds: current status and future outlook. *Outlooks Pest Manage*. 2005;16:183–187.
- Fighting weeds in biotech crops takes skill. *Ag Answers*. (Ohio State University Extension and Purdue University Extension). February 18, 2000. <<http://www.agriculture.purdue.edu/agcomm/aganswers/story.asp?storyID=2167>>; Accessed 12.12.10.
- Steckel L. Quoted in Burchett A. Glyphosate resistant weeds on the move. *Farm J*. 2005; Sept 28.
- Institute for Responsible Technology. *State-of-the-Science on the Health Risks of GM Foods*. <<http://www.saynotogmos.org/paper.pdf>>; Accessed 05.02.12.
- Pollack A. Crop scientists say biotechnology seed companies are thwarting research. *New York Times*. February 20, 2009. <[http://www.nytimes.com/2009/02/20/business/20crop.html?\\_r=2](http://www.nytimes.com/2009/02/20/business/20crop.html?_r=2)>; Accessed 12.12.10.
- Parliamentary Assembly of the Council of Europe. *Genetically Modified Organisms (GMOs) Resolution 1419*. <<http://assembly.coe.int/documents/adoptedtext/ta05/eres1419.htm>>; 2005. Accessed 02.04.12.
- Council of Europe, Parliamentary Assembly. *Genetically modified organisms: a solution for the future?* Resolution 1795. <[http://www.europeanrights.eu/getFile.php?name=public/atti/ris1795\\_ing.mht](http://www.europeanrights.eu/getFile.php?name=public/atti/ris1795_ing.mht)> Accessed 05.02.12.
- CHW takes action for sustainable food production*. [press release] San Francisco: Catholic Healthcare West; January 5, 2009. <[http://www.chwealth.org/CHW\\_Information/Press\\_Center/194268](http://www.chwealth.org/CHW_Information/Press_Center/194268)>; Accessed 12.12.10.
- American Academy of Environmental Science. *Genetically Modified Foods*. <<http://www.aeonline.org/gmopost.html>>; Accessed f05.02.12.
- (new reference <http://www.google.com/url?sa=t&rc=j&q=gmo%20illinois%20public%20health%20association&source=web&cd=1&ved=0CCMQFjAA&url=http%3A%2F%2Fwww.ipha.com%2Fadmin%2Fuploads%2Fdocuments%2FIPHA%2520Res%25203%2520GMO%2520FINAL.doc&ei=Jv8uT9WjD4fegQeo0JDTDw&usq=AFQjCNHGDTZy7h9OvDL2ob4QvrXErD5l2w&cad=rja>)
- American Public Health Association. *Opposition to the Use of Hormone Growth Promoters in Beef and Dairy Cattle Production*. <<http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1379>>; Accessed 05.02.12.

45. Moshe S. The dynamic epigenome and its implications in toxicology. *Toxicol Sci.* 2007;100:7–23.
46. Grun F, Blumberg B. Endocrine disruptors as obesogens. *Mol Cell Endocrinol.* 2009;304:19–29.
47. Tickner J, Raffensperger C, Myers N. *The Precautionary Principle in Action: A Handbook.* Windsor, ND: Science and Environmental Health Network; 1998. <[www.sehn.org/rtfdocs/handbook-rtf.rtf](http://www.sehn.org/rtfdocs/handbook-rtf.rtf)>; Accessed 05.11.11.
48. Centers for Disease Control and Prevention. *Fourth National Report on Human Exposure to Environmental Chemicals.* Atlanta: Centers for Disease Control and Prevention; 2009. <<http://www.cdc.gov/exposurereport/>>; Accessed 13.12.10.
49. Government Accountability Office. *High-Risk Series: An Update.* Publication no. GAO-09-271. Washington, DC: U.S. Government Accountability Office; 2009. <[www.gao.gov/new.items/d09271.pdf](http://www.gao.gov/new.items/d09271.pdf)>; Accessed 15.11.10.
50. American Public Health Association. *Toward a Healthy, Sustainable Food System.* Policy no. 200712. Washington, DC: American Public Health Association; 2007. <<http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1361>>; Accessed 12.12.10.
51. Minnesota Academy of Family Physicians. *2008 House of Delegates Report.* <<http://www.mafp.org/2008hodreport.asp>>; Accessed 12.12.10.
52. American Medical Association. *American Medical Association Resolution D-150.978 Sustainable Food.* <<https://ssl3.ama-assn.org/apps/ecommerce/PolicyFinderForm.pl?site=www.ama-assn.org&uri=%2fresources%2fdoc%2fPolicyFinder%2fpolicyfiles%2fDIR%2fD-150.978.HTM>>; Accessed 05.02.12.
53. Kaiser Institute for Health Policy. What healthcare leaders need to know. *In Focus.* 2009. Fall: 1–4. <[http://www.kpinstituteforhealthpolicy.org/kpihp/CMS/Files/In\\_Focus\\_5-09%20Sustainable%20Food%20Procurement.pdf](http://www.kpinstituteforhealthpolicy.org/kpihp/CMS/Files/In_Focus_5-09%20Sustainable%20Food%20Procurement.pdf)>; Accessed 12.12.10.
54. World Health Organization. *10 Facts about Water Scarcity.* <<http://www.who.int/features/factfiles/water/en/>>; 2009 Accessed 12.12.10.
55. U.S. Geological Survey. *Distribution of Selected Herbicides and Nitrates in the Mississippi River and Its Major Tributaries: April through June 1991.* Water resource investigation report no. 91-4163. Denver: U.S. Geological Survey; 1991:23–33.
56. Gilliom RJ, Alley WM, Gurtz ME. *Design of the National Water-Quality Assessment Program: Occurrence and Distribution of Water-Quality Conditions.* Circular 1112. Reston, VA: U.S. Geological Survey; 1995:33.
57. Wiles R, Cohen B, Campbell C, et al. *Tap Water Blues: Herbicides in Drinking Water.* Washington, DC: Environmental Working Group; 1994:1.
58. Intergovernmental Panel on Climate Change. *Climate Change 2007: Synthesis Report.* Fourth summary report. <[http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf)>; 2007 Accessed 12.12.10.
59. Parry ML, Canziani OF, Palutikof JP, et al, eds. *Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press; 2007.
60. Battisti DS, Naylor RL. Historical warnings of future food insecurity with unprecedented seasonal heat. *Science.* 2009;323:240–244.
61. International Assessment of Agricultural Knowledge, Science, and Technology for Development. *Food Security in a Volatile World.* Washington, DC: Island Press; 2008.
62. International Assessment of Agricultural Knowledge, Science, and Technology for Development. Food security in a volatile world. In: *Issues in Brief.* Washington, DC: Island Press; 2008. <[http://www.agassessment.org/docs/10505\\_FoodSecurity.pdf](http://www.agassessment.org/docs/10505_FoodSecurity.pdf)>; Accessed 12.12.10.
63. National Health Service. *Saving Carbon Improving Health: NHS Carbon Reduction Strategy for England.* <[http://www.sustainabilityforhealth.org/system/documents/97/original/saving\\_carbon\\_\\_improving\\_health\\_nhs\\_carbon\\_reducti.pdf?1243864872](http://www.sustainabilityforhealth.org/system/documents/97/original/saving_carbon__improving_health_nhs_carbon_reducti.pdf?1243864872)>; Accessed 05.02.12.
64. Chung J, Meltzer D. Estimate of the carbon footprint of the US health care sector. *JAMA.* 2009;302:1970–1972.
65. Swedish Ministry of the Environment. *Resilience and Sustainable Development: A Report for the Swedish Environmental Advisory Council.* <[http://www.sou.gov.se/mvb/pdf/206497\\_Resilienc.pdf](http://www.sou.gov.se/mvb/pdf/206497_Resilienc.pdf)>; Accessed 12.12.10.
66. Nazaroff W, Coleman B, Destailats H, et al. *Indoor Air Chemistry: Cleaning Agents, Ozone, and Toxic Air Contaminants. Final Report.* Sacramento: California Air Resources Board; 2006. <[http://www.arb.ca.gov/research/apr/past/01-336\\_a.pdf](http://www.arb.ca.gov/research/apr/past/01-336_a.pdf)>; Accessed 13.12.10.
67. U.S. Environmental Protection Agency. *Household Hazardous Waste.* <<http://www.epa.gov/osw/conservematerials/hhw.htm>>; 2010 Accessed 13.12.10.
68. U.S. Environmental Protection Agency. *Environmentally Preferable Purchasing.* <<http://www.epa.gov/epp/pubs/products/cleaning.htm>>; 2010 Accessed 13.12.10.
69. Green Seal. <<http://www.greenseal.org>>; Accessed 16.11.10.
70. Sutton P. *Adolescent Exposures to Cosmetic Chemicals of Concern.* Environmental Working Group. <<http://www.ewg.org/reports/teens>>; 2008 Accessed 21.11.10.
71. Lindström A, Buerge IJ, Poiger T, et al. Occurrence and environmental behavior of the bactericide triclosan and its methyl derivative in surface waters and in wastewater. *Environ Sci Technol.* 2002;36:2322–2329.
72. Natural Resources Defense Council. *FDA acknowledges potential harmful effects of antibacterial chemicals* [press release]. April 8, 2010. <<http://www.nrdc.org/media/2010/100408.asp>>; Accessed 21.11.10.
73. Hardell LO, Carlberg M, Söderqvist F, et al. Long term use of cellular phones and brain tumours: increased risk associated with use for >10 years. *Occup Environ Med.* 2007;64:626–632.
74. BioInitiative. *BioInitiative Report: A Rationale for a Biologically Based Public Exposure Standard for Electromagnetic Fields (ELF and RF).* <[www.bioinitiative.org](http://www.bioinitiative.org)>; 2011 Accessed 05.11.11.
- 74a. Hardell L, Carlberg M, Hansson Mild K. Letter to the Editor: Reanalysis of risk for glioma in relation to mobile telephone use: comparison with the results of the Interphone international case-control study. *Int. J. Epidemiology,* 2010; 1-3. <<http://environmentalhealthtrust.org/sites/test1.nbcomp.com/files/Re-analysis%20Glioma%20Quising%20Interphone%20protocol%20Ltr%20to%20Editor12-17-10.pdf>>; 2010. Accessed 05.02.12.
- 74b. NEW REF: <[http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208\\_E.pdf](http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf)>; 20XX. Accessed 05.02.12.
75. McGowan Institute for Regenerative Medicine. *Cell Phone Use Alert Issued by Head of University of Pittsburgh Cancer Institute.* <<http://www.mirm.pitt.edu/news/article.asp?qEmpID=333>>; 2011 Accessed 05.11.11.
76. Immerman F, Schaum J. *Non-occupational Pesticide Exposure Study (NOPES).* No. PB-90-152-224/AS Springfield, VA: U.S. Environmental Protection Agency; 1990.
77. Ontario College of Family Physicians. *Pesticides Literature Review.* <<http://www.ocfp.on.ca/docs/pesticides-paper/pesticides-paper.pdf?sfvrsn=1>>; Accessed 03.02.12.
78. U.S. Environmental Protection Agency. *EnviroSense Fact Sheet: Safe Substitutes at Home: Nontoxic Household Products.* <[http://www.concrobium.com/Envirosense\\_Fact\\_Sheet\\_Non-Toxic\\_Products.pdf?phpMyAdmin=HgC2DWhgfTvoNnMSxaWklReppr4&phpMyAdmin=0Lt7mlYTH6CpPQzhJ3ImR-RY80](http://www.concrobium.com/Envirosense_Fact_Sheet_Non-Toxic_Products.pdf?phpMyAdmin=HgC2DWhgfTvoNnMSxaWklReppr4&phpMyAdmin=0Lt7mlYTH6CpPQzhJ3ImR-RY80)>; Accessed 05.02.12.
79. Institute for Agriculture and Trade Policy. *IATP applauds American Public Health Association call for precautionary moratorium on new CAFOs* [press release]. <<http://www.commondreams.org/news/2004/0108-04.htm>>; Accessed 07.11.11.
80. Agriculture Research Service, U.S. Department of Agriculture. *National Program 206: Manure and Byproduct Utilization Action Plan.* Washington, DC: U.S. Department of Agriculture; 2005.
81. Powerhouse big farms dominate U.S. Ag output. *Reuters News.* June 3, 2004 (based on Census of Agriculture, U.S. Department of Agriculture; 2002).
82. Kratz GP. Will corporate farms hog market? *Deseret News.* September 16, 1998.
83. Michigan State Medical Society. *Resolution 105-02A.* East Lansing, MI: Michigan State Medical Society; 2002.
84. Canadian Medical Association. Ottawa, Canada: Canadian Medical Association; 2002.
85. American Public Health Association. *Precautionary Moratorium on New Concentrated Animal Feed Operations.* <<http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1243>>; Accessed 05.02.12.
86. Steinfeld H, Gerber P, Wassenaar T, et al. *Livestock's Long Shadow.* Rome: Food and Agriculture Organization, 2006. <[http://www.virtualcentre.org/en/library/key\\_pub/longshad/A0701E00.htm](http://www.virtualcentre.org/en/library/key_pub/longshad/A0701E00.htm)>.
87. Centers for Disease Control and Prevention. *Get Smart for Healthcare.* <<http://www.cdc.gov/drugresistance/healthcare/problem.htm>>; Accessed 07.11.11.
88. Shea K, Florini K, Barlam T. *When Wonder Drugs Don't Work: How Antibiotic Resistance Threatens Children, Seniors and the Medically Vulnerable.* Washington, DC: Environmental Defense;

- 2001:5. <[http://www.edf.org/sites/default/files/162\\_ABRreport.pdf](http://www.edf.org/sites/default/files/162_ABRreport.pdf)>; Accessed 07.11.11.
89. American College of Physicians. Senator Bill Frist in a hearing of the Subcommittee on Public Health to examine the problem of and potential solutions for the problem of antimicrobial resistance. <<http://www.cdc.gov/mlp/pdf/nls/HEHS-99-26.pdf>>; Accessed 03.02.12.
  90. Levy SB. The challenge of antibiotic resistance. *Sci Am*. 1998;278:46–56.
  91. Infectious Diseases Society of America. *Bad Bugs, No Drugs: Defining the Antimicrobial Availability Problem*. <[http://www.idsociety.org/uploadedFiles/IDSA/Policy\\_and\\_Advocacy/Current\\_Topics\\_and\\_Issues/Antimicrobial\\_Resistance/10x20/Images/Bad%20Bugs%20no%20Drugs.pdf#search=%22bad%20bugs%22](http://www.idsociety.org/uploadedFiles/IDSA/Policy_and_Advocacy/Current_Topics_and_Issues/Antimicrobial_Resistance/10x20/Images/Bad%20Bugs%20no%20Drugs.pdf#search=%22bad%20bugs%22)>; 2004 Accessed 07.11.11.
  92. Benbrook M, Benbrook C, Benbrook Mellon K. *Hogging It: Estimates of Antimicrobial Abuse in Livestock*. Cambridge, MA: Union of Concerned Scientists; 2001.
  93. Smolinski MS, Hamburg MA, Lederberg J, Institute of Medicine, Board on Global Health, eds. *Microbial Threats to Health: Emergence, Detection, and Response*. Washington, DC: National Academy of Sciences Press; 2003. <<http://books.nap.edu/books/030908864X/html/R1.html#pagetop>>; Accessed 07.11.11.
  94. Akhtar AZ, Greger M, Ferdowsian H, Frank E. Health professionals' roles in animal agriculture, climate change, and human health. *Am J Prev Med*. 2009;36:182–187.
  95. Hites RA, Foran JA, Carpenter DO, et al. Global assessment of organic contaminants in farmed salmon. *Science*. 2004;303:226–232.
  96. Easton MDL, Luszniak D, Von der Geest E. Preliminary examination of contaminant loadings in farmed salmon, wild salmon and commercial salmon feed. *Chemosphere*. 2002;46:1053–1074.
  97. Environmental Defense. *Pocket Seafood Selector*. <[www.environmentaldefense.org/documents/1980\\_pocket\\_seafood\\_selector.pdf](http://www.environmentaldefense.org/documents/1980_pocket_seafood_selector.pdf)>; 2011 Accessed 07.11.11.
  98. Wiks R, Campbell C. *Pesticides in Children's Foods*. Washington, DC: Environmental Working Group; 1993.
  99. Environmental Working Group. *Report Card: Pesticides in Produce*. <<http://www.ewg.org/foodnews/summary/>>; Accessed 03.02.12.
  100. U.S. Environmental Protection Agency. *Ground Water and Drinking Water*. <[www.epa.gov/safewater/dwhealth.html](http://www.epa.gov/safewater/dwhealth.html)>; Accessed 07.11.11.
  101. U.S. Environmental Protection Agency. *Drinking Water Contaminant Candidate List (CCL)*. <<http://water.epa.gov/scitech/drinkingwater/dws/ccl/>>; Accessed 03.02.12.
  102. U.S. Environmental Protection Agency. *Drinking Water from Household Wells*. <[www.http://water.epa.gov/drink/info/well/](http://water.epa.gov/drink/info/well/)>; Accessed 07.11.11.
  103. NSF International. *Home Water Treatment Devices*. <[www.nsf.org/consumer/drinking\\_water/dw\\_treatment.asp](http://www.nsf.org/consumer/drinking_water/dw_treatment.asp)>; Accessed 07.11.11.
  104. Olson ED. *Bottled Water: Pure Drink or Pure Hype?* New York: National Resources Defense Council; 1999. <[www.nrdc.org/publications/reports.asp#health/](http://www.nrdc.org/publications/reports.asp#health/)>; Accessed 07.11.11.



# 106

## Counterstrain

Harmon Myers, DO, and Julia Jernberg, MD

### History and Theory of Counterstrain Therapy

In the 1950s, Lawrence Jones, an osteopathic physician in rural Oregon, discovered a novel, highly effective, low-risk form of manipulation that, 6 decades later, has become an internationally taught technique. In an attempt to ameliorate a farmer's severe back pain, Dr. Jones noted that the passive positioning of this index patient into a position of comfort and the holding of that position resulted in the complete resolution of the patient's back pain. Jones followed up this serendipitous discovery with the meticulous cataloging of hundreds of points that could be relieved by precisely positioning the patient.<sup>1</sup> The position needed to treat the patient's pain effectively could be determined by finding specific points of disease that Jones termed "tender points." Tender points were areas that, when palpated, caused the patient to experience discomfort at that site and that felt more taut to the examiner or were of a firmer consistency than the surrounding tissue. Jones believed that the cause—and subsequently the treatment—centered on the pathologic features of agonist and antagonist muscles of specific joints.

Jones (and subsequent theorists) ascribed the pathologic features of a tender point and the associated pain to the inappropriate and ceaseless firing of muscle proprioceptors and nociceptors that were, as a result, constantly "turned on" without any relaxation. Jones termed his treatment of the pain associated with these tender points, "strain-counterstrain" because he hypothesized that a rapid attempt to return a strained agonist muscle back to its neutral position would excessively accelerate the lengthening of the antagonist muscle. Because the antagonist was short while the agonist was stretched out (the strain), the proprioceptors within the shortened antagonist were hypervigilant for signs of stretch (i.e., the "gain" was increased to enhance the sensitivity to subsequent stretch). Thus, when the antagonist was rapidly lengthened (the counterstrain) as the agonist raced back to its neutral position, the antagonist's highly attuned proprioceptors could "see"

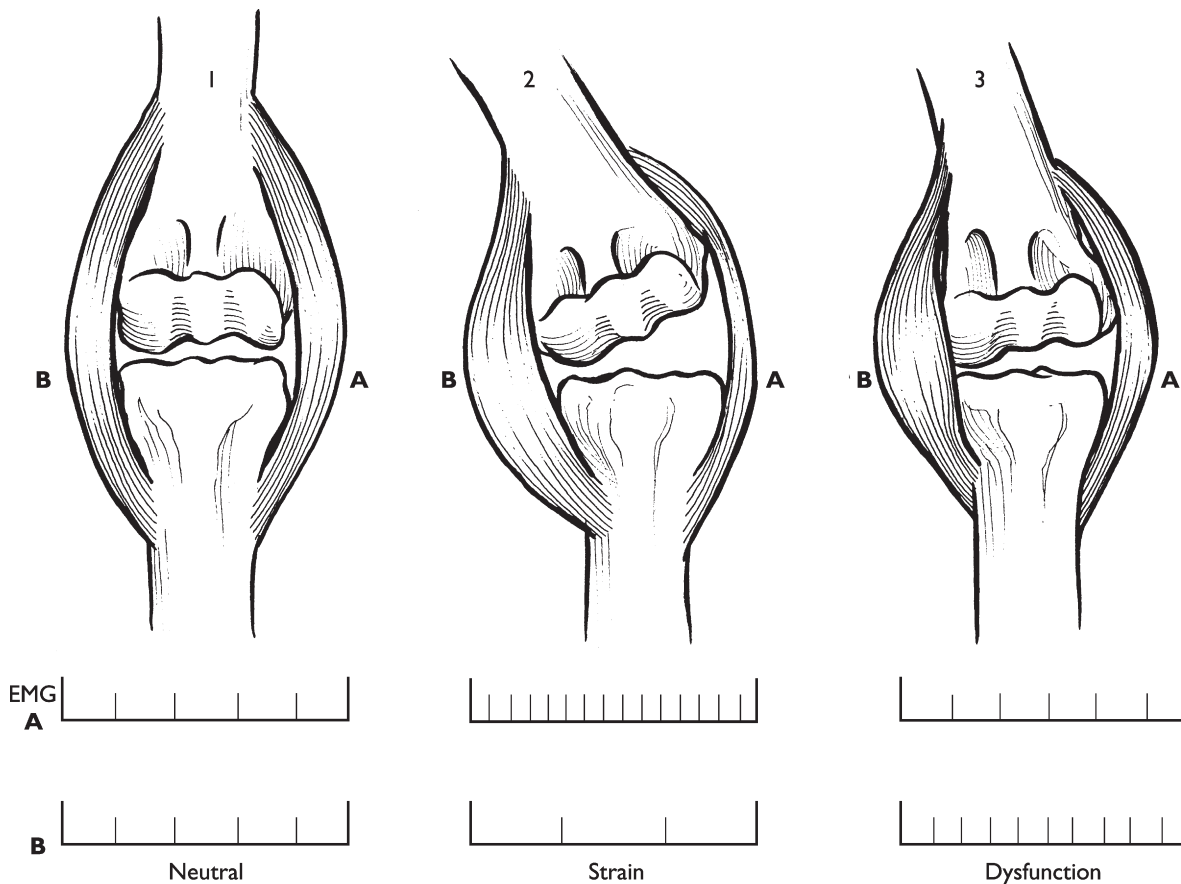
the prompt lengthening as a signal that the antagonist was being stretched beyond neutral, even though it was not actually longer than its neutral length. This false sensation that the antagonist was being stretched then led to chronic overfiring of the antagonist's proprioceptors. Because the muscle was signaling "stretch" when it was not actually lengthened, it had no opportunity to turn down the neural discharge. The muscle therefore continually tried to shorten (i.e., was chronically constricted) in its attempt to alleviate the false sensation of stretch (Fig. 106-1).

Strain-counterstrain, Jones reasoned, was effective because it enabled the cessation of the inappropriate firing of the proprioceptors in the antagonist muscle. If the muscle were shortened while it was not contracted, the perpetual firing that relayed the false sensation of stretch could be shut down, and the proprioceptors could be "reset" with the normal length of the muscle as the baseline. Thus, Jones' therapy is based on the *passive* shortening of the afflicted muscle into an optimum relaxed position that allows the afferent nerve impulses to dampen. As a result, the muscle can escape from signals to contract on a long-term basis.

While Jones was beginning to appreciate the therapeutic potential of strain-counterstrain manipulations, Janet Travell, MD, John F. Kennedy's physician, was embarking on what was to become an exhaustive study of myofascial trigger points and their pain referral patterns. Travell's trigger points were similar to Jones' tender points—in that they were nodular, taut areas in muscle that were tender to palpation. Travell noted that trigger points could refer pain to areas beyond the region of the trigger point, and she extensively mapped out both mundane and unexpected referred sites. For instance, Travell noted that a trigger point in the soleus muscle in the leg could cause pain in the leg, the sacral area and, surprisingly, in the jaw. Travell's therapy of the trigger points differed markedly from Jones' counterstrain manipulations. Travell's preferred method of treating trigger points was to anesthetize the skin topically with a cold spray and then to stretch out the muscle containing the trigger point. In addition, injection into a trigger point was also noted to relieve associated pain (Box 106-1).

**FIGURE 106-1**

Jones' neuromuscular model. EMG, electromyography. (From D'Ambrogio KJ, Roth GB. *Positional Release Therapy: Assessment and Treatment of Musculoskeletal Dysfunction*. St. Louis: Mosby, 1997; modified from Jones LH. *Strain and Counterstrain*. Newark, OH: American Academy of Osteopathy, 1981.)



Harmon Myers, DO, was an early student and a subsequent teacher of Jones' technique. Myers synthesized the joint-centered tender points and manipulations of Jones with Travell's myofascial referral patterns of pain stemming from muscular trigger points. Myers realized that Jones' tender points and counterstrain treatment positions actually were locating and shortening Travell's myofascial trigger points and associated muscles. In counterstrain, the passively and optimally shortened position (held for 90 seconds) allowed the inappropriate firing of the proprioceptors located in the muscle containing Travell's trigger point to abate. When the chronically contracted muscle finally relaxed, Travell's trigger point palpably dissolved, and the myofascial pattern of pain ceased.

Often, complete symptom resolution was obtained with just a few counterstrain sessions. This was true not for just muscular pain, but also for other symptoms noted by Travell or Jones. Not uncommonly, patients with complaints of dizziness (sternocleidomastoid muscle), cough (pretracheal fascia and sternocleidomastoid muscle), gastric reflux, and bowel symptoms (rectus abdominis, external abdominal oblique, and longissimus thoracis muscles) dramatically improved with the application of Jones' positioning applied to Travell's myofascial patterns of pain.

The seemingly remarkable efficacy of this therapy, when administered in a finite number of sessions, along with the relatively benign nature of the treatment led to its appeal for patients and therapists alike. Without further provocation, a few sessions of counterstrain are often curative, even for long-standing pain problems. If continuing reasons for exacerbation exist (e.g., Crohn's disease-induced abdominal pain and back pain in a patient with chronic inflammatory bowel disease, lupus-associated recurrent headaches associated with disease severity, or back pain in a patient with leg-length discrepancy), then recurring treatments may need to be allotted based on activity of the underlying disease.

## Practical Applications of Counterstrain Therapy

### Evaluating the Patient for Therapy

To determine whether a patient might be helped by counterstrain, the practitioner must know the myofascial pain referral patterns, as well as the associated visceral and autonomic symptoms. Once the clinician is familiar with the referral patterns, especially for the more common muscles, then a

search for tender points within those muscles can ascertain whether counterstrain is likely to be an effective therapy for that particular patient.

To help guide the search for culprit muscles further, ask yourself what muscles are stretched when the pain worsens, and then look for tender points within those muscles. If a patient complains of back pain and enters the office hunched over (back in flexion), then an examination of the anterior muscles (rectus abdominis, external abdominal oblique, and iliacus) may very well yield significant tender points. The back pain in this patient would worsen when the patient is standing straight, which stretches the anterior (abdominal) thoracic and lumbar muscles.

Myofascial pain is not limited solely to the somatic realm. Multiple examples of muscular pain stemming from the stomach and intestines exist, and ample evidence indicates

neural feedback between the viscera and the muscles and vice versa. A thorough understanding of the somatovisceral relationships, followed by subsequent treatment of identified muscular disorders, can prove invaluable in patients who have failed to attain relief by pharmaceutical and other conventional methods (e.g., for gastroesophageal reflux disease, inflammatory bowel disease, irritable bowel syndrome, and the associated back pain).

Some ailments associated with the more common myofascial pain patterns are listed in [Table 106-1](#). More detailed lists can be found in the references.<sup>1-3</sup> Successful treatment of muscle disorders implicated in myofascial pain referral patterns can frequently spare patients unnecessary consumption of pain medications, can sometimes prevent surgery (e.g., appendectomy for a tender point in the right lower external abdominal oblique muscle), and, of course, can often provide pain relief.

Even if you should decide to refer patients elsewhere for treatment instead of endeavoring to treat them yourself, you must appreciate the contributions of myofascial patterns of pain. A clinician who is adept—or at least competent—in diagnosing myofascial contributions to pain and other dysfunctions will cultivate appreciative patients.

### BOX 106-1. Pathophysiology of a Tender Point

Awareness of tender points in the myofascial system dates back to the Chinese Tang Dynasty (AD 618), when these areas were called Ah Shi points. Descriptions of these points in Western medicine have included terms such as trigger points, fibrositis, muscle callus, chronic myositis, and muscular nodules. The underlying mechanisms of pain and inflammation appear to share common origins. Tender points result from the following three mechanisms:

- A proprioceptive neural response to acute muscular strain that registers the rate of stretch of the muscle spindle fibers
- A nociceptive neural response to visceral disease, muscle strain, or injury that persists because of a lack of response to treatment
- An autonomic-somatic neural response to increased tone of the sympathetic nervous system that can result from anxiety and pain

Within the area of the tender point, proinflammatory and vasoconstrictive chemical mediators, including histamine, prostaglandins, bradykinin, products of anaerobic metabolism, and potassium, accumulate. These mediators team with an influx of calcium ions and lead to chronic hyperstimulation of the associated muscle, thereby causing a neurologic reflex arc that further exacerbates and “tightens” the painful muscle. The underlying trigger of this phenomenon can be an acute injury, repetitive strain, imbalance of muscle use, visceral disease, or chronic stress and tension.

### History and Examination

#### ■ Clues From History

Determine the probable initial or continuing source of pain or dysfunction. This can lead to a directed search for related myofascial referral. For example, a patient with upper back pain who has a history of chronic gastroesophageal reflux disease would prompt evaluation of upper tender points in the anterior rectus abdominis and external abdominal oblique muscles, in addition to posterior tender points, whereas a patient who has headaches and dizziness that began after she ran into a truck's side mirror, with resultant forceful turning of her head, may well have tender points in the sternocleidomastoid muscle.

#### ■ Exacerbating and Alleviating Factors

Assess what positions the patient naturally assumes to alleviate the discomfort and what movements make it worse. Realize that shortening of the culprit muscle lessens pain and stretching of that muscle worsens it. In addition, active use of an afflicted muscle worsens the pain. For example, low back pain that worsens with lumbar extension could implicate the anterior abdominal muscles, whereas pain in the knee on rising from a sitting position would prompt an examination of the groin for a tender point in the rectus femoris muscle.

**TABLE 106-1.** Myofascial Pain Patterns Associated With Common Ailments

HEADACHE AND NECK PAIN	BOWEL PROBLEMS	BACK PAIN
Sternocleidomastoid	External abdominal oblique	Quadratus lumborum
Trapezius	Rectus abdominis	Longissimus thoracis
Levator scapulae	Iliacus	Multifidus
	Longissimus thoracis	Rectus abdominis

### ■ Feel the Tender Point

Attentively “listen” to the patient’s muscles with your fingers as you search for tender points. Closing your eyes and directing your full attention to the symphony of textures that your fingers encounter will markedly enhance your ability to appreciate tender points.

### Treatment Logistics

Once the tender points have been discerned, treatment consists of *shortening* the affected muscles while they are in a *relaxed* state. This passively shortened position enables the constantly firing proprioceptors and nociceptors to sense that continual stretching is no longer occurring; thus, they can finally turn down their signal intensity to a normal level. For this to happen, the treatment position must be precisely determined so that the muscle is optimally shortened. A solid knowledge of anatomy helps the counterstrain practitioner envision the correct position, and the palpable softening of the previously taut tender point confirms the optimum treatment position. Subjective input from the patient is also very helpful in finding the correct position. Palpation of the tender point initially elicits a painful sensation in the patient. When the patient is perfectly positioned for optimal shortening of the muscle, however, the patient will experience at least 70% improvement in the level of pain with palpation of the tender point. Often, complete amelioration of the pain with palpation at the tender point coincides with ideal muscle shortening, and the patient is incredulous that the palpating finger is still on the same tender point (as it should be throughout the treatment and after returning the patient to neutral position while the practitioner checks periodically for the texture and the subjective sensitivity of the tender point). Especially when a practitioner is first learning counterstrain, the patient’s subjective input regarding tenderness from firm palpation of the tender point can be very helpful in guiding the proper positioning of the patient.

The final test for the efficacy of that position is to check for the disappearance of the tender point on returning the patient to a neutral position. Because the practitioner’s finger remains on the tender point during the entire treatment, it is possible to reevaluate the consistency and sensitivity of the tender point after holding the optimum position for 90 seconds. If the maneuver is done correctly, the posttreatment tender point should no longer be tender (or should be at least 70% improved) and should no longer feel taut or ropey in the neutral position.

During counterstrain treatments, the patient is moved into and out of positions very slowly, so as not to reset the inappropriate receptor firing with any rapid stretching. The optimal position must be held for 90 seconds to turn off the inappropriately firing neurons effectively. Counterstrain should not be painful, and the patient should not experience any discomfort (except the occasional gentle stretching sensation in muscles opposite to those being shortened). The patient must be instructed to alert the practitioner if any pain or discomfort is experienced, and the practitioner should adjust the position accordingly to ensure that the position is comfortable.

### Precautions

Although this technique can be powerfully beneficial, a few potential warnings are in order. Occasionally, the patient will feel sore or have flulike symptoms for 24 to 48 hours after

a treatment, as the inflammatory mediators and byproducts of anaerobic metabolism are released into the circulatory system. This phase typically does not last more than 48 hours, and the patient is usually markedly improved thereafter. A more serious caveat of treatment applies to patients with severe posttraumatic stress disorder (PTSD). Relief of chronic and debilitating pain may destabilize the psychological state of a tenuous patient with PTSD who has come to rely on pain as a distraction from mental trauma. Other than these precautions, if a patient is treated in a position of comfort, then counterstrain can be an astonishingly effective, yet reassuringly benign, manual therapy to incorporate in your arsenal.

### General Guidelines

#### *Treat Referral Points First*

Before you attempt to treat the tender points at the site of pain, search for the important and common myofascial pain referral areas and treat those first. If a patient has a headache, first examine and treat the neck referral muscles (sternocleidomastoid, trapezius, and levator scapulae) before you begin to treat any tender points in the head itself. Approximately half the time, abolition of tender points in these referral muscles alone will resolve the head pain. Similarly, if a patient has sacral or buttock pain, you must evaluate and alleviate any tender points in the quadratus lumborum or longissimus thoracis muscles that refer pain to this area before trying to remedy any points in the piriformis or gluteus muscles themselves. If you fail to remove disorders in the offending *referral* muscles before addressing the tender points within the area itself, therapy will often be ineffective because the major culprit of the pain—*anatomically removed from the site of the discomfort*—will continue to cause symptoms until it is treated.

#### *Order of Treatment*

Once you have located the tender points, treat the most severe or the middle of a chain of tender points first. Sometimes, this approach can “turn off” adjacent or milder tender points.

#### *Be Slow and Gentle*

Move the patient into and out of position very slowly and gently. Ask the patient to tell you if he or she has any discomfort beyond the mild stretching of muscles on the side opposite the one being treated.

#### *Listen to Your Fingers and the Patient*

As you strive to position the patient so that the afflicted muscle is at its shortest length, the palpable softening of the texture of the tender point combined with the patient’s subjective assessment of the resolution of the discomfort noted during application of pressure to the tender point will guide you to the optimal position.

#### *Hold*

Hold the position for 90 seconds. This is how long it takes to reset the inappropriately firing nerves. If pain is long standing, you may need to hold the position for a minute or two more. Use the sensation that the tender point is dissolving to know when the patient can be returned to neutral position.



### Check Response

Keep your fingers on the tender point during treatment, and occasionally check back to make sure the tender point is soft and painless. When you return the patient to neutral position after treating that particular muscle, recheck the tender point. It should be at least 70% improved for lasting therapeutic efficacy.

### Variations in Position

Although each particular muscle has general guidelines to direct you to the correct position, each patient will differ in the extent needed to achieve ideal resolution of the tender point. Often, younger, more limber patients need more flexing, bending, or rotating, whereas older, stiffer patients experience complete tender point and pain relief with much less dramatic contortion of the body.

Anterior tender points tend to be treated with flexion, whereas posterior tender points tend to be treated in extension. The more lateral tender points tend to need more side-bending or rotation, whereas the more midline tender points tend to evoke more flexion or extension in their resolution.

### Comfort Is Paramount

Always treat the patient while he or she is in a position of comfort. Counterstrain is an inherently low-risk therapy as long as the patient is comfortable during treatment. Obviously, extreme extension of the cervical spine (rarely used in counterstrain) should be undertaken with a degree of caution in the older adults or in young women and others more prone to vertebral artery issues.

### Sequelae

Discuss with the patient that he or she may feel sore or have flulike symptoms for 24 to 48 hours after treatment. Most ailments need three or fewer treatments to resolve. If the pain persists beyond three sessions, then the source of the pain needs to be reevaluated.

## Examples of the Technique

This section contains illustrations of referral patterns, tender points, and treatment positions for several muscle groups that are commonly involved in pain. This discussion provides just a short sample, and the reader should refer to referenced resources or continuing medical education for more information.<sup>2,3</sup>

Headache, a common and frequently debilitating complaint, aptly illustrates the need for a clinician to be familiar with the myofascial pain patterns and also provides an example of the ease and efficacy of using counterstrain in clinical practice. Many headaches are associated with tender points in three noncranial muscles: sternocleidomastoid, trapezius, and levator scapulae. These tender points are relatively easy to locate, and the positions of treatment are readily learned. Because the neck is not extended, the risk of vertebral artery dissection is not a concern. Thus, this is a rewarding set of muscles on which to learn the counterstrain technique. Consider checking to see whether these muscles are implicated in patients with migraines, stress headaches, or other head or neck pain complaints.

## Trapezius Muscle

The trapezius muscle, an expansive muscle in the upper back, can have various trigger point locations. The trapezius muscle can refer pain from the posterior neck into the head and sometimes causes discomfort in the frontal sinus area. The two most common tender points (medial and lateral) that refer pain to the head and neck are found by pinching the uppermost area between the shoulder and the neck and are depicted by the Xs in [Figure 106-2A](#).

### Tender Points

Tender points are located in the fibers of the upper part of the muscle at the junction of the neck and shoulder and are found by pinching the muscle between finger and thumb.

- **Medial point:** The medial point is found in the webbing at the junction of the neck and thorax (a gentle version of the Star Trek “Vulcan death grip”).
- **Lateral point:** The lateral point is found a centimeter or two more lateral than the medial point as you pinch out toward the shoulder.

### Referral Pattern

- **Medial point:** Pain can be located at the angle of the jaw, behind the eye, and through the temporal region into the lateral neck.
- **Lateral point:** Pain is found in the suboccipital area through the posterior neck (see [Fig. 106-2B](#)).

### Treatment Position

With patient lying on back:

- **Medial points:** Side-bend the patient's cervical spine toward the side of pain so the ear is moved toward the shoulder.
- **Lateral points:** Flex the patient's shoulders so that the arms are approximately 150 to 170 degrees overhead (so that the humerus is though the plane of the eyes), as shown in [Figure 106-2C](#), and apply steady, gentle cephalic traction (in effect, moving the scapular attachments closer to the vertebral origins of the muscle).

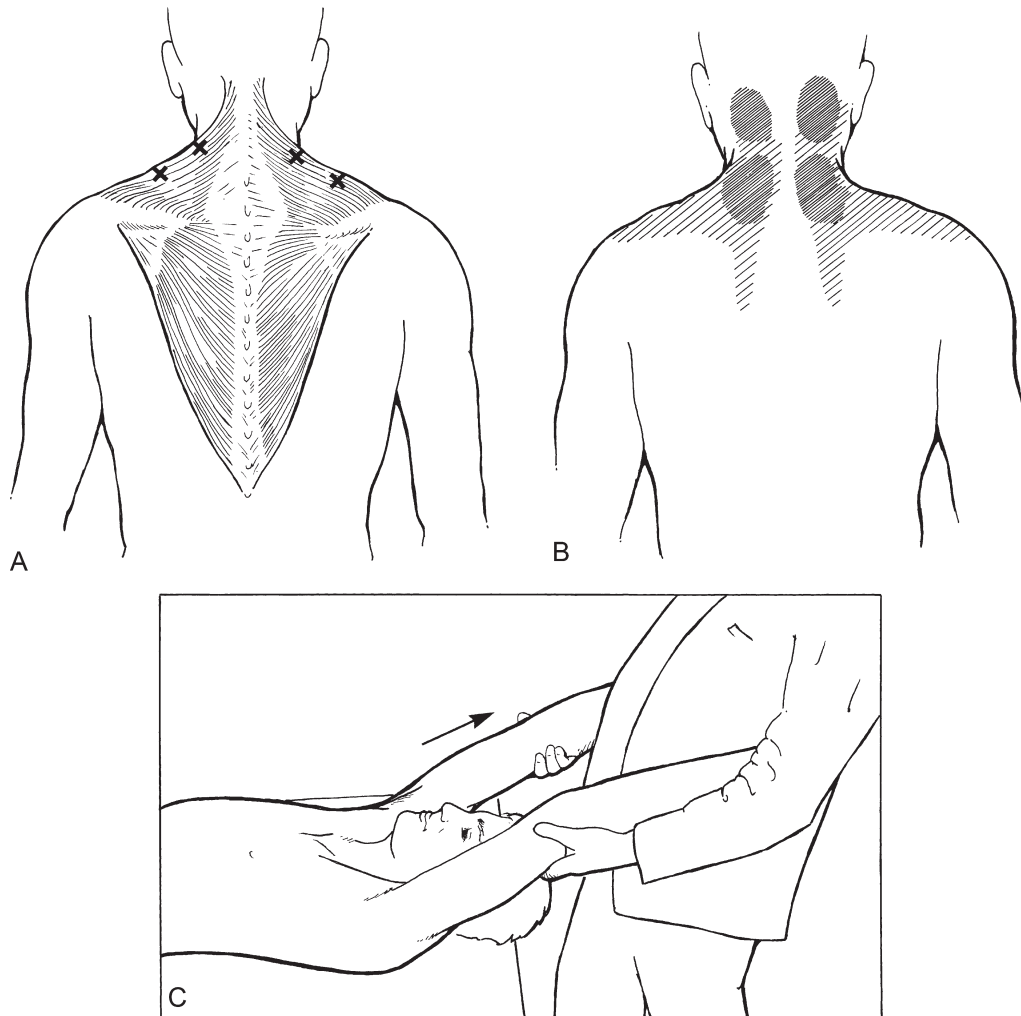
## Levator Scapulae Muscle

Chronic contraction within the levator scapulae muscle can be a frequent source of pain in the shoulders and the posterior neck, with radiation of pain into the occipital area. This condition is seen in people with tension and anxiety (chronic shoulder shrug), those who work extensively with a keyboard, or those who regularly hold a telephone between the ear and the shoulder. A hint that the levator scapulae is in need of treatment comes when a patient holds his or her contralateral hand over the area between the shoulder and neck and rubs the upper back with his or her fingers.

- **Tender point:** This point is located at the superomedial border of the scapula between the scapula and the nape of the neck ([Fig. 106-3A](#)). Slide your fingers medially over the scapular spine and move laterally to medially. When the spine of the scapula ends, hook your fingers up and onto

**FIGURE 106-2**

The counterstrain technique applied to the trapezius muscle. See text for details. **A**, Tender points. **B**, Pain referral pattern. **C**, Treatment position for lateral trapezius points.



the superior medial border of the scapula, and press posterior to anterior and medial to lateral against the medial edge of the scapula.

- Referral pattern: Pain is felt in the posterior neck through the shoulder, with referral pain in the occipital area (see [Fig. 106-3B](#)).
- Treatment position: With the patient supine, side-bend the neck toward the side of the tender point. Flex the patient's shoulder to approximately 30 to 45 degrees with the elbow flexed. Abduct the shoulder slightly and apply a cephalic force through the shaft of the humerus to elevate the scapula. It feels as though you are shoving the shoulder toward the ear (see [Fig. 106-3C](#)).

### Sternocleidomastoid Muscle

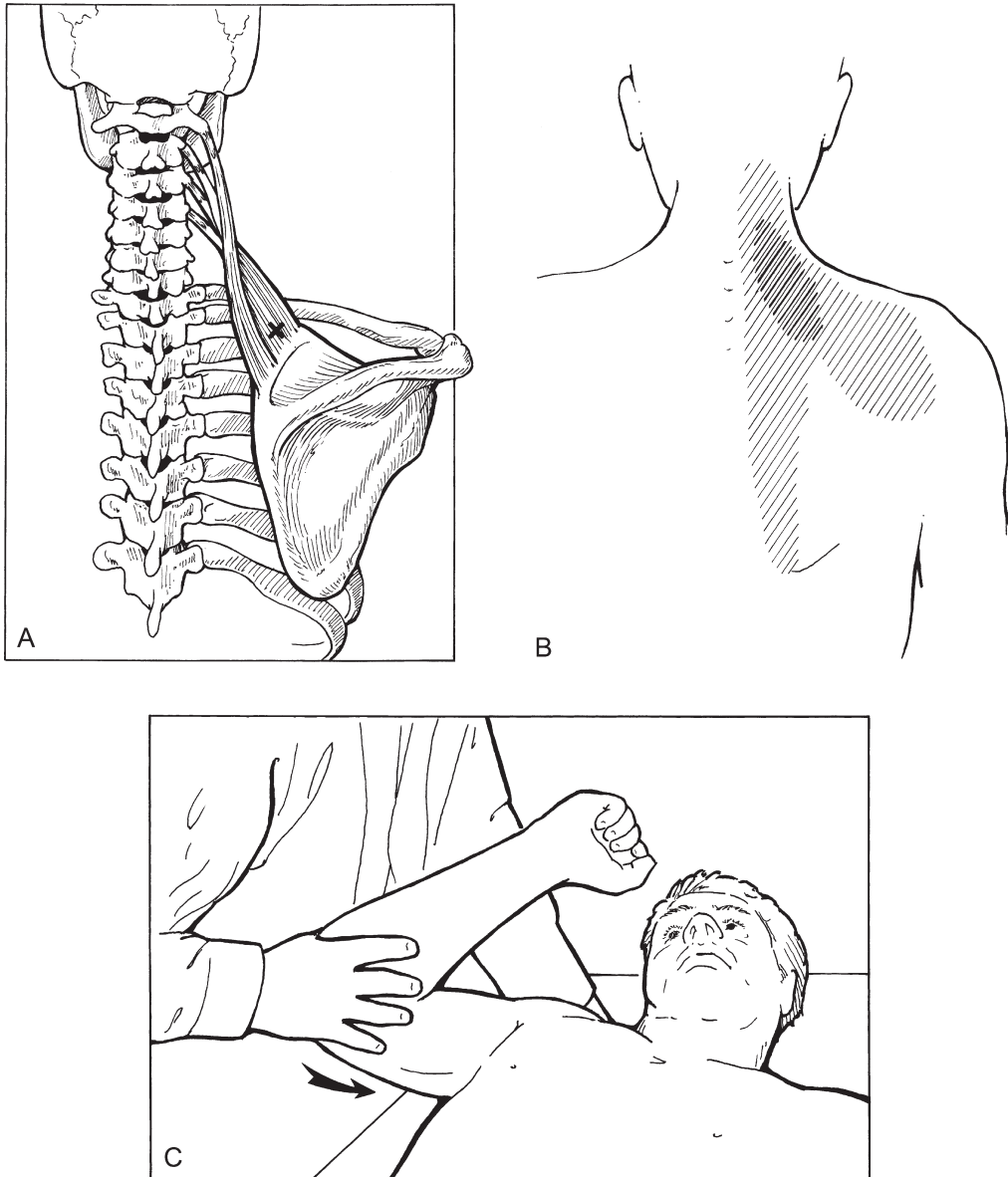
This muscle is a myofascial culprit often implicated in headache, ear pain, or sinus symptoms. Additionally, the sternal branch attachment can be associated with dry

cough, whereas disorders of the clavicular belly of the muscle can be associated with postural dizziness and a sense of imbalance. Generally, patients do not actually complain of any discomfort in the anterior neck, and thus awareness of Travell's myofascial patterns of pain can be important in resolving the many headaches and other symptoms originating from dysfunction in the sternocleidomastoid muscle.

- Tender point: This is located anywhere in the body of either the sternal or the clavicular division of the muscle (or the sternal attachment in the case of cough). Pinch the belly of the muscle with your thumb and index finger to help find the tender point. Obviously, care should be taken to avoid carotid massage ([Fig. 106-4A](#)).
- Referral pattern: Pain is referred to the suboccipital, frontal, maxillary, or other areas of the head. Further symptoms stemming from the sternocleidomastoid muscle include ear, eye, or temporomandibular joint symptoms, dizziness or imbalance, and dry cough (see [Fig. 106-4B](#)).

**FIGURE 106-3**

The manipulation technique applied to the levator scapulae muscle. See text for details. **A**, Tender point. **B**, Pain referral pattern. **C**, Treatment position.



- Treatment position: With the patient supine, support the head as you gently but markedly flex the neck, rotate the head away from the tender point, and side-bend it toward the tender point. Imagine coaxing the patient's ear toward either the sternum (for the sternal branch) or the clavicular insertion (for the clavicular branch). Sometimes, using a pillow helps the patient relax enough to soften the sternocleidomastoid muscle while the patient's head is elevated off the table (see Fig. 106-4C).

### Piriformis Muscle

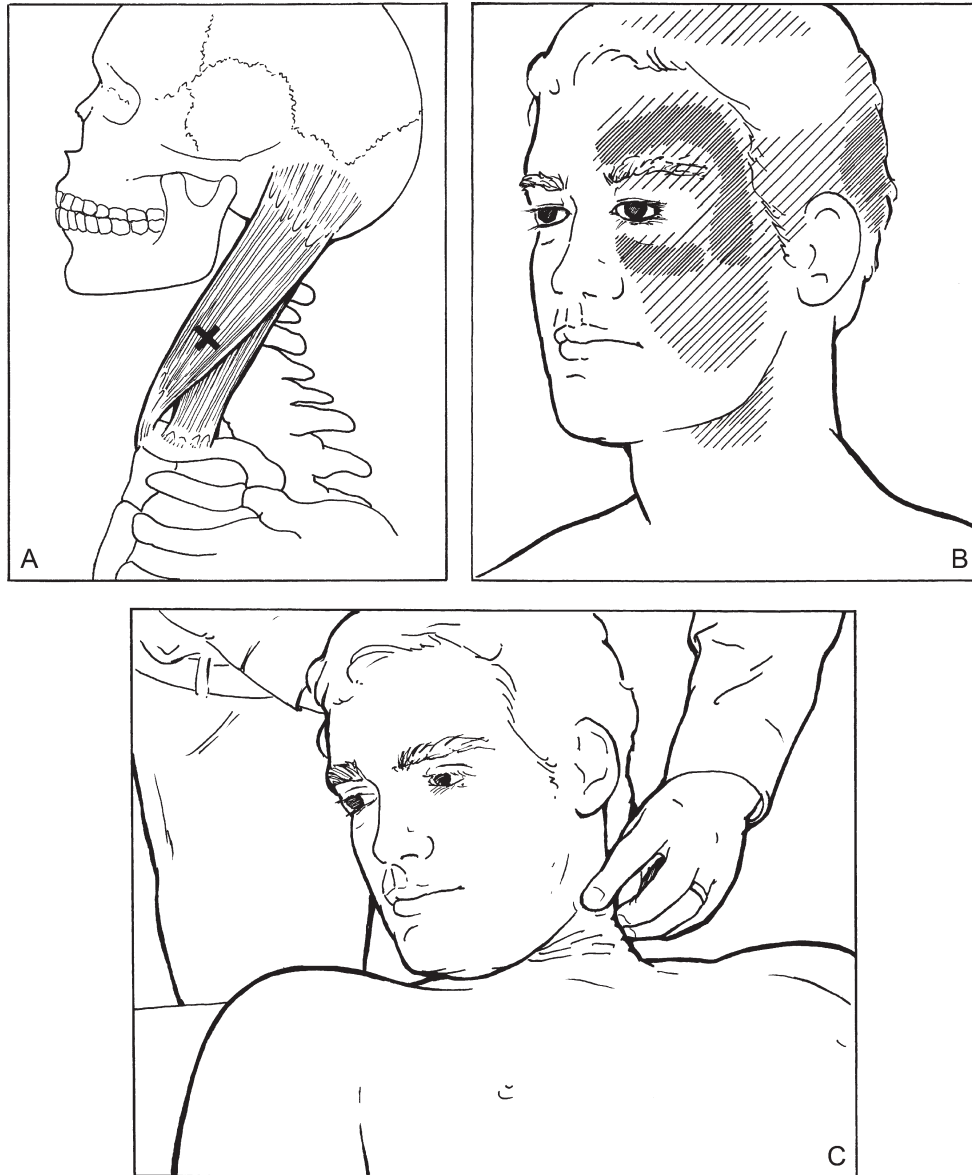
The sciatic nerve and the piriformis muscle are in close proximity (Fig. 106-5). In fact, in 5% of the population, the nerve runs through or over the muscle, thus making

irritation of the nerve much more likely when the muscle is inflamed. This condition, called piriformis syndrome, is a common cause of buttock pain with radiation of pain down the back of the thigh. Before treating the piriformis muscle, be sure to assess for and treat any tender points in the quadratus lumborum and longissimus thoracis muscles because both these muscles can radiate to the sacral or buttocks area. The rectus abdominis and external abdominal oblique muscles can also be involved anteriorly.

- Tender point: This point is located within the piriformis muscle, which is 3 inches medial and slightly cephalad to the greater trochanter. Tender points can occur anywhere within muscle, which runs between

**FIGURE 106-4**

The manipulation technique applied to the sternocleidomastoid muscle. See text for details. **A**, Tender point. **B**, Pain referral pattern. **C**, Treatment position.



the midsacrum and the greater trochanter of the proximal femur (see Fig. 106-5A).

- Referral pattern: Pain may occur in the buttock and the back of the thigh (see Fig. 106-5B).
- Treatment position: The patient is prone. The therapist sits on the same side as the tender point. The patient's leg on the tender point side is suspended off the table with the patient's anterior ankle resting on the therapist's thigh. Flex the patient's hip 120 to 130 degrees, adduct the hip to tolerance, and slightly rotate the hip internally by gently pulling outward on the foot (see Fig. 106-5C).

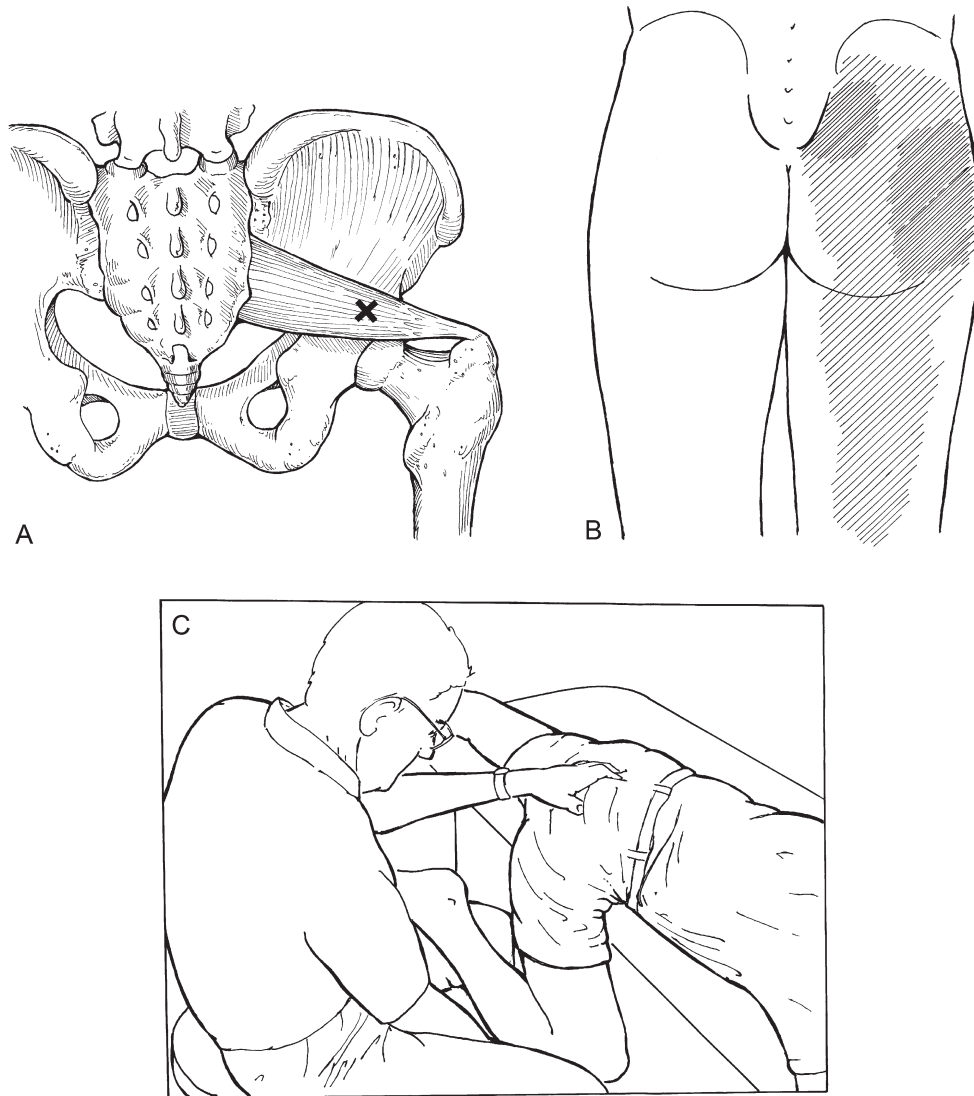
## Benefits

The counterstrain technique is beneficial for the following reasons:

- It often provides immediate relief of discomfort. The benefits are frequently long lasting or even permanent, and they can usually be achieved in a few sessions.
- It readily and efficiently helps the body regain normal function and range of motion that may have been severely and chronically limited by a remote injury that led to continual myofascial dysfunction.

**FIGURE 106-5**

The manipulation technique applied to the piriformis muscle. See text for details. **A**, Tender point. **B**, Pain referral pattern. **C**, Treatment position.



- Not only is it comfortable for the patient to experience, but also counterstrain can be highly rewarding for the practitioner to perform. Counterstrain is easy to learn (especially using Myers' method of combining Travell's myofascial trigger point and Jones' positioning) and not difficult to master at an advanced level.
- It enables you to touch the patient and thereby increase a sense of caring and rapport in a time when technology is creating barriers between practitioner and patient.
- In addition to treating pure somatic pain, counterstrain can help relieve visceral symptoms and the associated somatic pain resulting from somatovisceral or viscerosomatic neural feedback loops.
- It uses a position of comfort, with almost negligible inherent risk to the patient.
- The acquisition of this technique can be readily accomplished by most medical practitioners who have a fundamental medical or anatomic knowledge base.

### Limitations

The limitations of counterstrain therapy are as follows:

- Although pain relief is usually permanent, in some cases pain can recur. Recurrence is more likely when the initial source of injury is not adequately addressed.
- A somewhat localized technique such as this may not be the most effective approach for treating a patient with diffuse and disseminated tender points (e.g., fibromyalgia). In addition, it may not be as rewarding when treating

someone with frequent or continuous recurrent reinjury (e.g., as seen in untreated Crohn's disease or gastroesophageal reflux disease in which the visceral problem restimulates the somatic disorder).

- The technique is conceptually easy to learn but takes practice to become thoroughly adept at it. The practitioner should start by becoming familiar with the common and important muscle groups and then progress from there.
- When able, one should begin the counterstrain technique by practicing on children because their limited soft tissue mass allows for easy identification of tender points, and their small frames enable ready maneuverability into treatment positions.
- If psychological problems are not addressed, a patient who “needs” somatic pain to maintain equilibrium can become destabilized. Close coordination with a mental health professional is recommended in patients with a history of severe psychological issues or with significant PTSD before attempts are made to relieve the somatic pain.

#### KEY WEB RESOURCES

American Academy of Osteopathy: <a href="http://www.academyofosteopathy.org/">http://www.academyofosteopathy.org/</a>	Many courses in manual medicine, including counterstrain, are offered annually.
Jones Institute: <a href="http://www.jiscs.com/Article.aspx?a=0">http://www.jiscs.com/Article.aspx?a=0</a>	This organization coordinates counterstrain workshops in the United States and internationally.
Tucson Osteopathic Medical Foundation: <a href="http://www.tomf.org/">www.tomf.org/</a>	This group offers hands-on classes in strain/counterstrain, taught by Myers twice a year.

#### KEY EDUCATIONAL TEXTS

Travell J, Simons D. <i>Travell and Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual</i> . Philadelphia: Lippincott; 1998.	Travell and Simons' two-volume text documenting the myofascial pain and dysfunction referral patterns encompasses an amazingly thorough life's work, replete with interesting observations of common and unique myopathic associations.
Travell J, Simons D. <i>Travell and Simons' Trigger Point Flip Charts</i> . Baltimore: Williams & Wilkins; 1996.	This useful trigger point flip chart is based on Travell's work.
Myers H. <i>Clinical Application of Counterstrain</i> . Tucson: Osteopathic Press; 2006.	Myers' counterstrain manual combines Travell's findings with Jones' work to provide a succinct, visual, and hands-on approach to learning and applying counterstrain.

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. Jones L, Kusunose R, Goering E. *Jones Strain-Counterstrain*. Boise, ID: Jones Strain-Counterstrain, Inc; 1995.
2. Yates H, Glover J. *Counterstrain Handbook of Osteopathic Technique*. Tulsa, OK: Y Knot; 1995.
3. Rennie B, Glover J. *Counterstrain and Exercise: An Integrated Approach*. 2nd ed. Williamstown, MI: RennieMatrix; 2004.



# 107

## Acupuncture for Headache

Aaron J. Michelfelder, MD

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### Overview

*Acupuncture* is the technique of piercing the skin with needles in specific points on the body to treat or prevent various conditions. Acupuncture has been used for thousands of years by practitioners in many different cultures and societies around the world. Because acupuncture has become more popular, physicians must have at least a basic working knowledge of the technique. The best physicians use all their knowledge of integrative medicine to provide the most comprehensive care available for patients.

Acupuncture points are not random. They are palpable, and points often correspond to depressions in muscles or bones or to neural foramina. An acupuncture point usually has its own neurovascular bundle, which distinguishes it from surrounding tissue, and is sometimes quite tender to palpation. In traditional Chinese medicine, these points connect to energy (qi) channels within the body called meridians. Fourteen principal meridians (6 bilateral [total of 12] and 2 central) are recognized, typically named after organs of the body: kidney (KI), heart (HT), small intestine (SI), bladder (BL), liver (LV), master of the heart, also called pericardium (MH), triple heater (TH), gallbladder (GB), spleen (SP), lung (LU), large intestine (LI), stomach (ST), conception vessel (CV), and governor vessel (GV).

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### Mechanism of Action

The exact mechanism of action of acupuncture is unclear. However, significant evidence indicates that acupuncture effects changes in the muscles where the needle is inserted, changes starting at nerves near the needle and passing all the way up to the higher cortex, as well as changes in circulating and local hormones, cytokines, neurotransmitters, and other body chemicals.<sup>1</sup>

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### Safety of Acupuncture

Despite the use of sterile needles to pierce unsterilized skin, serious adverse reactions to acupuncture are very rare. A systematic review of the world literature on prospective studies of the safety of acupuncture revealed that in 9 trials involving tens of thousands of treatments, pneumothorax was the only life-threatening complication, and it occurred twice; infections did not occur at all.<sup>2</sup> A prospective survey of 34,000 treatments by traditional acupuncturists in the United Kingdom found no serious adverse events.<sup>3</sup> In the largest prospective trial to date, involving 97,733 patients and more than 760,000 treatments performed by 7050 physicians in Germany, pneumothorax occurred twice, as well as one occurrence each of exacerbation of depression, acute hypertensive crisis, vasovagal reaction, and asthma attack with hypertension and angina.<sup>4</sup> The reactions most commonly reported were needling pain in 3.28%, hematoma in 3.19%, bleeding in 1.38%, and orthostasis in 0.46% of patients. Overall, nonserious adverse events were reported to occur in 7.1% of patients.<sup>4</sup>

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### Training in Acupuncture

Laws concerning the practice of acupuncture are defined by each state. Practitioners include the following: licensed acupuncturists, who have completed at least 3 years of training at a college of Oriental medicine; chiropractors, who receive variable amounts of training in chiropractic school but may have additional training after school; and physicians and dentists who have completed acupuncture training courses outside their regular professional training. For physicians to practice acupuncture, some states require no training at all, others require 200 hours, and some mandate 300 hours of acupuncture training. Board certification is available to physicians through the American Board of Medical Acupuncture. Details on physician training and licensure can be found on the Web site of the American Academy of Medical Acupuncture (see the Key Web Resources box, later).



## Techniques

### Technique for Acupressure

Acupressure is essentially massage, but with the purpose of stimulating an acupuncture point for a desired effect. Acupressure can also be used to relax trigger points, as well as other areas of spasm within muscles that may or may not be acupuncture points.

The purpose of the technique is to find the point or area to be stimulated, as follows:

1. With your index finger or thumb, start superficially and apply just enough pressure to move the skin.
2. Move the finger or thumb in gentle, slow circles.
3. With every few circles, apply more and more pressure until you feel the muscle fibers beginning to relax beneath your fingers. If you are stimulating an area without a muscle, such as over the supraorbital foramen, just keep applying slow, steady downward, circular pressure over the foramen.
4. With stimulation of an acupuncture point, the patient should eventually feel a dull, aching sensation. Stimulation of the point should last at least several minutes past which the patient feels this aching sensation. You may have to apply acupressure intermittently, such as for a few minutes, several times an hour.

This technique is a good one to teach patients to perform on themselves for problems such as sinus headaches and pressure.

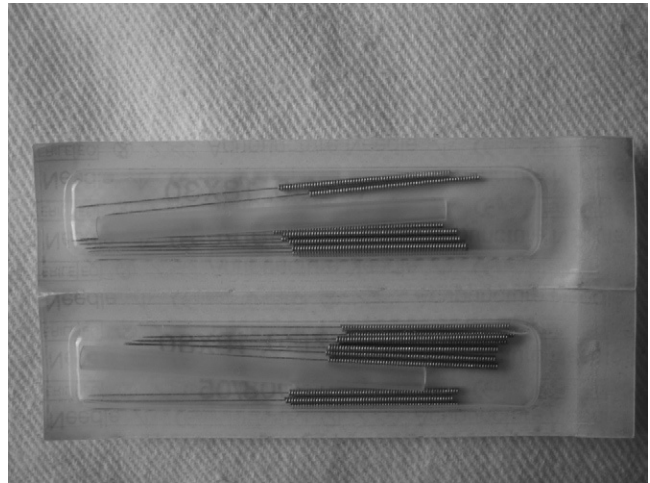
### Technique for Acupuncture

Acupuncture needles come in all sizes, from very small (approximately 40 gauge) to much larger (up to 20 gauge). An acupuncture needle comes to a very sharp point and has a plastic or wrapped metal handle. Because acupuncture needles are not hollow like phlebotomy needles, they are believed to separate tissue more than to cut it (Fig. 107-1).

1. After the desired acupuncture point is found, palpation of the point is important to prepare the body for the needle (Fig. 107-2).
2. A very small needle may need an introducer, which is included with most needles. The introducer is a plastic tube a few millimeters shorter than the needle. Place the introducer on top of the acupuncture point, and then drop the needle into the introducer (Figs. 107-3 and 107-4). The handle of the needle will protrude a few millimeters from the top of the introducer.
3. Holding the introducer between the thumb and third finger of your dominant hand, tap the needle into the skin using your index finger (Figs. 107-5 and 107-6). With practice, the right amount of force needed to pierce the skin is simple to recognize.
4. After the initial tap of the needle into the skin, carefully remove the introducer. Then, the needle may be pushed in deeper and angled to wherever you would like it to go. Typically, the needle enters the body of a muscle, but the depth depends on the acupuncture point. A point on the back of the neck may be 2 to 3 cm deep, but a point on the forehead may only be a few millimeters deep.

Inserting the needles without the plastic introducer requires some training and supervision and is beyond the scope of this chapter.

**FIGURE 107-1**  
Package of acupuncture needles.



**FIGURE 107-2**  
Palpation.



Once a needle has been inserted, it can either be stimulated or left alone. If it is left alone, the coiled handle and temperature difference between the needle tip in the body and the needle handle at room temperature will cause electrons to move from inside the body into the needle. Inserting a needle and then leaving it alone is called *needle in dispersion*. The needle becomes a capacitor removing electrons from the body. In traditional Chinese medicine, this action is believed to be calming, cooling, and depleting.

To add electrons to the body, the needle can be stimulated by a back-and-forth twirling action, which the acupuncturist achieves by rotating the needle approximately 180 degrees alternately clockwise and counterclockwise. The needle can also be stimulated by warming with something like Chinese moxa, an herb pressed into an incense-like stick that, when lit, smolders and emits a steady stream of heat. Electrical stimulators are very popular and may be connected to the

**FIGURE 107-3**  
Positioning the introducer.



**FIGURE 107-4**  
Needle in introducer.



**FIGURE 107-5**  
Tapping needle into place.



**FIGURE 107-6**  
Needle in place.



needles in a circuit to add electron flow from one needle to another. This is the process for percutaneous electrical nerve stimulation, the acupuncture version of transcutaneous electrical nerve stimulation. Lasers can also be used to stimulate acupuncture points with or without needles.

Both acupuncture and acupressure can be used to stimulate acupuncture points. Patients can be taught to perform their own acupressure, thus empowering them to help themselves.

## Evidence for Acupuncture in Headache

The allopathic tradition of the randomized placebo-controlled clinical trial is very difficult to apply to acupuncture. Defining placebo acupuncture is challenging because many people argue that any needle piercing the skin is acupuncture. Many studies use no acupuncture as the control intervention, or they use sham acupuncture, which usually means inserting needles into places that are not acupuncture points. Some studies have tried to use acupressure as the control. In any case, many studies have been unsuccessful in blinding patients or their physicians regarding whether they had acupuncture, and the acupuncturist is certainly not blinded regarding whether traditional or sham acupuncture is being used on the patient. Many studies also use protocols whereby every patient receives the same treatment. Most acupuncturists individualize the acupuncture treatment to each patient and modify treatments based on response to earlier treatments.

To put acupuncture studies into context, the U.S. Food and Drug Administration requires only two studies of a drug to show that the drug is better than placebo before the agent can be approved. A drug could show neutral results in many studies, but as long as two studies have positive results, the drug can be approved for use. Possibly because of the difficulties in

experimental design, many studies of acupuncture have had positive results, and many have had neutral results.

In 1999, Melchart et al<sup>5</sup> performed a review of 22 randomized controlled trials of acupuncture for headache involving 1042 patients from European countries. These reviewers concluded that the trials tended to be small and had methodologic problems; however, the evidence suggested a role for acupuncture in headache treatment.<sup>5</sup> In a newer, well-designed trial reported in 2004, Vickers et al<sup>6</sup> studied acupuncture in 401 patients with chronic headaches in the United Kingdom. Subjects underwent either acupuncture treatments once a week for 3 months or no acupuncture. Over 1 year, the treatment group had a 34% decrease in headache score, versus 16% in the control group. In addition, the treatment group was found to have 20 fewer days of headache per year, 15% less medication use, 25% fewer visits to the general practitioner, and 15% fewer days off work. Wonderling et al<sup>7</sup> examining the cost effectiveness of acupuncture for headaches in the United Kingdom, found that acupuncture improved health-related quality of life at a small additional cost and was relatively cost effective.

Two Cochrane Collaboration reviews of acupuncture performed meta-analyses of available acupuncture trials for headache. The first meta-analysis of acupuncture trials included 22 studies with a total of 4419 patients in whom acupuncture was used for migraine prophylaxis. The reviewers concluded that these “studies suggest that acupuncture is at least as effective as, and possibly more effective than, prophylactic drug treatment, and has fewer side effects.” They recommended acupuncture as a treatment option for patients with migraines.<sup>8</sup> The second meta-analysis concerned acupuncture for tension headaches and included 11 trials with a total of 2317 participants. The reviewers found that patients had a statistically significant reduction in the number, frequency, and intensity of tension headaches over 3 months, but none had studied effects beyond 3 months. The reviewers concluded that “acupuncture could be a valuable non-pharmacologic tool in patients with frequent episodic or chronic tension-type headaches.”<sup>9</sup>

The latest evidence shows that acupuncture is helpful in treating headaches.

## Selecting Acupuncture and Acupressure Points

Selection of acupuncture or acupressure points for treatment of headaches should proceed as follows:

1. Start with general relaxation or calming points.
2. Release trigger points in the posterior cervical region.
3. Depending on the type of headache, use local points.

### General Relaxation and Calming Points

#### Governor Vessel 20

The GV20 point is at the top of the head, over the sagittal suture, which is created by the closure of the posterior fontanelle. Often, a bony ridge is present at this point. Visually, GV20 can be found by tracing an imaginary line from the ear lobes up through the middle of the top of the ears (the helix) and up to the midline. Where that line crosses the sagittal

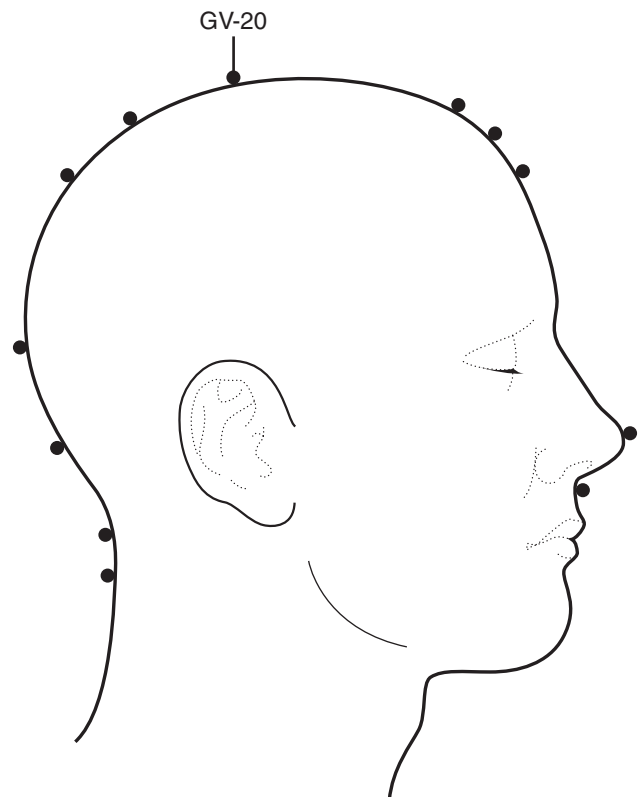
suture (midline) is the GV20 point. The patient can apply acupressure to this point, or a needle can be inserted here and left in dispersion (Fig. 107-7).

#### Large Intestine 4

The LI4 point is located in the body of the first interosseus muscle in the hand, between the first and second metacarpal bones. This point is usually tender, and patients can easily perform acupressure to this point bilaterally on themselves (Fig. 107-8).

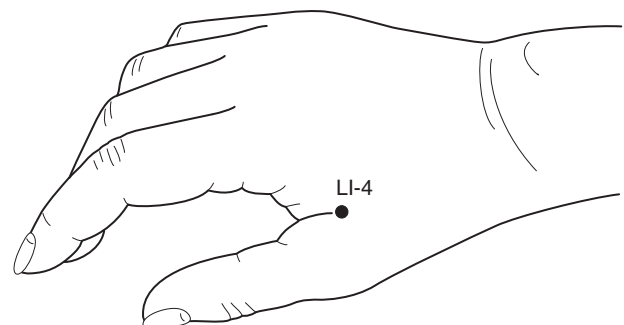
**FIGURE 107-7**

The governor vessel 20 (GV20) acupuncture point.



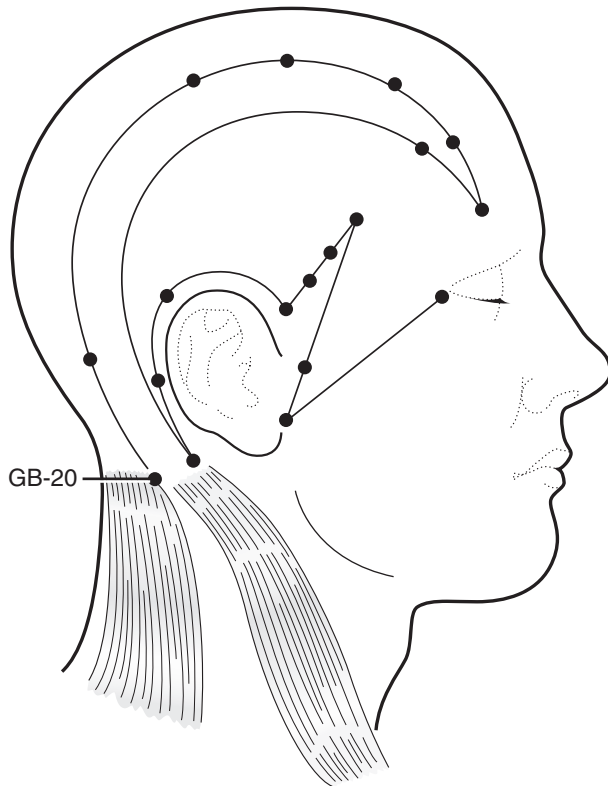
**FIGURE 107-8**

The large intestine 4 (LI4) acupuncture point.



**FIGURE 107-9**

The gallbladder 20 (GB20) acupuncture point.



## Trigger Points in the Cervical Region

People with headaches tend to have stiff posterior cervical muscles. Massage, heat, chiropractic and osteopathic manipulation, acupressure, trigger point injections, and acupuncture can all help release the muscle spasm.

### Gallbladder 20

The GB20 point is located at the base of the skull, posteriorly, between the insertions of the sternocleidomastoid and the trapezius muscles. Start by placing the thumb and index finger of one hand on the mastoid processes and then slide them posteriorly. Your fingertips will “fall into” two depressions at the base of the skull. Superiorly, you will feel the skull. On either side of your fingers, you will feel the sternocleidomastoid or trapezius muscles (Fig. 107-9).

Palpate all the muscles of the posterior neck from the base of the skull down to the shoulders. Any tender points or areas of spasm should be addressed with massage, acupuncture, or acupressure.

## Local Points

### Frontal Headaches

For frontal headaches, including sinus, tension, and migraine, the GV24.5 may be used. GV24.5 is located on the glabella, between the eyebrows (Fig. 107-10).

**FIGURE 107-10**

Acupuncture points governor vessel 24.5 (GV24.5), bladder 2 (BL2), and stomach 2 (ST2).



## Sinus Headaches

- **Bladder 2:** The BL2 point is located at the frontal notch, just medial to the supraorbital foramen (see Fig. 107-10). Insert the needle from above.
- **Stomach 2:** The ST2 point is located lateral to the nose in a depression where the infraorbital foramen is found. Needle this point starting laterally, aim toward the medial canthus of the eye, and insert the needle subcutaneously (see Fig. 107-10).

## Tension Headaches

- **Temporal muscle tender points:** Palpate the muscles of the scalp carefully, and perform acupressure or acupuncture at any tender areas or regions of spasm found, especially in the temporal region.

## Migraines and Cluster Headaches

Migraines and cluster headaches are complicated to treat with acupuncture. Follow the same principles of general relaxation points, then cervical points, then GV24.5. After those procedures, search for any tender points on the scalp. If needling tender points on the scalp does not provide satisfactory relief, a more systemic approach with acupuncture may be more successful. Such an in-depth approach is beyond the scope of this chapter.

## During an Acupuncture Treatment

Needles stay in place for approximately 30 minutes. Patients should be relaxing in a comfortable room with the lights low and perhaps some calming music in the background. Distractions should be minimized.

Remove acupuncture needles as follows:

1. Place one finger on the skin next to the needle.
2. While holding your finger in place, use the other hand to pull the needle out gently.

3. Sometimes a drop of blood may be released. Applying pressure is not necessary; simply dab the blood away with sterile gauze.

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## Posttreatment Home Program

Patients are instructed to moderate their activity for 24 hours after a treatment. They should avoid very hot or very cold foods, consumption of alcohol, sexual activity, and other physically demanding activities. They should also drink plenty of water and get lots of sleep.

Patients can continue to perform acupressure on themselves starting 24 hours after the treatment. A good approach is to stimulate GV20, LI4, and local neck and head points twice a day and as needed.

Ideally, acupuncture is integrated into a regimen of headache trigger avoidance, healthful diet, exercise, and stress reduction, as well as possible medication therapy. Acupressure is a great way to empower patients to take control of their own symptoms.

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## What to Look for in an Acupuncturist

A physician acupuncturist should have completed training in one of the programs approved by the American Board of Medical Acupuncture. Board certification in medical

acupuncture identifies individuals who have completed at least 200 hours of training, passed a board examination, practiced at least 2 years, and performed at least 500 acupuncture treatments.

A nonphysician acupuncturist should be licensed. The letters “L.Ac.” should follow a licensed acupuncturist’s name. In addition, the National Certification Commission for Acupuncture and Oriental Medicine has a database of certified acupuncturists (see the Key Web Resources box).

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## Conclusion

- Training for physicians to learn acupuncture is available through several continuing medical education programs.
- Acupuncture is useful for treating headaches, and patients can be taught acupressure to empower them to take control of their own health.
- In treating headaches: (1) start with general relaxation points (GV20, LI4), (2) release trigger points in the posterior cervical region (GB20 and any tender points), and (3) depending on the type of headache, use local points.
- For referral, look for a physician acupuncturist, licensed acupuncturist, or chiropractor with documented training and, ideally, certification in acupuncture.

### KEY WEB RESOURCES

American Academy of Medical Acupuncture: <http://www.medicalacupuncture.org/index.html>

National Certification Commission for Acupuncture and Oriental Medicine (NCCAOM): [www.nccaom.org](http://www.nccaom.org)

National Center for Complementary and Alternative Medicine (NCCAM): <http://nccam.nih.gov>

Acumedico: <http://www.acumedico.com/acupoints.htm>

Acupuncture Today: <http://www.acupuncturetoday.com/mpacms/at/home.php>

The main certifying group of physician acupuncturists

Certifying group maintaining a database of certified acupuncturists

Part of the National Institutes of Health

A list of acupuncture sites with illustrations

Acupuncture news source with information on clinicians and acupuncture research

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## References

References are available online at [expertconsult.com](http://expertconsult.com)

## References

1. Helms JP. The basic, clinical, and speculative science of acupuncture. In: *Acupuncture Energetics: A Clinical Approach for Physicians*. Berkeley, CA: Medical Acupuncture Publishers; 1995:19–69.
2. Edzard E, White AR. Prospective studies of the safety of acupuncture: a systematic review. *Am J Med*. 2001;110:481–485.
3. MacPherson H, Thomas K, Walters S, Fitter M. The York Acupuncture Safety Study: prospective survey of 34,000 treatments by traditional acupuncturists. *BMJ*. 2001;323:486–487.
4. Melchart D, Weidenhammer W, Streng A, et al. Prospective investigation of adverse effects of acupuncture in 97,733 patients. *Arch Intern Med*. 2004;164:104–105.
5. Melchart D, Linde K, Fischer P, et al. Acupuncture for recurrent headaches: a systematic review of randomized controlled trials. *Cephalalgia*. 1999;19:779–786.
6. Vickers AJ, Rees RW, Zollman CE, et al. Acupuncture for chronic headache in primary care: large, pragmatic, randomised trial. *BMJ*. 2004;328:744.
7. Wonderling D, Vickers AJ, Grieve R, McCarney R. Cost effectiveness analysis of a randomised trial of acupuncture for chronic headache in primary care. *BMJ*. 2004;328:747.
8. Linde K, Allais G, Brinkhaus B, et al. Acupuncture for migraine prophylaxis. *Cochrane Database Syst Rev*. 2009;(1): CD0001218.
9. Linde K, Allais G, Brinkhaus B, et al. Acupuncture for tension-type headache. *Cochrane Database Syst Rev*. 2009;(1): CD0007587.



# Acupuncture for Nausea and Vomiting

Aaron J. Michelfelder, MD

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## Overview

For an overview of acupuncture, its mechanism of action, safety, training for, and techniques for performing acupuncture and acupressure, please see Chapter 107, Acupuncture for Headache.

Extensive data are available concerning acupuncture and acupressure for nausea and vomiting, especially with regard to the following causes or types of these disorders:

- Postoperative status
- Chemotherapy
- Pregnancy
- Motion sickness

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## Postoperative Nausea and Vomiting

In 1997, the National Institutes of Health (NIH) convened a panel of nonadvocate scientists to assess the current evidence concerning acupuncture and its efficacy. At that time, the panel concluded that clear evidence indicated that acupuncture was effective for adult postoperative and chemotherapy-induced nausea and vomiting.<sup>1</sup> Since then, six studies have also demonstrated efficacy for preventing postoperative nausea and vomiting in children.<sup>2-4</sup> A 2004 Cochrane Review of 26 trials involving 3347 children and adults showed that acupuncture, with and without electrical stimulation, and acupressure were effective in decreasing the incidence of postoperative nausea and vomiting in comparison with controls.<sup>5</sup> When compared, acupuncture and acupressure were equivalent to antiemetic drugs for preventing vomiting but were actually better for preventing nausea.<sup>5</sup> A Cochrane meta-analysis including 40 trials with a total of 4858 participants looked specifically

at stimulation of the wrist acupuncture point pericardium 6 (PC6) for preventing postoperative nausea and vomiting.<sup>6</sup> The reviewers found that acupuncture and acupressure at the PC6 acupoint significantly reduced the risk of postoperative nausea and vomiting when compared with sham in both children and adults. The reviewers also found that PC6 stimulation was equivalent to antiemetic drugs.<sup>6</sup>

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## Chemotherapy-Induced Nausea and Vomiting

As previously stated, the 1997 NIH Acupuncture Consensus Panel concluded that acupuncture was effective for chemotherapy-induced nausea and vomiting. Dundee and Yang<sup>7</sup> found that acupressure was effective for decreasing nausea in hospitalized patients but worked much better when the acupressure bands were stimulated every hour. In an attempt to make this effect stronger, these investigators gave acupuncture with electrical stimulation to 105 patients, all of whom had had sickness after an earlier chemotherapy treatment. This treatment prevented sickness in 66% of patients, and only 6% did not have some benefit from the acupuncture.<sup>7</sup> A meta-analysis of 11 studies including 1247 patients found that self-administered acupressure prevented chemotherapy-induced nausea and vomiting, and electroacupuncture also had a positive effect.<sup>8</sup> The reviewers concluded that these studies suggested a biologic effect of acupuncture in preventing and treating chemotherapy-induced nausea and vomiting.<sup>8</sup>

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## Pregnancy-Related Nausea and Vomiting

The data for use of acupuncture in pregnancy-related nausea and vomiting are equivocal.<sup>9</sup> A Cochrane Review of available studies found limited evidence to support the use of wrist

and ear acupressure or acustimulation to treat pregnancy-related nausea and vomiting and cited the need for higher-quality, more focused studies in this area.<sup>10</sup>

## Motion Sickness

Several devices, including acupressure and electrical stimulation devices, are approved by the U.S. Food and Drug Administration for the prevention of motion sickness. Hu et al<sup>11</sup> reported that acupressure reduced the symptoms of motion sickness and decreased abnormal gastric myoelectric activity and tachyarrhythmia. However, Miller and Muth,<sup>12</sup> who tested two available acupressure and acustimulation bands for the prevention of motion sickness, found that the devices delayed the onset of, but did not prevent, the sickness.<sup>9</sup>

Acupuncture and acupressure are effective for postoperative and chemotherapy-induced nausea and vomiting, but data are equivocal for pregnancy-induced nausea and vomiting, as well as for motion sickness. Acupuncture, with or without electrical stimulation, and acupressure appear to be equivalent to antiemetic drugs for the prevention of nausea and vomiting.

## Acupuncture Points for Nausea and Vomiting

Naming of acupuncture points and techniques for performing acupuncture and acupressure are discussed in Chapter 107, Acupuncture for Headache.

Three main points are relevant to this discussion: (1) master of the heart 6, also called pericardium 6 (MH6, PC6, or P6), (2) stomach 36 (ST36), and (3) liver 3 (LV3).

### Master of the Heart 6

MH6 is located on the anterior surface of the wrist, approximately three fingerbreadths proximal to the distal wrist crease. It lies between the tendons of the flexor carpi radialis and palmaris longus muscles. Because the median nerve can be very superficial, insert the needle only a few millimeters under the skin starting proximally and direct it very superficially toward the hand. Warn the patient that if he or she feels a shooting or shocklike sensation into the hand, it is nothing harmful, and then redirect the needle more superficially (Fig. 108-1).

### Stomach 36

ST36 is a depression in the anterolateral aspect of the shin, between the tibialis anterior muscle and the extensor digitorum longus muscle. You can find this point by placing your thumb on the anterior border of the tibia and sliding superiorly. Where the tibia starts to fan out near the patella (tibial tuberosity), allow your thumb to travel laterally until it encounters a depression approximately six fingerbreadths below the patella and one fingerbreadth lateral to the tibial tuberosity. The needle is inserted perpendicular to the skin, approximately 1 to 2 cm deep, and is stimulated with clockwise and counterclockwise twisting (Fig. 108-2).

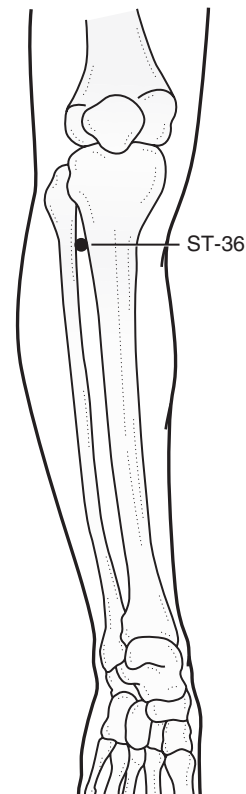
**FIGURE 108-1**

The master of the heart (MH6; also called pericardium [PC6 or P6]) acupuncture point.



**FIGURE 108-2**

The stomach 36 (ST36) acupuncture point.



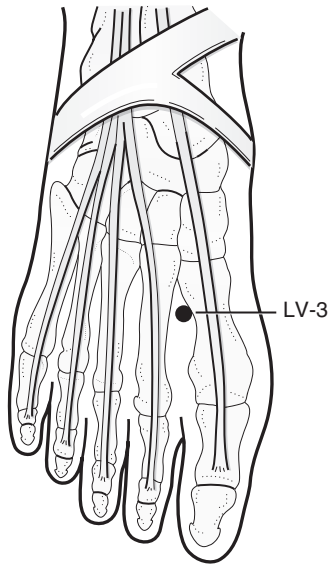
### Liver 3

LV3, also a very important point for the treatment of nausea and vomiting, is located on the dorsum of the foot between the first and second metatarsal bones. If you place a finger between the first and second toes and slide it up the foot



**FIGURE 108-3**

The liver 3 (LV3) acupuncture point.



between the first two metatarsal bones, LV3 is the last place where you can access the underlying muscle between those two bones. The needle is directed toward the tip of the calcaneus and is inserted to a depth of approximately 1 cm (Fig. 108-3).

### Practical Use of These Points

To prevent nausea, stimulate the MH6 point, either with acupressure with a finger, a commercially available acupressure band, an acustimulator or with acupuncture. To treat nausea and vomiting, start with MH6, and then add ST36 with stimulation and LV3 in dispersion (see Chapter 107, *Acupuncture for Headache*, for the distinction between stimulation and dispersion).

### During an Acupuncture Treatment

For the prevention of nausea, needles should be placed at least 30 minutes before the antiemetic effect is needed and continued for as long as required. For the treatment of nausea and vomiting, needles stay in for as long as needed. Patients should be relaxing in a comfortable room with the lights low and perhaps some calming music in the background. Distractions should be minimized.

Remove acupuncture needles as follows:

1. Place one finger on the skin next to the needle.

2. While holding your finger in place, use the other hand to pull the needle out gently.
3. Sometimes a drop of blood may be released. Applying pressure is not necessary; simply dab the blood away with sterile gauze.

### Posttreatment Home Program

Patients are instructed to moderate their activity for 24 hours after a treatment. They should avoid very hot or very cold foods, consumption of alcohol, sexual activity, and other physically demanding activities. They should also drink plenty of water and get lots of sleep.

Patients can continue to perform acupressure on themselves whenever needed. Acupressure is a great way to empower patients to take control of their own symptoms.

### What to Look for in an Acupuncturist

A physician acupuncturist should have completed training in one of the programs approved by the American Board of Medical Acupuncture. Board certification in medical acupuncture identifies individuals who have completed at least 200 hours of training, passed a board examination, practiced at least 2 years, and performed at least 500 acupuncture treatments.

A nonphysician acupuncturist should be licensed. The letters “L.Ac.” should follow a licensed acupuncturist’s name. In addition, the National Certification Commission for Acupuncture and Oriental Medicine has a database of certified acupuncturists (see the Key Web Resources box).

### Conclusion

- Acupuncture has been shown to be effective for the prevention and treatment of postoperative and chemotherapy-induced nausea and vomiting. Acupuncture may be helpful for the prevention of pregnancy-induced nausea and vomiting, as well as motion sickness.
- For prevention of nausea, stimulate the MH6 point with acupuncture, acupressure, or electrical stimulation.
- To treat nausea and vomiting, use MH6, but also add ST36 with stimulation (clockwise and counterclockwise twisting action) and LV3 in dispersion (needle left alone).
- For more information about learning acupuncture, visit the American Academy of Medical Acupuncture Web site (see the Key Web Resources box).

#### KEY WEB RESOURCES

American Academy of Medical Acupuncture: <http://www.medicalacupuncture.org/index.html>

Acumedico: <http://www.acumedico.com/acupoints.htm>

National Certification Commission for Acupuncture and Oriental Medicine (NCCAOM): [www.nccaom.org](http://www.nccaom.org)

The main certifying group of physician acupuncturists

A list of acupuncture sites with illustrations

Certifying group maintaining a database of certified acupuncturists

Acupuncture Today: <a href="http://www.acupuncturetoday.com/mpacms/at/home.php">http://www.acupuncturetoday.com/mpacms/at/home.php</a>	Acupuncture news source with information on clinicians and acupuncture research
Sea-Band: <a href="http://www.sea-band.com/">http://www.sea-band.com/</a>	A commercial product that stimulates PC6 for nausea and vomiting
Mayo Clinic: <a href="http://www.youtube.com/watch?v=XWdDMrS8WlA">http://www.youtube.com/watch?v=XWdDMrS8WlA</a>	You Tube video on acupuncture for nausea

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## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. Acupuncture. *NIH Consensus Statement*. 1997;15:1–34.
2. Lee A, Done ML. The use of nonpharmacologic techniques to prevent postoperative nausea and vomiting: a meta-analysis. *Anesth Analg*. 1999;88:1362–1369.
3. Rusy LM, Hoffman GM, Weisman SJ. Electroacupuncture prophylaxis of postoperative nausea and vomiting following pediatric tonsillectomy with or without adenoidectomy. *Anesthesiology*. 2002;96:300–305.
4. Shenkman Z, Holzman RS, Kim C, et al. Acupressure-acupuncture antiemetic prophylaxis in children undergoing tonsillectomy. *Anesthesiology*. 1999;90:1311–1316.
5. Lee A, Done ML. Stimulation of the wrist acupuncture point p6 for preventing postoperative nausea and vomiting. *Cochrane Database Syst Rev*. 2004;(3): CD003281.
6. Lee A, Fan LT. Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting. *Cochrane Database Syst Rev*. 2009;(1): CD003281.
7. Dundee JW, Yang J. Prolongation of the anti-emetic action of P6 acupuncture by acupressure in patients having cancer chemotherapy. *J R Soc Med*. 1990;83:360–362.
8. Ezzo J, Richardson AM, Vickers A, et al. Acupuncture-point stimulation for chemotherapy-induced nausea or vomiting. *Cochrane Database Syst Rev*. 2010;(11): CD002285.
9. Jewell D, Young G. Interventions for nausea and vomiting in early pregnancy. *Cochrane Database Syst Rev*. 2003;(4): CD000145.
10. Matthews A, Dowswell T, Haas DM, et al. Interventions for nausea and vomiting in early pregnancy. *Cochrane Database Syst Rev*. 2010;(8): CD007575.
11. Hu S, Stritzel R, Chandler A, et al. P6 acupressure reduces symptoms of vector-induced motion sickness. *Aviat Space Environ Med*. 1995;66:631–634.
12. Miller KE, Muth ER. Efficacy of acupressure and acustimulation bands for the prevention of motion sickness. *Aviat Space Environ Med*. 2004;75:227–234.



# Saline Nasal Irrigation

David Rabago, MD, and  
Aleksandra Zgierska, MD, PhD

Saline nasal irrigation (SNI) is an adjunctive therapy for upper respiratory conditions that bathes the nasal cavity with saline delivered as a spray or liquid.<sup>1,2</sup> SNI likely originated centuries ago in the Ayurvedic medical tradition.<sup>3</sup> In the West, several administration devices, indications, and solutions for SNI were described in the *Lancet* in 1902.<sup>4</sup> Although the exact use prevalence is not known, the popularity of SNI has increased over time, in context of studies reporting positive effects in several upper respiratory conditions, as well as publicity in news and popular media outlets, including the Oprah Winfrey Show on television (May, 2007) and National Public Radio.<sup>5</sup> The most common method of liquid SNI is the so-called neti pot, which uses a gravity-based administration. Endorsement of SNI by physicians is common; in a survey of 330 family physicians, 87% reported recommending SNI to their patients for one or more conditions.<sup>6</sup>

## Mechanism and Indications

The exact mechanism of SNI action is not known.<sup>2</sup> SNI may improve the nasal mucosa's immune response to infectious agents, inflammatory mediators, and irritants through several reported physiologic effects including direct cleansing by irrigation,<sup>7-9</sup> removal of inflammatory mediators,<sup>10,11</sup> and improved mucociliary function as demonstrated by increased ciliary beat frequency.<sup>12,13</sup> Chronic sinus symptoms (lasting more than 12 weeks) are the most common indications for SNI.<sup>6</sup> Based on positive results in clinical and functional outcomes, the Cochrane Collaboration concluded that SNI is appropriate adjunctive therapy for the symptoms of chronic rhinosinusitis.<sup>2,14,15</sup> Users of liquid SNI also reported significantly decreased antibiotic and nasal spray use.<sup>1</sup> These results

were corroborated for liquid SNI, but not for nasal spray SNI.<sup>15</sup> Data for other indications are less rigorous, including irritant rhinitis,<sup>16,17</sup> viral upper respiratory infection,<sup>18-20</sup> allergic rhinitis,<sup>21-23</sup> and postoperative care after endoscopic sinus surgery,<sup>24</sup> although positive study results exist for each indication. SNI has been recommended by content experts for mild to moderate rhinitis of pregnancy,<sup>25</sup> acute rhinosinusitis,<sup>26</sup> sinonasal sarcoid,<sup>27</sup> and Wegener granulomatosis<sup>28</sup> (Table 109-1).

Gravity liquid irrigation using a neti pot appears to be more effective than nasal spray irrigation for reducing antibiotic use in patients with recurring sinus infections.

## Technique Variations

SNI can be performed using positive-pressure (spray or squirt bottle) or gravity-based pressure (a vessel with a nasal spout) devices (Fig. 109-1 in the Patient Handout). Each type of device is available over the counter. Saline is instilled in one nostril and is allowed to drain out the other.<sup>2</sup> Although liquid and spray SNI have both been assessed, liquid SNI is reported to be significantly more effective than spray SNI for chronic sinus symptoms<sup>15</sup> and allergic rhinitis.<sup>11,21</sup> Uniform recommendations regarding liquid versus spray SNI and other use-related variables are less evidence based for other indications. Ideal salinity of SNI for any given condition is not known; 0.9% to 3% saline solutions have been most often used. Similarly, optimal pH and temperature are not known.<sup>2</sup> Each may be patient specific,<sup>22</sup> and SNI has been reported

**TABLE 109-1.** Recommended Indications for Saline Nasal Irrigation

KEY CLINICAL RECOMMENDATIONS	EVIDENCE RATINGS*	REFERENCES
Nasal irrigation is effective adjunctive treatment for symptoms of chronic rhinosinusitis.	A	14 and 15
Nasal irrigation may be effective adjunctive treatment for symptoms of several other conditions based on limited trial evidence: irritant rhinitis or congestion, allergic rhinitis, viral upper respiratory congestion, and postoperative care after endoscopic sinus surgery.	B	16–24
Nasal irrigation has been recommended by content experts for mild to moderate rhinitis of pregnancy, acute rhinosinusitis, sinonasal sarcoid, and Wegener granulomatosis.	C	25–28

Adapted from Rabago D, Zgierska A. Saline nasal Irrigation for upper respiratory conditions. *Am Fam Physician*. 2009;80:1117–1119.

\*A, consistent, good-quality patient-oriented evidence; B, inconsistent or limited-quality patient-oriented evidence; C, consensus, disease-oriented evidence, usual practice, expert opinion, or case series.

to be safe within the pH and temperature ranges used in the cited studies. In the United States, lukewarm tap water from municipal water systems or intact wells deeper than 40 feet seems safe for saline preparation; surface water should not be used for nasal irrigation. If these criteria are not met, or if potability is otherwise in doubt, boiled water cooled to room temperature, or distilled water, is recommended for saline preparation.

## Recommended Dose for Treatment and for Prevention

The effective dose of SNI for treatment of chronic sinus symptoms in randomized controlled settings has been reported to be once<sup>1</sup> or twice<sup>15</sup> daily. Long-term use is less well known, but subjects with chronic sinus symptoms in one study stabilized their use of liquid SNI at approximately three times weekly for prevention of symptoms.<sup>29</sup> Recommendations for acute rhinosinusitis, upper respiratory infection, and rhinitis are more difficult to make. NSI once daily or spray saline up to three times daily has been reported to be safe.<sup>20,30</sup>

## Safety

SNI appears safe. No study assessing SNI has reported any adverse events.<sup>2</sup> SNI is associated with frequent, minor side effects that are self-limited or resolve with practice

or adjustment of the procedure.<sup>1,15,22,31</sup> Minor side effects include a sense of discomfort and nervousness with the first use of liquid SNI.<sup>22</sup> Side effects noted by fewer than 10% of SNI users include self-limited ear fullness, stinging of the nasal mucosa, and epistaxis (rare)<sup>1,15,31</sup>; these side effects were ameliorated by technique modification and salinity adjustment,<sup>22</sup> and they did not cause subjects to discontinue SNI.<sup>1,15</sup>

## Practical Uses

SNI has been identified as “an important component in the management of most sinonasal conditions [that is] effective and underutilized.”<sup>32</sup> Most interested patients with appropriate conditions would be considered appropriate for a trial of SNI. Examples of inappropriate patients include those with the potential to leak saline into unwanted tissue planes or spaces (e.g., incompletely healed facial trauma), patients with neurologic or musculoskeletal problems that could facilitate aspiration, or patients who otherwise cannot perform the procedure.

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## KEY WEB RESOURCES

University of Wisconsin Department of Family Medicine: <http://www.fammed.wisc.edu/research/past-projects/nasal-irrigation>

Guidelines on how to perform saline nasal irrigation and prepare saline solution, with directions available in English and Spanish

### Patient Handout: Using Saline Nasal Irrigation for Upper Respiratory Conditions

Chronic sinus symptoms (nasal congestion, runny nose, or postnasal drip) are very common and have several potential causes and treatments. Saline nasal irrigation is a therapy you can do at home in addition to your current care plan for sinus symptoms. This technique improves symptoms by rinsing the area behind the nose with salt water. This handout describes how to perform saline nasal irrigation using a nasal cup, also known as a neti pot.

What you will need: A nasal cup and prepackaged salt are commercially available at many pharmacies.

Saline nasal irrigation has three steps.

#### Step 1: Mix the solution

- If you are using prepackaged salt, simply prepare the salt water as directed on the package. To make your own salt solution, measure 1 tsp of salt and 1/2 tsp of baking soda and stir into a pint (16 oz) of lukewarm water. Place 4 fluid oz (100 mL) in the nasal cup.

#### Step 2: Position the nasal cup (Fig. 109-1)

- Lean over a sink so you are looking directly into the basin.
- Rotate your head slightly and gently insert the spout of the nasal irrigation pot into the upper nostril so that it forms a comfortable seal. Do not press the spout against the “middle,” or septum, of the nose.

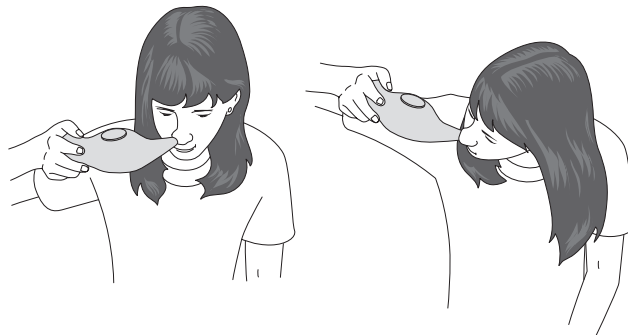
#### Step 3: Irrigate the nose

- *Breathing through your mouth*, raise the nasal irrigation pot so that the solution enters the upper nostril. The solution will soon drain from the lower nostril.
- When the nasal pot is empty, gently exhale through both nostrils to clear them of excess solution and mucus. Gently blow your nose into a tissue.
- Repeat the procedure for the other nostril.

Nasal cup care: Mix new solution when you plan to irrigate your nose, and discard extra salt water immediately. Wash the nasal pot after irrigation.

Troubleshooting: You may notice some drainage of salt water up to 30 minutes after nasal irrigation; this is normal. Many users of nasal irrigation carry tissues. If stinging or burning occurs, try decreasing the salt content by half; you may also adjust the temperature of the water slightly. Do not use very hot or very cold water. Nasal irrigation can also be done in the shower.

Want more information? A more detailed patient handout (including a version in Spanish), instructions for making and adjusting salt water using bulk ingredients, instructional videos and links, scientific reports, and a radio story by National Public Radio (NPR) are at <http://www.fammed.wisc.edu/research/past-projects/nasal-irrigation>



**FIGURE 109-1**

A common nasal irrigation technique using a nasal cup, or neti pot. Liquid saline is instilled in one nostril and is allowed to drain out the other. (From Rabago D, Zgierska A, Mundt M, et al. Efficacy of daily hypertonic saline nasal irrigation among patients with sinusitis: a randomized controlled trial. *J Fam Pract.* 2002;51:1049-1055.)

Redrawn from University of Wisconsin Department of Family Medicine : *Nasal irrigation instructions.* <<http://www.fammed.wisc.edu/research/past-projects/nasal-irrigation>>; Accessed 15.02.12.

## References

- Rabago D, Zgierska A, Mundt M, et al. Efficacy of daily hypertonic saline nasal irrigation among patients with sinusitis: a randomized controlled trial. *J Fam Pract.* 2002;51:1049–1055.
- Rabago D, Zgierska A. Saline nasal irrigation for upper respiratory conditions. *Am Fam Physician.* 2009;80:1117–1119, 1121–1122.
- Rama S, Ballentyne R, Hymes A. *Science of Breath: A Practical Guide.* Honesdale, PA: Himalayan Institute Press; 1998.
- Wingrave W. The nature of discharges and douches. *Lancet.* 1902;1:1373–1375.
- Aubrey A. Got a runny nose? Flush it out! “Morning Edition”. National Public Radio. February 22, 2007.
- Rabago D, Zgierska A, Bamber A, Peppard P. The prescribing patterns of Wisconsin family physicians surrounding saline nasal irrigation for upper respiratory conditions. *WJM.* 2009;108:145–150.
- Ozsoylu S. Nose drops and the common cold. *Eur J Pediatr.* 1985;144:294.
- Karadag A. Nasal saline for acute sinusitis. *Pediatrics.* 2002;109:165.
- Kurtaran H, Karadag A, Catal F, Avci Z. A reappraisal of nasal saline solution use in chronic sinusitis. *Chest.* 2003;124:2036–2037.
- Ponikau JU, Sherris DA, Kephart DM, et al. Striking deposition of toxic eosinophil major basic protein in mucus: implications for chronic rhinosinusitis. *J Allergy Clin Immunol.* 2005;116:362–369.
- Georgitis JW. Nasal hyperthermia and simple irrigation for perennial rhinitis: changes in inflammatory mediators. *Chest.* 1994;106:1487–1492.
- Boek WM, Graamans K, Natzijl H, et al. Nasal mucociliary transport: new evidence for a key role of ciliary beat frequency. *Laryngoscope.* 2002;112:570–573.
- Talbot AR, Herr TM, Parsons DS. Mucociliary clearance and buffered hypertonic saline solution. *Laryngoscope.* 1997;107:500–503.
- Harvey R, Hannan S, Badia L, Scadding G. Nasal saline for the symptoms of chronic rhinosinusitis. *Cochrane Database Syst Rev.* 2007;(3): CD006394.
- Pynnonen MA, Mukerji SS, Kim HM, et al. Nasal saline for chronic sinonasal symptoms: a randomized controlled trial. *Arch Otolaryngol Head Neck Surg.* 2007;133:1115–1120.
- Rabone SJ, Saraswati SB. Acceptance and effects of nasal lavage in volunteer woodworkers. *Occup Med (Lond).* 1999;49:365–369.
- Holmstrom M, Rosen G, Wahlander L. Effect of nasal lavage on nasal symptoms and physiology in wood industry workers. *Rhinology.* 1997;35:108–112.
- Passali D, Damiani V, Passali FM, et al. Atomized nasal douche vs nasal lavage in acute viral rhinitis. *Arch Otolaryngol Head Neck Surg.* 2005;131:788–790.
- Adam P, Stiffman M, Blake RL. A clinical trial of hypertonic saline nasal spray in subjects with common cold or rhinosinusitis. *Arch Fam Med.* 1998;7:39–43.
- Tano L, Tano K. A daily nasal spray with saline prevents symptoms of rhinitis. *Acta Otolaryngol.* 2004;124:1059–1062.
- Georgitis J. Local hyperthermia and nasal irrigation for perennial allergic rhinitis: effect on symptoms and nasal airflow. *Ann Allergy.* 1993;71:385–389.
- Rabago D, Barrett B, Marchand L, et al. Qualitative aspects of nasal irrigation use by patients with chronic sinus disease in a multi-method study. *Ann Fam Med.* 2006;4:295–301.
- Garavello W, Romagnoli M, Sordo L, et al. Hypersaline nasal irrigation in children with symptomatic seasonal allergic rhinitis: a randomized study. *Pediatr Allergy Immunol.* 2003;14:140–143.
- Sepey M, Schwery T, Hausler R. Comparative randomised clinical study of tolerability and efficacy of Rhinmer Force 3 versus a reference product in post-operative care of nasal fossae after endonasal surgery. *ORL J Otorhinolaryngol Relat Spec.* 1996;58:87–92.
- De Guzman DA, Bettcher CM, Van Harrison R, et al. *Allergic Rhinitis: Guidelines for Clinical Care.* University of Michigan Health System. <http://cme.med.umich.edu/pdf/guideline/allergic07.pdf>; Accessed 09.11.11.
- Aring AM, Chan MM. Acute rhinosinusitis in adults. *Am Fam Physician.* 2011;83:1057–1063.
- Long CM, Smith CL, Loehrl TA, et al. Sinonasal disease in patients with sarcoidosis. *Am J Rhinol.* 2001;15:211–215.
- Tami TA. Granulomatous diseases and chronic rhinosinusitis. *Otolaryngol Clin North Am.* 2005;38:1267–1278.
- Rabago D, Pasic T, Zgierska A, et al. The efficacy of hypertonic saline nasal irrigation for chronic sinonasal symptoms. *Otolaryngol Head Neck Surg.* 2005;133:3–8.
- Slapak I, Skoupa J, Strnad P, Hornik P. Efficacy of isotonic nasal wash (seawater) in the treatment and prevention of rhinitis in children. *Arch Otolaryngol Head Neck Surg.* 2008;134:67–74.
- Tomooka L, Murphy C, Davidson T. Clinical study and literature review of nasal irrigation. *Laryngoscope.* 2000;110:1189–1193.
- Brown CL, Graham SM. Nasal irrigations: good or bad? *Curr Opin Otolaryngol Head Neck Surg.* 2004;12:1–13.



# Integrating Spiritual Assessment and Care

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Spiritual and religious practices such as prayer represent the most prevalent complementary therapies in the United States. More than twice as many U.S. adults use prayer for health and healing than use herbal medicines.<sup>1</sup> Nearly 80% of U.S. adults believe that religion, to a large extent, helps patients and families cope with illness.<sup>2</sup> Nearly 75% of the public believes that praying for someone else can help cure his or her illness, and 56% of adults state that faith has helped them recover from illness, injury, or disease.<sup>3</sup> By definition, whole person medical care integrates the spiritual dimensions of the patient and the family.

Spirituality may or may not involve formal religion. Spirituality is subjective, complex, and fluid and therefore difficult to define or measure. Anandarajah<sup>4</sup> advanced our cognitive understanding of spirituality in his description of its three dimensions, based on answers from more than 800 health professionals to the question, “What does the word *spirituality* mean?” (Table 110-1). As a more formal definition, spirituality is a journey toward, or experience of, connection with the source of ultimate meaning. Spirituality includes connection with oneself, with others, with nature, and with a higher power. This connection is often with a greater story that makes sense of one’s life.

In clinical settings, both spiritual support and spiritual distress demand professional attention. Spiritual beliefs are frequently important in medical decisions.<sup>5</sup> Spiritual well-being is closely linked to successful coping,<sup>6</sup> faster recovery,<sup>7</sup> and higher quality of life.<sup>8</sup> Many patients may want help with meaning, hope, or overcoming fears.<sup>9</sup> Unmet spiritual needs are associated with despair,<sup>10</sup> increased mortality,<sup>11</sup> and unnecessarily increased use of health care resources.<sup>12</sup> This last point is crucial for both primary and subspecialty care because it expands the differential diagnosis to consider in

patients requiring frequent encounters with the health care system for ambiguous or nonspecific symptoms (Fig. 110-1).

U.S. adults consistently report that it is good for doctors to talk with patients about spirituality.<sup>13,14</sup> In 2004, 83% of 921 primary care patients surveyed in Ohio reported that they wanted physicians to ask about spiritual beliefs in certain circumstances, such as serious illness or loss of loved ones.<sup>15</sup> In response to the accumulating data on the importance of spirituality and health, the Joint Commission (formerly the Joint Commission for the Accreditation of Healthcare Organizations [JCAHO]) now requires that patients’ spirituality be addressed as part of routine inpatient care.<sup>16</sup> Despite patients’ interest and needs, however, a nationwide survey of 1,732,562 patients reported very low ratings of satisfaction with the emotional and spiritual aspects of care received.<sup>17</sup>

Integrative clinicians should be prepared to inquire about and engage patients in discussions of spirituality. To ignore the patient’s source of meaning, purpose, richness, and direction places the physician at risk for providing inefficient, ineffective, and unsatisfactory care.<sup>18</sup> The challenge is to identify the best means of doing so.

Multiple mnemonics exist to guide physicians in their interviews. These include FICA,<sup>19</sup> HOPE,<sup>20</sup> and SPIRIT,<sup>21</sup> which are outlined in Box 110-1. These mnemonics highlight content and provide questions that may lead to important insights on care for the patient and family. For appropriate integration of spiritual assessment and care into clinical settings, this chapter identifies five practical goals. When these goals are addressed, three practical outcomes result: (1) improved diagnostic accuracy, (2) appropriately focused and directed resources, and (3) a strengthened therapeutic alliance.



**TABLE 110-1.** Three Dimensions of Spirituality: Head, Heart, and Hand

COGNITIVE	EXPERIENTIAL	BEHAVIORAL
Beliefs	Love, compassion, altruism, forgiveness	Duties: daily behavior, moral obligations
Values	Connection, relationship with: self, others, community, environment, nature, the transcendent	Choices: life choices, medical choices
Ideals	Inner energy, strength, resilience	Specific practices: prayer, meditation, yoga, chanting, rituals, diet, nature walks, etc.
Meaning	Inner peace, comfort, support	Participation in religious community
Purpose	Hope	
Truth	Faith (trust)	
Wisdom	Transcendence	
Faith (belief)		

From Anandarajah G. The 3H and BMSEST models for spirituality in multicultural whole-person medicine. *Ann Fam Med.* 2008;6:448–458.

## The Five Clinical Goals of Spiritual Assessment and Care

### Clinical Goal 1: Anticipate the Presence of Religious and Spiritual Concerns in Both Adult and Pediatric Care

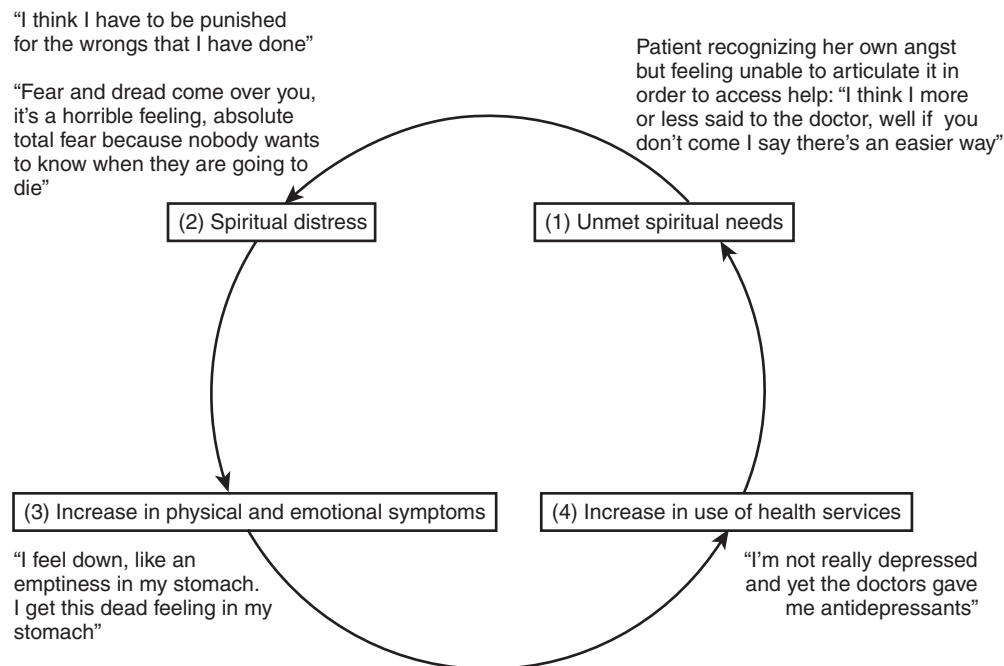
Spiritual and religious concerns in clinical care range from rituals or practices such as prayer to complex crises such as despair. Every illness is a potential spiritual crisis. This is true for the patient and family, as well as for the care team. These crises can be found in both acute care and chronic care, but they may be most easily seen in end-of-life care. For example, common spiritual or religious concerns at the end of life include the following:

- Not being forgiven by God
- Not reconciling with others
- Dying alone or cut off from God
- Not having a blessing from a family member or clergy person
- Wondering whether anyone will miss you or remember you over time<sup>22</sup>

Spiritual concerns can arise at any time. To recognize religious and spiritual concerns in others, one should be able to recognize them in oneself. Whole person health care

**FIGURE 110-1**

Unmet spiritual need cycle may result in increased demand and service use. (Redrawn from Grant L, Murray SA, Sheikh A. Spiritual dimensions of dying in pluralist societies. *BMJ.* 2010;341:c4859.)



**BOX 110-1. Spiritual Assessment Tools****FICA (Pulchaski et al\*)**

F: *Faith or belief*: What is your faith or belief?

I: *Importance and influence*: Is it important in your life? How?

C: *Community*: Are you part of a religious community?

A: *Awareness and addressing*: What would you want me as your physician to be aware of? How would you like me to address these issues in your care?

**HOPE (Anandarajah and Hight†)**

H: *Hope*: What are your sources of hope, meaning, strength, peace, love, and connectedness?

O: *Organization*: Do you consider yourself part of an organized religion?

P: *Personal spirituality and practices*: What aspects of your spirituality or spiritual practices do you find most helpful?

E: *Effects*: How do your beliefs affect the kind of medical care you would like me to provide?

**SPIRIT (Maugans‡)**

S: *Spiritual belief system*: What is your formal religious affiliation?

P: *Personal spirituality*: Describe the beliefs and practices of your religion or spiritual system that you personally accept or do not accept.

I: *Integration within a spiritual community*: Do you belong to a spiritual or religious group or community? What importance does this group have for you?

R: *Ritualized practices and restrictions*: Do you carry out specific practices as part of your religion or spirituality (e.g., prayer and meditation)? What significance do these practices or restrictions have to you?

I: *Implications for medical care*: What aspects of your religion or spirituality would you like me to keep in mind as I care for you?

T: *Terminal events planning*: As we plan for your care near the end of life, how does your faith affect your decisions?

\*Data from Pulchaski CM, Larson DB, Post SG. Physicians and patient spirituality. *Ann Intern Med.* 2000;133:748–749.

†Data from Anandarajah G, Hight E. Spirituality and medical practice: using the HOPE questions as a practical tool for spiritual assessment. *Am Fam Physician.* 2001;63:81–88.

‡Data from Maugans TA. The SPIRITual history. *Arch Fam Med.* 1996;5:11–16.

means proactively engaging the spiritual life, as opposed to waiting for a crisis to bring that awareness to light. Hence, all clinicians are challenged to develop self-awareness of their own spiritual history and perspectives.<sup>23</sup> In clinical care, the goal is to not to react to one's own spiritual needs or beliefs, but rather to acknowledge and bracket them and then respond to the patient's spiritual concerns. This occurrence of responding to the patient rather than to one's own emotional responses is termed being present.

Both culture and spirituality can be implicit and unconscious. Patients and physicians can be blind to the effects of their own perspectives in clinical interviewing and decision making. For this reason, health care professionals should

begin by conducting cultural and spiritual assessments of themselves before they complete such assessments on patients. The most effective interviewing allows the patient's deeply held implicit and unconscious beliefs to be understood, acknowledged, and affirmed by the clinician. The clinical challenge is to create a safe and conducive setting in which spiritual concerns can be recognized and shared.

Spirituality is about questions, not answers. The challenge is for health care professionals to step out of their role as answer givers and into their role as listeners.

When patients believe that they will not be judged, that someone will listen and not try to fix, dismiss, or deny their concerns, they often freely share their most private concerns. The sense of being heard is itself frequently therapeutic.

From an ethical viewpoint, physicians should maintain respect for their patients' beliefs and recognize patients' vulnerability to their own attitudes. No practitioner should impose his or her own religious, or antireligious, beliefs on patients.<sup>24,25</sup> All practitioners need to recognize that their answers are their answers only.

To address spiritual and religious concerns does not require specifically religious or spiritual questions. Good open-ended questions include the following:

- How else do you hurt?
- Serious illness can affect lives in many unexpected ways. How has this illness affected your life?
- What do you miss most or fear most as a result of this illness?
- What are some of the things you wish you could talk about? Is there anyone you wish you could talk to?
- What's most important to you right now?

The answers to such questions frequently reflect the patient's spiritual values and worldview, in addition to identifying important connections that have been disrupted.

## Clinical Goal 2: Comprehend How Patients Want Their Religious or Spiritual Beliefs and Community to be Seen as Resources for Strength and Recovery

Faith and related religious worldviews may be considered medically relevant only when they obstruct implementation of scientifically sound biomedical care.<sup>26</sup> However, this attitude is profoundly naive. Every religion and cultural tradition has teachings, practices, and rituals that facilitate spiritual healing.<sup>27</sup>

The challenge is not to seek omnicultural and spiritual competency, but rather to develop a humility that allows patients to teach about what is important to them.

Patients often display many clues that can be keys to the beginning of a conversation. For example, “Mrs. Xiong, I see that you have white and red strings tied around your wrist. Could you share with me their importance to you?” Such questioning would lead the health care professional into a deeper understanding of the patient’s worldview and sources of strength. Such questioning would also prevent profound patient harm by accidental cutting and removal of sacred objects to make way for an intravenous placement or other biomedical intervention.

Related questions include the following:

- In the past, from where have you drawn the strength to cope with difficult situations?
- How can I be helpful regarding your spiritual concerns and practices?
- With regard to your care, what is most important to you?

The principal guideline in any such questioning is to listen for understanding, rather than to express agreement or disagreement.

### Clinical Goal 3: Understand Better Your Patients' Subjective Experiences and Subjective Understanding of (Ultimate) Reality

Every effective health care professional is broadly familiar with the religious worldviews of the cultural groups within his or her patient population. Patients and their families can teach health care practitioners about the specifics. This is important because significant danger exists in extrapolating the truth for one patient of one cultural group and making it the truth for all such patients. This approach constitutes practice by stereotype (e.g., this patient is Hmong; therefore....). The challenge is to understand what *this* illness means for *this* particular patient.<sup>28</sup>

The following seven concepts and questions help guide the clinician’s understanding:

1. How is ultimate health understood?
2. How are affliction and suffering understood?
3. What are the different parts of a person?
4. How is the patient’s illness, sickness, or disease understood?
5. What intervention or care is believed necessary by the patient?
6. Who is seen as qualified to address the different parts that need healing?
7. What do the patient and family mean by efficacy or healing?

Given the frequently implicit and unconscious nature of the answers to these questions, these questions should be seen only as prompts or guides. Health care professionals should ask themselves whether they could answer these questions for their patients based on their interviews. Doing so directs interviewing toward the clinically relevant meaning of the illness for the patient. The response to an open-ended question such as “What do you fear most about surgery?” often leads to a dialogue that may help answer these questions. Should this information reveal a spiritual concern that cannot be addressed medically, further questioning can help identify the interventions that are needed and the persons who should perform them.

### Clinical Goal 4: Determine What Impact, Positive or Negative, Your Patients' Spiritual Orientation Has on Their Health Problems and Perceived Needs

Although spirituality is frequently seen in a positive light, it also has a shadow side. The fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) added an axis IV concern: a religious or spiritual problem.<sup>29</sup> Examples cited include distressing experiences that involve loss or questioning of faith, problems associated with conversion to a new faith, or questioning of other spiritual values that may not necessarily be related to an organized church or religious institution.

When patients are asked about their sources of support, what worked previously may not be perceived to be working at present. Spiritual distress is often exacerbated when a patient’s understanding of his or her spiritual life and spiritual support conflicts with the religious beliefs of his or her faith tradition. For example, if the Source of Life (God) is feared or is understood as punishing, the person in distress has nowhere to turn and thus is at high risk for panic and despair. This situation often surfaces when patients hear a diagnosis of a life-threatening or life-changing illness.

In such cases, traditional spiritual sources of support, such as teachings, practices, and rituals, may paradoxically be barriers to spiritual well-being. For this reason, health care professionals are at risk for creating a sense of shame or guilt by denying, dismissing, or silencing doubts or theologic challenges. Examples of valid spiritual suffering include the following:

#### *Spiritual Alienation*

“Where is God now when I need Him most?”  
“Why isn’t He listening?”

#### *Spiritual Anxiety*

“Will I ever be forgiven?”  
“Am I going to die a horrible death?”

#### *Spiritual Guilt*

“I deserve this.”  
“I am being punished by God.”  
“I didn’t pray hard enough.”

#### *Spiritual Anger*

“I’m mad at God.”  
“I blame God for this.”  
“I hate God.”

#### *Spiritual Loss*

“I feel empty.”  
“I don’t care anymore.”

#### *Spiritual Despair*

“There’s no way God could ever care for me.”  
“I’m just a corpse waiting to happen.”<sup>16</sup>

When spirituality is understood as including connections with oneself, with others, with nature, and with God or a higher power, then spiritual suffering can be seen as resulting from the loss of such connections: betrayal by one’s body, loss of social

roles, dependence on technology, and theological doubt or loss of faith. Healing therefore is the process of resolving such broken connections and recovering one's wholeness. The focus of healing is the human experience of illness. Healing can occur in any dimension: physical, emotional, social, and spiritual. Healing as the resolution of brokenness may or may not include curing disease. Healing is never quick or easy.

Frequently, when patients are diagnosed with a life-threatening or life-changing illness, they turn toward their God and pray for healing. Healing, in its truest sense of making whole, means personal (spiritual) growth and development through embracing the illness (or any other presenting issue) and discovering their God as a source of love in it.

“Healing” and “cure” are terms and intentions that, for many, if not most, people are used interchangeably and synonymously. Therefore, when one prays for healing, one may more truly be praying for cure. This lack of distinction between healing and curing is crucial for clinicians to understand because it addresses the patient's understanding of his or her relationship with their God or Source of Life. A person who prays for cure, which is not always possible, sets himself or herself up for an experience of disconnection with his or her God and may perceive that God as an abandoning God. This experience needs to be considered in the differential diagnosis of spiritual distress or despair.

Spiritual healing begins with recognition and acknowledgment of spiritual pain. For this reason, the American Academy of Hospice and Palliative Medicine's mnemonic LET GO can be quite helpful (Box 110-2).<sup>30</sup> The challenge here is to respond not as an expert with answers, but as a fellow human being also struggling to make sense of tragedy. Listening, acknowledging, and validating are means of connecting at a deep level and are the most profound means of strengthening the therapeutic alliance. This connection between clinician and patient is the foundation for healing. Without this connection, without listening to the patient at a deep level, referral of patients to professionals with expertise in pastoral care and counseling may be perceived as abandonment by these patients.

### BOX 110-2. Spiritual Suffering Response Mnemonic

#### LET GO: American Academy of Hospice and Palliative Medicine

- L: Listen to the patient's story.
- E: Encourage the search for meaning.
- T: Tell of your concern and acknowledge the pain of loss.
- G: Generate hope whenever possible.
- O: Own your own limitations, seek competence, and refer when appropriate

Generating hope whenever possible does not mean creating fake scenarios or deceiving patients. Generating hope means identifying what is important to the patient and working to achieve that. What constitutes hope and its shadow side, despair, changes throughout the course of an illness.

As with any medical referral, pastoral experts are available for assistance in understanding complex or difficult cases. Referrals can enhance the quality of care and, frequently, the patient's quality of life.

### Clinical Goal 5: Determine Appropriate Referrals to Chaplains, Clergy, or Traditional Healers for Spiritual Care

Many spiritual concerns are addressed as a variation on the following questions: “Why? Why me? Why now?” Clearly, multiple members of the health care team can recognize the many varieties of such spiritual concerns in clinical settings. Even if time allows, however, these are not questions that should be answered by health care professionals. To do so is to risk harming patients. For every such question, the best answers are found, rather than given. The health care professional's role is to help give voice to such questions and to support the patient's search for answers.

Today, no member of a health care team needs to be a self-sufficient virtuoso. This is especially true when Clinical Pastoral Education (CPE)-trained chaplains are available in hospital settings. Chaplains offer well-tuned skills in listening for, and responding to, spiritual concerns in acute care settings. Furthermore, they can help identify when a spiritual guide (director) or a culture's spiritual healer (e.g., priest, pipe holder, or shaman) may be the most appropriate professional for a patient's spiritual concerns.

Professionally trained spiritual directors (guides) serve in outpatient settings. This setting allows the spiritual director to enter a long-term or more expansive relationship with the patient. Spiritual direction is emphatically not about giving preformed or formulaic answers. Spiritual directors are trained in the art of meeting the person where he or she is experiencing life. Spiritual direction ideally addresses integration of the *all* of life without judgment.

Care plans should identify a patient's spiritual resources, spiritual needs, and preferred spiritual care provider. Truly integrative medicine requires that a relationship be built between the physician and available chaplain services, thus leading to establishment of a network of local consultants and patient- or family-preferred spiritual care providers who can offer assistance.



## THERAPEUTIC REVIEW

When spiritual assessment and care are integrated into clinical settings, three practical outcomes result: (1) improved diagnostic accuracy, (2) appropriately focused and directed resources, and (3) a strengthened therapeutic alliance. To achieve these outcomes, clinicians should consider integrating these eight summary points:

1. Mnemonics exist to guide inclusion of spirituality in clinical care. Expand the social history.
2. Spiritual needs can arise at any time or place. Anticipate them.
3. Spiritual healing begins with recognition and acknowledgment of spiritual pain. Listen intentionally.
4. Spirituality is about questions, not answers. Help voice the questions.
5. The best answers are found, rather than given. Support the search.
6. Care plans should include patients' spiritual needs, resources, and preferred spiritual care providers. Identify them.
7. Every religious tradition has teachings, practices, and rituals that are potential resources for strength and recovery. Integrate these into the care plan when appropriate.
8. Every illness is a potential spiritual crisis. Refer to pastoral care specialists (chaplains, clergy, spiritual directors) for assistance.

### KEY WEB RESOURCES

Duke University Center for Spirituality, Theology and Health:  
<http://www.spiritualityandhealth.duke.edu/>

The center is focused on conducting research, training others to conduct research, and field-building activities related to religion, spirituality, and health.

George Washington Institute for Spirituality and Health (GWish):  
<http://www.gwish.org/>

GWish is working toward a more compassionate system of health care by restoring the heart and humanity of medicine through research, education, and policy work focused on bringing increased attention to the spiritual needs of patients, families, and health care professionals.

HealthCare Chaplaincy: <http://www.healthcarechaplaincy.org>

The multifaith HealthCare Chaplaincy is a national leader in the research, education, and practice of spirit-centered palliative care, which helps people with life-altering illness to live well and live fully.

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

- Barnes PM, Powell-Griner E, McFann K, Nahin RL. Complementary and alternative medicine use among adults in the United States, 2002. *Adv Data*. 2004;343:1–19.
- Dujardin RC. *Faith in Medicine*. Detroit: Free Press; December 26, 1996.
- McNichol T. When religion and medicine meet: the new faith in medicine. *USA Weekend*. April 7, 1996;4.
- Anandarajah G. The 3H and BMSEST models for spirituality in multicultural whole-person medicine. *Ann Fam Med*. 2008;6:448–458.
- Silverstri GA, Knittig S, Zoller JS, Nietert PJ. Importance of faith on medical decisions regarding cancer care. *J Clin Oncol*. 2003;21:1379–1382.
- Koenig HG, Cohen HJ, Blazer DG, et al. Religious coping and depression among elderly, hospitalized medically ill men. *Am J Psychiatry*. 1992;149:1693–1700.
- Koenig HG, George LK, Peterson BL. Religiosity and remission of depression in medically ill older patients. *Am J Psychiatry*. 1998;155:536–542.
- Fisch MJ, Titzer ML, Kristeller JL, et al. Assessment of quality of life in outpatients with advanced cancer: the accuracy of clinician estimations and the relevance of spiritual well-being—a Hoosier Oncology Group Study. *J Clin Oncol*. 2003;21:2754–2759.
- Moadel A, Morgan C, Fatone A, et al. Seeking meaning and hope: self-reported spiritual and existential needs among an ethnically-diverse cancer population. *Psychooncology*. 1999;8:378–385.
- McClain CS, Rosenfield B, Breitbart W. Effect of spiritual well-being on end-of-life despair in terminally-ill cancer patients. *Lancet*. 2003;361:1603–1607.
- Pargament KI, Koenig HG, Tarakeshwar N, et al. Religious struggle as a predictor of mortality among medically ill elderly patients: a two-year longitudinal study. *Arch Intern Med*. 2001;161:1881–1885.
- Grant E, Murray SA, Kendall M, et al. Spiritual issues and needs: perspectives from patients with advanced cancer and non-malignant disease. A qualitative study. *Palliat Support Care*. 2004;2:371–378.
- King DE, Bushwick B. Beliefs and attitudes of hospital inpatients about faith healing and prayer. *J Fam Pract*. 1994;3:349–352.
- Ehman JW, Ott BB, Short TH, et al. Do patients want physicians to inquire about their spiritual or religious beliefs if they become gravely ill? *Arch Intern Med*. 1999;159:1803–1806.
- McCord G, Gilchrist VJ, Grossman SD, et al. Discussing spirituality with patients: a rational and ethical approach. *Ann Fam Med*. 2004;2:356–361.
- Joint Commission. *Comprehensive Accreditation Manual for Hospitals*. Oakbrook Terrace, IL: Joint Commission Resources; 2010. <http://www.jcrinc.com/>; Accessed 10.11.11.
- Clark PA, Drain M, Malone MP. Addressing patients' emotional and spiritual needs. *Jt Comm J Qual Saf*. 2003;29:659–670.
- Plotnikoff GA. Should medicine reach out to the spirit? *Postgrad Med*. 2000;108:19–25.
- Puchalski CM. Taking a spiritual history: FICA. *Spirit Med Connect*. 1999;3:1.
- Anandarajah G, Hight E. Spirituality and medical practice: using the HOPE questions as a practical tool for spiritual assessment. *Am Fam Physician*. 2001;63:81–88.
- Maugans TA. The SPIRITual history. *Arch Fam Med*. 1996;5:11–16.
- Nathan Cummings Foundation and Fetzer Institute. *Spiritual Beliefs and the Dying Process*. Princeton, NJ: George H. Gallup International Institute; 1997.
- Leonard BJ, Plotnikoff GA. Awareness: the heart of cultural competence. *AACN Clin Issues*. 2000;11:51–59.
- Post SG, Puchalski CM, Larson DB. Professional boundaries, competency and ethics. *Ann Intern Med*. 2000;132:578–583.
- Plotnikoff GA. Spirituality, religion, and the physician: new ethical challenges in patient care. *Bioethics Forum*. 1997;13:25–30.
- Asser SM, Swan R. Child fatalities from religion-motivated medical neglect. *Pediatrics*. 1998;101:625–629.
- Barnes LL, Plotnikoff GA, Fox K, Pendleton S. Spirituality, religion and pediatrics: intersecting worlds of healing. *Pediatrics*. 2000;106:899–908.
- Barnes LL, Plotnikoff GA. Fadiman and beyond: the dangers of extrapolation. *Bioethics Forum*. 2001;17:32–40.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Press; 1994.
- Storey P, Knight CF. *UNIPAC 2: Alleviating Psychological and Spiritual Pain in the Terminally Ill*. Gainesville, FL: American Academy of Hospice and Palliative Medicine; 1997.



# Therapeutic Homeopathy

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## Why Homeopathy?

“When I was a medical student I felt sure that any one of us would have been ashamed to be caught looking into a homeopathic book by a professor. We had to sneer at homeopathy by word of command. Such was the school opinion then, and I imagine similar [sentiments]... exist in the medical schools today.”<sup>1</sup>

So spoke William James, philosopher and physician, in 1898, when he made a plea to the Massachusetts legislature to support homeopathy. Medical practitioners today are no less skeptical about homeopathy than they were a century ago. Homeopathy is just as implausible, irrational, and misunderstood today as it was then.

How is it possible that homeopathic remedies containing infinitesimal amounts of active substance can cure illness? Proponents of homeopathy believe that the use of microdoses stimulates human defense and homeostatic self-regulatory mechanisms to resolve illness. Cure is possible in many acute and chronic diseases, some of which have little or no chance of cure in regular medicine. Despite a relative lack of scientific data to support its theory, homeopathy has been used safely and effectively by millions of people worldwide for more than 2 centuries.

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## What is Homeopathy?

Homeopathy is derived from the Greek words for “like” and “suffering.” The guiding principle “likes cure likes” has its origins in ancient Egyptian medicine, as well as in Hippocratic medicine of the ancient Greeks, but the practice of homeopathy was codified by Samuel Hahnemann, a seventeenth-century German medical doctor. Disillusioned with the medical practices of his day, which included bloodletting, purging, cathartics, and cupping, Hahnemann decided to experiment with medicinal substances on himself.

He started with quinine, an herbal medicine known at the time to cure malaria:

“I took by way of experiment ... four drams of good China (quinine). My feet, fingers, at first became cold; I grew languid and drowsy; then my heart began to palpitate, and my pulse grew hard and small; intolerable anxiety, trembling, prostration throughout all my limbs; then pulsation, in the head, redness of my cheeks, thirst, and, in short, all those symptoms which are ordinarily characteristic of intermittent fever, make their appearance. This paroxysm lasted two or three hours each time, and recurred if I repeated this dose, not otherwise; I discontinued it and was in good health again.”<sup>2</sup>

This was the first proving of a homeopathic medicine, and it led Hahnemann to formulate the Law of Similars, which states that a remedy can cure a disease if it produces similar symptoms in a healthy person. Hahnemann also found that symptoms of poisoning by a drug were often the same as the symptoms of the disease cured by the drug. Hahnemann and his followers went on to prove hundreds of plant, mineral, animal, and disease substances. These symptoms were collected and catalogued in the Homeopathic Materia Medica, which today includes more than 2000 remedies. Each remedy has a full profile of mental, emotional, and physical pathologic symptoms. Homeopathic remedies are compiled in the Homeopathic Pharmacopeia of the United States, which is recognized by the U.S. Food and Drug Administration.

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## How Are Homeopathic Remedies Prepared?

Because many remedies are toxic in their crude form, Hahnemann attenuated the remedies by serial dilution and succussion, a process whereby the solution is struck

on a pad a given number of times between dilutions. This process eliminated almost all the side effects of the crude substance. A 12C potency, for example, is prepared by diluting 1 drop of the crude tincture in 99 drops of an alcohol-water solution, succussing it, and then taking a drop of that diluted solution and diluting it in another 99 drops of alcohol-water solution; this process is repeated 12 times to reach the 12C, or 12 centesimal, potency. The decimal (X or D) potencies are diluted 1:9 and are considered less potent. Beyond a 12C or 24X dilution, Avogadro's rule designates that not a single molecule of the original substance should remain in solution.<sup>3</sup> Paradoxically, however, in clinical practice, the higher the number of dilutions and succussions, the more potent the remedy. French scientists Jacques Benveniste et al<sup>4</sup> were able to demonstrate mast cell degranulation by a homeopathic dilution of immunoglobulin E antibodies in a laboratory setting, even at very high dilutions in which not a single molecule of immunoglobulin E remained in the solution. Because of its implausibility, their study, published in the scientific journal *Nature*, was rejected by the scientific community. However, the study was repeated 10 years later in a rigorous pan-European trial published in 1999. Again, the investigators demonstrated statistically significant results showing activity of hyperdilute solutions.<sup>5</sup>

Table 111-1 lists the common homeopathic potencies and their usual dosing methods.

## How Do Homeopathic Remedies Work?

The exact mechanism by which homeopathic remedies work is unknown. The clinical success of homeopathy is often attributed to the placebo effect. Reilly and Taylor et al<sup>6-9</sup> conducted four double-blind placebo-controlled trials of homeopathy in the treatment of allergies and found that homeopathy was significantly more effective than placebo. These researchers concluded that either homeopathy works or the clinical trial was flawed. Since 1980, more than 190 controlled and 115 randomized trials of homeopathy have been performed. Several groups have conducted comprehensive meta-analyses of the entire body of data, results of which again suggest that homeopathy is more than a placebo-based approach.<sup>10-12</sup>

Transfer of bioelectric wave signatures from medicinal substances to water in hyperdilute solutions has been posited as a possible mechanism of the action of homeopathic remedies.<sup>13</sup> French virologist and Nobel Laureate Luc Montagnier et al<sup>14</sup> published a study showing that dilute solutions containing the DNA of pathogenic bacteria and viruses (including human immunodeficiency virus [HIV]), “could emit low frequency radio waves” that induced surrounding water molecules to become arranged into nanostructures. Once induced, these water molecules could then also emit radio waves. These investigators suggested that water could retain these properties even after the original DNA-containing solutions were ultradiluted to the point where no molecules of the original DNA remained (much like a diluted and potentized homeopathic remedy).<sup>14</sup>

**TABLE 111-1. Common Homeopathic Potencies**

COMMON POTENCIES	SERIAL CYCLES (OF DILUTION AND SUCCUSSION)	USUAL DOSING METHOD
6X	1:10 dilution 6 cycles	3–5 pellets every 5 min– every hr for acute illness
12X	1:10 dilution 12 cycles	3–5 pellets every 15 min– every 2 hr for acute illness
30X	1:10 dilution 30 cycles	3–5 pellets every 1–8 hr for subacute illness
6C	1:100 dilution 6 cycles	3–5 pellets every 5 min– every hr for acute illness
12C	1:100 dilution 12 cycles	3–5 pellets four times daily in acute case, or 5 pellets daily in chronic case
30C	1:100 dilution 30 cycles	3–5 pellets three times daily in acute case, or daily for 10 days in subacute case
200C	1:100 dilution 200 cycles	5 pellets every hr or daily in very acute case, 10 pellets once in chronic case
1M	1:100 dilution 1000 cycles	5 pellets every hr in severe acute case, 10 pellets once in chronic case
10M	1:100 dilution 10,000 cycles	5 pellets every hr in severe acute case, 10 pellets once in chronic case
50M	1:100 dilution 50,000 cycles	5 pellets daily in severe acute case, 10 pellets once in chronic case
CM	1:100 dilution 100,000 cycles	5 pellets daily in severe acute case, 10 pellets once in chronic case

## How Are Homeopathic Medicines Prescribed?

When the body is threatened by harmful external forces, such as trauma, bacteria, and viruses, it produces symptoms such as fever, cough, and pain. These symptoms often reflect certain innate purposes: to inactivate bacteria or viruses, to carry off irritating byproducts of disease, and to force the individual to rest and recuperate. Although these symptoms may be uncomfortable for the patient, they represent a healthy reaction of the body's defense mechanisms. They are also the only true guides to individual manifestations of disease.

The homeopath, recognizing the individual as body, mind, and spirit, takes an extensive history of all physical, mental, and emotional symptoms. The location, quality, severity, frequency, and time of aggravation of symptoms are discovered. Underlying causes such as trauma, bereavement, change of job, abuse, and physical changes (pregnancy, teething, menarche, menopause) are important.



**BOX 111-1. Examples of Materia Medicas**

- Allen JT. *Encyclopedia of Materia Medica*. New York: Boericke & Tafel; 1879 [reprint: New Delhi: B. Jain Publishing; 1988].
- Boericke W. *Materia Medica Pocket Guide*. New Delhi: B. Jain Publishing; 2004 [reprint].
- Encyclopedia Homeopathica ([www.wholehealthnow.com/homeopathy\\_software/index.html](http://www.wholehealthnow.com/homeopathy_software/index.html)) and Reference Works ([www.kenthomeopathic.com/referenceworks.html](http://www.kenthomeopathic.com/referenceworks.html)): examples of computer programs that contain hundreds of materia medicas from the past to the present, with programs designed to access the symptoms and remedies from the entire homeopathic database.
- Hahnemann S. *Materia Medica Pura* (contains original proving symptoms). New Delhi: B. Jain Publishing; 2002 [reprint].
- Morrison R. *Desktop Guide*. Nevada City, CA: Hahnemann Clinic Publishing; 1993.
- Phatak SR. *Concise Materia Medica*. New Delhi: B. Jain Publishing; 1999.
- Vermeulen F. *Concordant Materia Medica*. Haarlem, The Netherlands: Merlijn; 1994.

Amelioration or aggravation of symptoms, fears and phobias, food cravings and aversions, sex drive, and energy level are all considered. Body habitus, physiognomy, mannerisms, behavior, and psychological symptoms are examined. The homeopath is especially interested in unusual symptoms, or strange, rare, and peculiar symptoms.

The homeopath builds a complete picture of the pathologic features of the person in the course of taking the history and then attempts to find a remedy that most closely matches the whole picture of symptoms. In an acute case, the acute symptoms are primarily taken into account. In a chronic case, in what is often called constitutional prescribing, all symptoms, past and present, may help the homeopath find the right remedy.

The process of finding the correct remedy can be the most challenging aspect of the clinical practice of homeopathy. A homeopathic repertory of symptoms and a homeopathic materia medica are the two essential references for practicing homeopaths (Boxes 111-1 and 111-2). After the most important symptoms are elicited, a repertory of symptoms is consulted to see which remedies cover all or most of the important symptoms in the case. Those remedies are studied more closely in one or more of the materia medicas, which are encyclopedias of remedy characteristics and symptoms. The remedy that appears to match the pathologic features and essential nature of the case most accurately is given to the patient. Several remedies may match the case closely enough to stimulate the natural homeostatic mechanisms of the body to move toward cure. If the remedy chosen is not a close match to the case, it will do nothing for the symptoms.

**Remedy Prescription**

In acute illnesses, the remedy is usually given in lower potencies, such as 12 C or 30 C, three to five pellets by mouth every 5 to 60 minutes. If the remedy does not help the symptoms after four or five doses, a different remedy should be chosen.

**BOX 111-2. Examples of Repertories**

Homeopathic repertories are books that help guide the most appropriate remedy.

- Kent JT. *Kent's Repertory*. Calcutta (Kolkata): Sett Dey; 1974.
- MacRepertory ([www.kenthomeopathic.com/macrepertory.html](http://www.kenthomeopathic.com/macrepertory.html)) and Radar ([www.wholehealthnow.com/homeopathy\\_software/index.html](http://www.wholehealthnow.com/homeopathy_software/index.html)): computer programs that contain multiple repertories and help the homeopath choose remedies.
- Schroyens F. *Synthesis 9.1*. London: Homeopathic Book Publishers; 2002.
- Van Zandvoort R. *Complete Repertory*. Leidschendam, The Netherlands: Institute for Research in Homeopathic Information and Symptomatology; 1998.

In less acute illnesses, the remedy can be given three or four times a day for 1 to 2 days. If no improvement is noted, a different remedy is chosen.

Once improvement is noted, the remedy is given only when symptoms recur. In chronic illnesses, a higher potency, such as 200 C, is used once at the beginning of treatment. Symptoms are monitored over the next 1 to 2 months. If improvement is followed by relapse, the remedy is repeated once. If no improvement is noted, a different remedy is chosen. A patient who is taking other medications may need a daily dose of a lower potency (e.g., 12 C) after the initial 200 C to counter the interfering effects of the other medications.

**Aggravation and Antidote**

Aggravation of a patient's existing symptoms can occasionally occur when a chronic problem is treated with a homeopathic remedy. This is particularly true for skin problems and diseases or disorders that have been treated with steroids. Usually, the aggravating symptoms resolve within 5 to 10 days, and resolution should be followed by gradual improvement beyond the initial baseline condition if the correct remedy has been chosen.

If a patient experiences improvement of chronic symptoms, and then has a sudden relapse after trauma, surgery, dental trauma, emotional grief, or severe illness or after initiating coffee, camphor, chamomile, steroids, or other regular allopathic medications, the remedy effects are said to be *antidoted*. These influences or substances do not always antidote the effects of a remedy, however.

Box 111-3 contains a list of several reputable homeopathic pharmacies.

**For Which Conditions Can Homeopathic Treatments be Used?**

Many conditions, chronic and acute, can be effectively treated with a homeopathic approach. They include pediatric problems, such as recurrent otitis media,<sup>15-17</sup> pharyngitis,

### BOX 111-3. Small Sample of Reputable Homeopathic Pharmacies

Boericke & Tafel, Inc.: 2381 Circadian Way, Santa Rosa, CA 95407; telephone: 707-571-8202; fax: 707-571-8237

Boiron-Bornemann, Inc.: Box 449, 6 Campus Avenue, Building A, Newtown Square, PA, 19073; telephone: 800-BLU-TUBE

Hahnemann Laboratories, Inc.: San Rafael, CA 94901; telephone: 888-4-ARNICA; fax, 415-451-6981

Helios Homeopathic Pharmacy: 97 Camden Road, Tunbridge Wells, Kent, TN1 2QR, United Kingdom; telephone 01892-537 254

Homeopathic Educational Services: 2124 Kittredge Street, Berkeley, CA 94704; telephone: 510-649-0294; fax: 510-649-1955

Standard Homeopathic Company: Box 61067; 204-210 West 131st Street, Los Angeles, CA 90061; telephone: 800-624-9659

Washington Homeopathic Products: 260 Hawvermale Way, Berkeley Springs, WV 25411; telephone 800-336-1695

attention deficit hyperactivity disorder,<sup>18</sup> enuresis,<sup>19</sup> constipation, diarrhea,<sup>20</sup> asthma, allergic rhinitis, eczema,<sup>7,21,22</sup> juvenile arthritis, chronic bronchitis, and recurrent pneumonia. Adult problems well treated by homeopathy include anxiety,<sup>23</sup> bruising and ecchymosis from trauma and surgery,<sup>24-26</sup> poisonings,<sup>27</sup> anemia,<sup>28</sup> acquired immunodeficiency syndrome/HIV infection,<sup>29,30</sup> insomnia,<sup>31,32</sup> vertigo,<sup>33</sup> tinnitus,<sup>34</sup> depression,<sup>23,35,36</sup> bipolar disorder, headaches,<sup>37</sup> gastroesophageal reflux disease, colitis, Sjögren syndrome,<sup>38</sup> rheumatoid arthritis,<sup>39,40</sup> heart disease,<sup>41</sup> multiple sclerosis (management and arrest of progression), perimenopausal symptoms,<sup>42,43</sup> fibromyalgia,<sup>44</sup> chronic fatigue syndrome,<sup>45</sup> infertility,<sup>46</sup> dysmenorrhea,<sup>47,48</sup> postoperative ileus,<sup>49</sup> chronic or recurrent urinary tract infection, trigeminal neuralgia,<sup>50</sup> psoriasis,<sup>51</sup> numerous other dermatologic conditions,<sup>52,53</sup> influenza,<sup>54,55</sup> snoring,<sup>56</sup> and chronic cough. Traditionally, homeopathy has been used effectively for the treatment of epidemics; during certain cholera epidemics and severe influenza epidemics, homeopathy was significantly more effective than any of the allopathic approaches to management.

In a study funded by the Cuban government, Bracho et al<sup>57</sup> created a homeopathic preparation of four strains of *Leptospira* and administered it to 2.3 million people at high risk during an epidemic of leptospirosis in Cuba. A significant decrease in the disease incidence was observed in the intervention regions. No decrease was noted in the regions where no remedy was administered. The epidemic was controlled, and the incidence of leptospirosis fell below the usual levels.<sup>57</sup>

Classical homeopaths use constitutional prescribing for chronic disease and complicated cases. Although most health care practitioners will probably not want to prescribe constitutionally, homeopathy may be used in a cookbook fashion to achieve results in many acute illnesses and some chronic illnesses. Tables 111-2 through 111-5 list some of the commonly used remedies for various problems.<sup>58</sup>

### TABLE 111-2. Remedies for Teething

REMEDY*	INDICATION	BETTER FROM/IN	WORSE FROM/IN
Calcarea Carbonica	Constipation, delayed teething, milk intolerance	Heat	Cold, wet, dairy products
Chamomile	Irritability, screaming, capriciousness	Being carried, rocked hard, car ride	Night, heat, being held still
Pulsatilla	Weepiness, whining	Gentle rocking, being held	Overheated, stuffy room
Nux Vomica	Irritability, burping, gas	Nap, evening	Morning

\*All doses 12C to 30C; three pellets given every hour as needed in the cheek. If no improvement is seen after four to five doses, choose another remedy.

### TABLE 111-3. Remedies for Colic

REMEDY*	INDICATION	BETTER FROM/IN	WORSE FROM/IN
Chamomile	Irritability, being cross	Being carried, being rocked hard	Open air, night
Calcarea Carbonica	Sweaty head, plumpness	Dry, warm	Cold, wet
Colocynthis	Doubling up, distended abdomen	Firm pressure, heat, bending legs up	Anger, eating, drinking

\*All doses 12C to 30C; three pellets given every hour as needed in the cheek. If no improvement is seen after four to five doses, choose another remedy.

## Otitis Media

Acute and chronic recurrent otitis media responds well to homeopathic remedies.<sup>17</sup> Acute otitis media often improves without treatment over 3 to 5 days. Antibiotics can often be avoided, and the appropriate homeopathic remedy will sometimes speed healing and prevent recurrence (Table 111-6).

## Sinusitis

Several remedies are appropriate for acute sinusitis<sup>59</sup> (Table 111-7). Chronic or recurrent sinusitis can be treated by referral to a classical homeopath for constitutional treatment. Referral to an ear, nose, and throat consultant may be helpful to rule out more serious disorders.

## Allergies, Asthma, and Atopic Eczema

Allergic rhinitis, asthma, and atopic eczema can be cured over several years with a constitutional classical homeopathic approach. Referral of a patient with such a problem to

**TABLE 111-4. Remedies for Severe Brain Injury and Mild Traumatic Brain Injury\***

Severe acute head trauma <sup>†</sup>	Arnica	10M–100M (CM)	5 pellets (oral/axilla/buccal mucosa), every 15 min in the first 12–24 hours, then every day for 10–30 days Decrease frequency of dose as patient improves Continue through rehabilitation
Chronic effects of head trauma (posttraumatic brain injury)	Suggest constitutional homeopathic therapy (e.g., Arnica, Calcarea Carbonica, Cicuta, Helleborus, Natrum Sulphuricum, Opium Silica)	200C–1 M	5 pellets once; repeated as necessary if improvement is followed by relapse

\*Homeopathic remedies have been used for acute severe concussion and intracranial hemorrhage as adjunctive therapy to neurosurgical approaches and in posttraumatic brain injury for speeding rehabilitation.<sup>58</sup>

<sup>†</sup>Homeopathic treatment would be adjunctive therapy to a hospital intensive care unit protocol for treatment of head injury.

**TABLE 111-5. Remedies for Acute Injury and Emergencies**

INDICATIONS	REMEDY	POTENCY	DOSE
Shock	Arnica	200C or up to 50M	5 pellets PO every 5 min—every day
Shock with fear	Aconite	200C or up to 50M	5 pellets PO every 5 min—every day
Head injury	Arnica	200C or up to 50M	As above; the more severe the trauma, the more frequently repeated and the higher the potency
Blow to spine or whiplash	Hypericum	200C or up to 50M	5 pellets PO every 5 min—every day
Trauma with bleeding, bruising, contusion, laceration	Arnica Hypericum	30C or up to 200C 30C or up to 200C	As above; remedies may be given concurrently
Eye injury	Aconite	30C–200C	5 pellets PO every 5 min—every day
Black eye	Ledum	30C–200C	As above
Cut nerves, crush injuries	Hypericum, Arnica	30C–200C	As above; may give concurrently
Fractures	Arnica, Symphytum, Ledum	200C	5 pellets of each daily for 10–14 days
Puncture wounds	Ledum	30C–200C	5 pellets PO every 5 min—every day, depending on severity
Bites, bee stings	Apis, Ledum	As above	As above
Muscle, ligament, and joint sprains and strains	Arnica, Ruta	30C–200C	5 pellets PO three times daily for 10–14 days
Chronic sprains or strains	Rhus Toxicodendron	30C or 200C	5 pellets daily for 7–10 days or 10 pellets one dose once
Burns	Calendula	Topical oil, lotion	Apply to burn
First-degree	Urtica Urens	30C	5 pellets PO every 5 min prn
Second-degree	Causticum	30C	5 pellets PO every 5 min prn
Third-degree	Urtica Urens	30C–200C	5 pellets PO every 5 min prn
Sunburn	Hypericum	30C–200C, topical	Tincture dilute 1:3 in water
	Cantharis, Hypericum	30C–200C	5 pellets PO every 5 min prn
	Belladonna	30C	5 pellets PO every 5 min prn
Heatstroke: hot, red, dry	Antimonium Crudum, Belladonna,	30C–200C	5 pellets every 15 min prn
Throbbing headache	Glonoin	30C–200C	As above
Electrical burns	Phosphorus	30C–200C	5 pellets PO three times daily prn

**TABLE 111-5. Remedies for Acute Injury and Emergencies—cont'd**

INDICATIONS	REMEDY	POTENCY	DOSE
Epistaxis	Phosphorus	30C–200C	5 pellets PO every 5 min prn
Blood, fluid loss	China Officinalis	30C–200C	As above
Dental extraction with blood loss	Phosphorus	30C–200C	As above
Syncope, collapse	Carbo Vegetabilis	30C–200C	5 pellets PO every 5 min prn
Food poisoning	Arsenicum Album	30C	5 pellets PO every 5 min prn
Mucus, vomiting	Ipecac	30C	5 pellets PO every 5 min prn

PO, orally; prn, as needed.

**TABLE 111-6. Remedies for Otitis Media**

REMEDY*	INDICATIONS	BETTER FROM/IN	WORSE FROM/IN
Aconite	Sudden onset, high fever, restlessness, being hot, dry, thirsty, or fearful	Open air, rest	Night, warm room, noise, cold wind, teething, touch
Belladonna	Red face, being hot, right ear, throbbing pains, high fever	Sitting up, wrapping up in warm room	Light, getting head wet or cold, teething, 3 AM–3 PM
Calcarea Carbonica	Thick discharge from ear, decreased hearing	Warmth, dryness, lying, massage	Cold, wet, exertion, teething, milk
Chamomile	Being cross, screaming in pain, pushing people away	Being carried rapidly, warm weather	Wind, 10 PM–10 AM, teething, cold, being looked at
Ferrum Phosphoricum	Early stages, gradual onset, pallor	Cold applications, touch, cold drinks	Night, motion, noise, right side, warm drinks
Hepar Sulphuris	Great sensitivity to pain, fits of screaming	Warmth, warm applications	Hating to be examined, cold, drafts of air
Lachesis	Rare, extreme pain, left ear, pharyngitis	Open air, discharge, loosening clothes	After birth of second child/jealousy, wind, tight clothes
Mercurius Vivus	Sickly child status, precociousness, foul discharge, salivation at night, pus in ears	Rest, morning	Night, warmth of bed, being too hot or too cold, being held
Pulsatilla	Weepiness, sensitivity, thick yellow discharge, left ear	Wanting to be held, carried, or comforted; open air, lying on painful side	Twilight, after eating, warm stuffy room, left side, fat-rich food
Silica	Constipation, being chilly, ruptured eardrum with watery or cheesy discharge, sweaty feet	Rest (fatiguing easily), warmth, covering up	Milk, teething, cold air, night, combing hair, touch

\*All remedies are 12C or 30C; three pellets are given every 5 minutes to every hour as needed until better. If no improvement is seen after four to five doses, choose another remedy.

a classical homeopath is recommended. Asthma and eczema symptoms are not always easily palliated, and the constitutional homeopathic approach, combined with steroid and bronchodilator inhalers and minimal use of steroid creams, is recommended. Allergic rhinitis symptoms, conversely, can be alleviated in a palliative manner.<sup>9</sup> Table 111-8 lists some of the more common remedies for palliation of these problems.<sup>60,61</sup>

## Chronic Bronchitis

For cough that persists after all other causes—infections, asthma, allergies, neoplasms, chronic obstructive pulmonary disease, and gastroesophageal reflux disease—have been ruled out and empirical therapy has failed, the homeopath can prescribe Ignatia 200C once or Ignatia 30C daily for 7 days. If emotional trauma or loss precedes the cough, this remedy is especially indicated.

**TABLE 111-7. Remedies for Sinusitis**

REMEDY*	INDICATIONS†	BETTER FROM/IN	WORSE FROM/IN
Arsenicum Album	Burning nasal discharge, restlessness, anxiety	Warm drinks, hot applications, food, lying head up	Midnight or after, cold, exertion, ice, draft, tobacco
Hepar Sulphuris	Pain at root of nose, sensitivity, irritability, stuffy nose, later stage	Warmth, wrapping up, eating	Cold draft of air, touch, lying on painful side
Hydrastis	Thick, yellow discharge from posterior nares, nose sores, bloody crusts	Pressure, warm wraps, dry weather, rest	Inhaling cold air, night, open air, motion
Kali Bichromicum	Most common sinus remedy, pain in maxillae and bridge of nose, thick stringy discharge, stuffy nose	Heat, pressure, motion	Cold, damp air, undressing, 2–3 AM, alcohol, after sleep
Mercurius Vivus	Raw nostrils, ulcers, bloody discharge, hurried, bad breath	Moderate temperatures, rest, morning	Night, extremes of temperature, heat, drafts, lying on right side
Natrum Muriaticum	Fluent white nasal discharge, violent sneezing	Rest, open air, lying on right side, massage	Heat of sun, morning, emotions, exertion, consolation, touch
Nux Vomica	Snuffling, stuffiness, impatience, anger, feeling chilly, sneezing on waking	Rest, allowing discharge freely, hot drinks, evenings	Uncovering, coffee, alcohol, drugs, morning, overeating, pressure of clothes
Pulsatilla	Ripe cold with yellow mucus, loss of smell, weepiness, clinginess	Gentle exercise, open air, weeping, massage	Warm and stuffy room, beds, rich fatty food, time before or during menses
Silicea	Dry nose crusts, sensitive nasal bones	Warmth, warm wraps, summer, wet weather	Cold air, noise, light, confrontation, talking, mental exertion

\*All remedies are three pellets, 12C or 30C, given every 2 to 4 hours as needed until better. If no improvement is seen after four to five doses, choose another remedy

**TABLE 111-8. Remedies for Allergic Rhinitis**

REMEDY*	INDICATIONS†	BETTER FROM/IN	WORSE FROM/IN
Allium Cepa	Bland eye tearing, sneezing, excoriating nasal discharge	Open air, cold room, cold water, motion	Warm room, wet feet, evening, spring, damp weather
Arsenicum Album	Burning eye and nasal discharge, thin mucus, feeling chilly, restlessness	Heat, hot applications, hot drinks, motion, lying with head elevated	Midnight or after, sight or smell of food, cold drinks, alcohol
Arundo	Itching inside nose, palate, or ear canals; salivation with runny nose	Desire for sour foods, drinking	Urination
Arum Triphyllum	Raw sores in nostrils, excoriating discharge, stuffy nose, mouth breathing	Warmth	Talking, overuse of voice, cold wet wind
Euphrasia	Profuse burning tears, bland nasal discharge, eyes filled with tears, red eyes	Winking, wiping eyes, dark, open air, coffee	Night, lying down, wind, sunlight, warmth, indoors
Galphimia Glauca <sup>13</sup>	Sneezing, hives, cold sores, skin allergy, eyelid edema		Weather changes
Natrum Muriaticum	Watery white nasal discharge, cold sores, sneezing, cracked lip, headache	Fresh air, cool bath, thirst, sweating, skipping meals	Heat, sun, light, 9–11 AM, time after menses, warm room, consolation, grief, loss
Nux Vomica	Violent sneezing in spells, daytime runny nose with nighttime stuffiness	Indoors, warmth, hot drinks	Outside, cold air, drafts, coffee, stimulants, alcohol, overwork

**TABLE 111-8. Remedies for Allergic Rhinitis—cont'd**

REMEDY*	INDICATIONS†	BETTER FROM/IN	WORSE FROM/IN
Sabadilla	Sneezing in spells, exhaustion, tickling in nose, red burning eyelids, dry mouth	Warmth, warm drinks, open air, eating	Cold air, cold drinks, odors (especially flowers), sneezing
Wyethia	Tremendous itching of upper palate, dry mouth	Clucking palate, swallowing saliva	Afternoon, eating, exercise, motion
Homeopathic combination remedies	Many over-the-counter preparations available; can be used for generic rhinitis symptoms		
House dust mite remedy†	Used if dust mite allergy is known		

\*All remedies are three pellets, 12C to 30C, every 2 to 4 hours as needed until better.  
†Data from Lewith GT, Watkins AD, Hyland ME, et al. Use of ultramolecular potencies of allergen to treat asthmatic people allergic to house dust mite: double blind randomized controlled clinical trial. *BMJ*. 2002;324:520–523.

## Cancer

Homeopathic remedies are used in cancer to stimulate the immune system and for palliation of symptoms.<sup>62–64</sup> They can also be used to reduce the side effects of cancer treatment.

Calendula 30C or Fluoric Acid 30C at a dose of five pellets every 4 hours daily or Calendula ointment applied two times a day after radiation treatment has been found to be highly effective for prevention of grade 2 or higher acute dermatitis in patients with breast cancer.<sup>65</sup> Radiation-induced itching in such patients can also be treated with several other remedies, including Causticum, Ignatia, Kali Bichromicum, Psorinum, Rhus Toxicodendron, and Gamma Ray.<sup>66</sup>

Radium Bromatum 30C, five pellets once or three times daily, can be used for other side effects of radiation therapy, such as Lhermitte sign, nonhealing burns or ulcers,

postradiation pain and myalgias, fatigue, and other skin problems.

## Gastrointestinal Disorders

Table 111-9 lists common remedies for gastrointestinal disorders.<sup>20,67</sup>

## Obstetrics

Homeopathic remedies are well suited to pregnancy. The remedies have no side effects and can be safely prescribed for various prenatal difficulties, including miscarriage, morning sickness, heartburn, headaches, constipation, induction of labor<sup>68</sup> and preeclampsia, as well as postpartum problems such as hemorrhage,<sup>69</sup> mastitis, depression, and newborn nursing difficulties<sup>70</sup> (Table 111-10).

**TABLE 111-9. Remedies for Acute Gastrointestinal Disorders**

REMEDY*	INDICATIONS†	BETTER FROM/IN	WORSE FROM/IN
Arsenicum Album	Diarrhea, vomiting, thirst for small sips, cramping, blood in stool or emesis	Heat, warm drinks, lying with head up, company, rest	Eating, spoiled food, cold drinks, spicy food, right side, cold
Cantharis	Burning stool, burning pains, blood in stools or emesis	Belching, flatus, warmth, rest, rubbing	Drinking liquids, coffee
Croton Tiglium	Gushing watery diarrhea, vesicular rash, loud gurgling, sloshing intestines	Time after sleep, gentle rubbing	Drinking or eating least amount, touch, motion, summer, washing
Carbo Vegetabilis	Feeling chilly, indigestion, gas, bloating, belching	Belching, fanning, cold, bending over double	Eating, evening, lying down, wine, warmth, rich food
China	Gas that will not come up or down, belching that gives no relief, indigestion	Bending double, hard pressure, open air, warmth	Light touch, night, eating, drafts, every other day
Colocynthis	Vomiting, diarrhea, with severe cramps, doubling up with pain	Warmth, pressure, rest, after stool	Anger, indignation, drafts, taking cold

Continued

**TABLE 111-9. Remedies for Acute Gastrointestinal Disorders—cont'd**

REMEDY*	INDICATIONS†	BETTER FROM/IN	WORSE FROM/IN
Gelsemium	Green or white diarrhea, heaviness of limbs and eyelids, tremor	Motion, profuse urination, bending forward, sweating	10 <sup>AM</sup> , anticipation, thinking of ailment, emotion, shock, humid weather
Ipecac	Continuous nausea and vomiting, increased salivation	Rest, open air, pressure, cold drinks, motion	Food smells, vomiting, warmth of room, overeating
Lycopodium	Indigestion, bloating, rumbling gas, heartburn, craving for sweets	After midnight, warm food and drink, uncovering, getting cool	Lying on right side, 4–8 <sup>AM</sup> , cold drinks, warm room, pressure of clothes
Nux Vomica	Constipation, vomiting, nausea	Evening, nap, warmth, wrapping head, hot drinks	Overindulgence, morning, spicy food, stimulants, narcotics, cold open air
Phosphorus	Vomiting, hematemesis, thirst for cold water	Cold, eating, sleep, cold food and water, dark	Warm food and drink, touch, evening, light, wind, odors, emotion
Podophyllum	Painless gushing diarrhea, colic, flatus, offensive odor	Massage over liver, lying on abdomen	Morning, teething, hot weather, eating, drinking, milk
Pulsatilla	Indigestion, heartburn, weepiness	Open air, motion, cold applications	Rich fatty food, time after eating, warm room
Sulfur	Constipation, diarrhea, burning anus with itching, large hard stools	Open air, lying on right side, dry heat, walking, drawing up limbs	Bathing, standing, warmth of bed, being overheated, suppressed symptoms

\*All remedies are three pellets, 12C to 30C, every 2-4 hours as needed until better.

†Data from Jacobs J, Jonas WB, Jimenez-Perez M, Crothers D. Homeopathy for childhood diarrhea: combined and metaanalysis from three randomized, controlled clinical trials. *Pediatr Infect Dis J.* 2003;22:229–234.

**TABLE 111-10. Remedies for Obstetrics**

INDICATION	REMEDY	POTENCY	DOSE
Induction of labor	Caulophyllum with Blue Cohosh tincture or capsules	30C–200C One dropperful or one capsule alternating with Caulophyllum every 2hr	5 pellets every 2 hr for five doses Repeat next day if no labor If no labor after 2 days, wait for several days before repeating
Turning a breech baby	Pulsatilla	30C–CM	5 pellets one dose
Weak, exhausted labor, rigid os, poor contractions	Gelsemium	30C	5 pellets every 5–10min for four doses
Ineffectual labor, lack of dilation, no progress	Caulophyllum	30C	5 pellets every 5–10min for four doses
Arrested labor with shooting pains and cramps in thighs	Cimicifuga	30C	5 pellets every 5–10min for four doses
Back labor, occiput posterior position	Kali Carbonicum	30C	5 pellets every 5–10min for four doses
Fainting, desire for cool air, labor with poor progress, weepiness	Pulsatilla	30C	5 pellets every 5–10min for four doses
Fear, anxiety during labor	Aconite	30C	5 pellets every 5–10min as needed
Retained placenta	Cantharis, Sepia	30C	5 pellets every 5–10min for two doses of one remedy If no results, try the other remedy
Completion of a miscarriage	Cimicifuga Take with tinctures of Blue and Black Cohosh	200C–1 M 1 dropperful of each	5 pellets once, with tinctures orally every 2–4 hr until bleeding slows and tissue passes

## Conclusion

Homeopathy is a safe and effective tool that can be integrated into a practicing clinician's armamentarium as either first-line therapy or adjunctive treatment. It is relatively free of adverse side effects, enhances the body's ability to restore balance, is curative in some diseases that would otherwise

be managed only with allopathic medicine, speeds healing in adjunctive approaches, and is inexpensive. Homeopathy has survived the ultimate test of any medical therapy—the test of time in the field of clinical practice. Perhaps elucidation of an underlying mechanism of action that can be understood in scientific terms will return homeopathy to a more prominent role in common clinical practice in the future.

### KEY WEB RESOURCES

American Institute of Homeopathy (AIH): [www.homeopathyusa.org](http://www.homeopathyusa.org)

This is the principal professional organization of licensed medical practitioners who are practicing homeopaths. The Institute publishes a quarterly journal for practitioner members.

National Center for Homeopathy (NCH): [www.nationalcenterfor-homeopathy.org](http://www.nationalcenterfor-homeopathy.org)

This national organization of lay and professional homeopaths is one of the primary homeopathic associations in the United States. It is dedicated to providing information on postgraduate training in homeopathy and dissemination of homeopathic educational materials and resources.

Homeopathic Educational Services: [www.homeopathic.com](http://www.homeopathic.com)

Homeopathic Educational Services is a retail outlet for homeopathic books, tapes, remedies, software, and educational materials. This site also includes the *Homeopathic Family Medicine eBook*, by Dana Ullman, MPH, a review of homeopathic treatment for numerous clinical problems with associated footnoted references.

Whole Health Now homeopathy software: [www.wholehealthnow.com/homeopathy\\_software/index.html](http://www.wholehealthnow.com/homeopathy_software/index.html); and Kent Homeopathic Associates: [www.kenthomeopathic.com/referenceworks.html](http://www.kenthomeopathic.com/referenceworks.html)

These computer programs contain materia medica designed to help match a remedy to specific symptoms from the entire homeopathic database.

### KEY RESOURCES FOR FURTHER STUDY

Coulter H. *Divided Legacy*. Washington, DC: McGrath; 1973.

A comprehensive history of homeopathy

Dean ME. *The Trials of Homeopathy*. York, UK: University of York; 2001.

A review of all the clinical research conducted on homeopathy from the early 1800s to the present

Herscu P. *The Homeopathic Treatment of Children*. Berkeley, CA: North Atlantic Books; 1991.

A review of some of the most often used remedies for a variety of common pediatric illnesses

Morrison R. *Desktop Companion to Physical Pathology*. Nevada City, CA: Hahnemann Clinic Publishing; 1998.

A concise desk reference written for physicians to aid in remedy selection for a group of common disorders

Panos M, Heimlich J. *Homeopathic Medicine at Home: Natural Remedies for Everyday Ailments and Minor Injuries*. Los Angeles: Jeremy P. Tarcher; 1990.

A resource for patients and practitioners in choosing remedies for common acute ailments at home

Perko S. *Homeopathy for the Modern Pregnant Woman and Her Infant*. Berkeley, CA: Benchmark Homeopathic; 1997.

A practical guide for using homeopathy in obstetrics and neonatal care

Ramakrishnan AU, Coulter C. *A Homeopathic Approach to Cancer*. St. Louis: Quality Medical; 2001.

A homeopathic adjunctive approach to the treatment of cancer

Sankaran R. *Soul of Remedies*. Mumbai: Homeopathic Medicals; 1997.

A description of the constitutional nature of a selected group of remedies by an experienced homeopath

Ullman D. *Homeopathic Family Medicine eBook*. Homeopathic Educational Services: [www.homeopathic.com](http://www.homeopathic.com); 2010.

A review of homeopathic treatment for a wide variety of clinical problems with associated footnoted references

## References

References are available online at [expertconsult.com](http://expertconsult.com).



## References

- James W. Banner of light, 1898. In: Coulter H, ed. *Divided Legacy. Vol 4. The Conflict Between Homeopathy and the American Medical Association: Science and Ethics in American Medicine 1800-1910*. Washington, DC: McGrath; 1973:467.
- Hahnemann S. Lesser writings. In: Coulter H, ed. *Divided Legacy. Vol 4. The Conflict Between Homeopathy and the American Medical Association: Science and Ethics in American Medicine 1800-1910*. Washington, DC: McGrath; 1973:23.
- Chikramane PS, Suresh AK, Dellare JR, et al. Extreme homeopathic dilutions retain starting materials: a nanoparticulate perspective. *Homeopathy*. 2010;99:231–242.
- Benveniste J, Davenas E, Beauvais F, et al. Human basophil degranulation triggered by very dilute antiserum against IgE. *Nature*. 1988;333:816–818.
- Belon P, Cumps J, Ennis M, et al. Inhibition of human basophil degranulation by successive histamine dilutions: results of a European multicentre trial. *Inflamm Res*. 1999;48(suppl 1):S17–S18.
- Reilly DT, Taylor MA. Potent placebo or potency? A proposed study model with initial findings using homeopathically prepared pollens in hay fever. *Br Homeopath J*. 1985;78:65–75.
- Reilly DT, Taylor MA, McSharry C, et al. Is homeopathy a placebo response? Controlled trial of homeopathic potency, with pollen in hay fever as a model. *Lancet*. 1986;2:881–886.
- Reilly DT, Taylor MA, Campbell J, et al. Is evidence for homeopathy reproducible? *Lancet*. 1994;344:1601–1606.
- Taylor MA, Reilly DT, Llewellyn-Jones RH, et al. Randomised controlled trial of homeopathy versus placebo in perennial allergic rhinitis with overview of four trial series. *BMJ*. 2000;321:471–476.
- Linde K, Clausius N, Ramirez G, et al. Are the clinical effects of homeopathy placebo effects? A meta-analysis of placebo controlled trials. *Lancet*. 1997;350:834–843.
- Kleijnen J, Knipschild P, ter Reit G, et al. Clinical trials of homeopathy. *BMJ*. 1991;302:316–323.
- Bornhoft G, Wolf U, Von Ammon K, et al. Effectiveness, safety and cost-effectiveness of homeopathy in general practice: summarized health technology assessment. *Forsch Komplementmed*. 2006;13(suppl 2):19–29.
- Roy R, Tiller WA, Bell IR. The structure of liquid water: novel insights from materials research. Potential relevance to homeopathy. *Mater Res Innov*. 2005;9:577–608.
- Montagnier L, Aissa J, Ferris S, et al. Electromagnetic signals are produced by aqueous nanostructures derived from bacterial DNA sequences. *Interdiscip Sci*. 2009;1:81–90.
- Frei H, Thurneysen A. Homeopathy in acute otitis media in children: treatment effect or spontaneous resolution? *Br Homeopath J*. 2001;90:180–182.
- Friese KH, Kruse S, Moeller H. Acute otitis media in children: a comparison of conventional and homeopathic treatment. *Biomed Ther*. 1997;15:113–122.
- Jacobs J, Springer DS, Crothers D. Homeopathic treatment of acute otitis media in children: a preliminary randomized controlled trial. *Pediatr Infect Dis J*. 2001;20:177–183.
- Frei H, Everts R, Von Ammon, et al. Homeopathic treatment of children with attention deficit hyperactivity disorder: a randomised, double blind, placebo controlled crossover trial. *Eur J Pediatr*. 2007;166:509.
- Ferrara P, Marrone G, Emmanuele V, et al. Homotoxicological remedies versus desmopressin versus placebo in the treatment of enuresis: a randomised, double-blind, controlled trial. *Pediatr Nephrol*. 2008;23:269–274.
- Jacobs J, Jonas WB, Jimenez-Perez M, Crothers D. Homeopathy for childhood diarrhea: combined and metaanalysis from three randomized, controlled clinical trials. *Pediatr Infect Dis J*. 2003;22:229–234.
- Witt CM, Ludtke R, Willich SN. Homeopathic treatment of children with atopic eczema: a prospective observational study with two years follow-up. *Acta Derm Venereol*. 2009;89:182–183.
- Keil T, Witt CM, Roll S, et al. Homeopathic versus conventional treatment of children with eczema: a comparative cohort study. *Complement Ther Med*. 2008;16:15–21.
- Davidson J, Morrison R, Shore J, et al. Homeopathic treatment of depression and anxiety. *Altern Ther Health Med*. 1997;3:46–49.
- Brinkhaus B, Wilkens JM, Ludtke R, et al. Homeopathic arnica therapy in patients receiving knee surgery: results of three randomised double-blind trials. *Complement Ther Med*. 2006;14:237–246.
- Robertson A, Suryanarayanan R, Banerjee A. Homeopathic Arnica montana for post-tonsillectomy analgesia: a randomised placebo control trial. *Homeopathy*. 2007;96:285.
- Seeley BM, Denton AB, Ahn MS, et al. Effect of homeopathic Arnica montana on bruising in face-lifts: results of a randomized, double-blind, placebo-controlled clinical trial. *Arch Facial Plast Surg*. 2006;8:54–59.
- Khuda-Bukhsh AR, Pathak S, Bibhas G, et al. Can homeopathic arsenic remedy combat arsenic poisoning in humans exposed to groundwater arsenic contamination? A preliminary report on first human trial. *Evid Based Complement Alternat Med*. 2005;2:237–248.
- Banerjee A, Chakrabarty SB, Darmakar SR, et al. Can homeopathy bring additional benefits to thalassaemic patients on hydroxyurea therapy? Encouraging results of a preliminary study. *Evid Based Complement Alternat Med*. 2010;7:129–136.
- Jaeger H, Eger J, Koegl C, et al. Healthy unrest: Canova stimulates CD4 cells in ART-treated virologically suppressed but immunologically unresponsive HIV patients. Presented at XVII International AIDS Conference, August 3-8, 2008, Mexico City. <http://www.aids2008.org/Pag/Abstracts.aspx?AID=15800> Accessed 27.11.10.
- Rastogi DP, Singh V, Singh V, et al. Homeopathy in HIV infection: a trial report of double-blind placebo controlled study. *Br Homeopath J*. 1999;88:49–57.
- Bell IR, Howerter A, Jackson N, et al. Effects of homeopathic medicines on polysomnographic sleep of young adults with histories of coffee-related insomnia. *Sleep Med*. 2011;5:505–511.
- Naude DF, Marcelline I, Couchman S, et al. Chronic primary insomnia: efficacy of homeopathic simillimum. *Homeopathy*. 2009;99:63–68.
- Weiser M, Strosser W, Klein P. Homeopathic vs. conventional treatment of vertigo: a randomized double-blind controlled clinical study. *Arch Otolaryngol Head Neck Surg*. 1998;124:879–885.
- Goldstein B, Shulman A, Avitable MJ. Clear tinnitus, middle-ear pressure, and tinnitus relief: a prospective trial. *Int Tinnitus J*. 2007;13:29–39.
- Adler UC, Paiva NMP, Cesar AT. Homeopathic individualized Q-potencies versus fluoxetine for moderate to severe depression: double-blind, randomized non-inferiority trial. *Evid Based Complement Alternat Med*. 2009; Aug 17 [Epub ahead of print].
- Pilkington K, Kirkwood G, Rampes H, et al. Homeopathy for depression: a systematic review of the research evidence. *Homeopathy*. 2005;95:199–205.
- Whitmarsh TE, Coleston-Shields DM, Steiner TJ. Double-blind randomized placebo-controlled study of homeopathic prophylaxis of migraine. *Cephalgia*. 1997;17:600–604.
- Haila S, Koskinen A, Tenovuo J. Effects of homeopathic treatment on salivary flow rate and subjective symptoms in patients with oral dryness: a randomized trial. *Homeopathy*. 2005;94:175–181.
- Fisher P, Scott DL. A randomized controlled trial of homeopathy in rheumatoid arthritis. *Rheumatology*. 2001;40:1052–1055.
- Gibson RG, Gibson SL, MacNeill AD, Buchanan WW. Homeopathic therapy in rheumatoid arthritis: evaluation by double-blind clinical therapeutic trial. *Br J Clin Pharmacol*. 1980;9:453–459.
- Schroder D, Weiser M, Klein P. Efficacy of homeopathic Crataegus preparation compared with usual therapy for mild (NYHA II) cardiac insufficiency: results of an observation cohort study. *Eur J Heart Fail*. 2003;5:319–326.
- Bordet MF, Colas A, Marijnen P, et al. Treating hot flushes in menopausal women with homeopathic treatment: results of an observational study. *Homeopathy*. 2008;97:10–15.
- Jacobs J, Herman P, Heron K, et al. Homeopathy for menopausal symptoms in breast cancer survivors: a preliminary randomized controlled trial. *J Altern Complement Med*. 2005;11:1–3.
- Bell IR, Lewis DA, Brooks AJ, et al. Improved clinical status in fibromyalgia patients treated with individualized homeopathic remedies versus placebo. *Rheumatology*. 2003;43:577–582.
- Weatherley-Jones E, Nicholl JP, Thomas KJ, et al. A randomised, controlled triple-blind trial of the efficacy of homeopathic treatment for chronic fatigue syndrome. *J Psychosom Res*. 2004;56:189–197.
- Gerhard I, Wallis E. Individualized homeopathic therapy for male infertility. *Homeopathy*. 2002;91:133–144.
- Witt CM, Ludtke R, Willich SN. Homeopathic treatment of patients with dysmenorrhea: a prospective observational study with 2 years follow-up. *Arch Gynecol Obstet*. 2009;280:603–611.
- Yakir M, Kreitler S, Brzezinski A, et al. Effects of homeopathic treatment in women with premenstrual syndrome: a pilot study. *Br Homeopath J*. 2001;90:148–153.

49. Barnes J, Resch KL, Ernst E. Homeopathy for postoperative ileus? A meta-analysis. *J Clin Gastroenterol*. 1997;25:628–633.
50. Mojaver YN, Mousavi F, Mazaherinezhad A, et al. Individualized homeopathic treatment of trigeminal neuralgia: an observational study. *Homeopathy*. 2007;96:82–86.
51. Witt CM, Ludtke R, Willich SN. Homeopathic treatment of patients with psoriasis: a prospective observational study with 2 years follow-up. *J Eur Acad Dermatol Venereol*. 2009;23:538–543.
52. Mousavi F, Sherafati S, Mojaver YN. Ignatia in the treatment of oral lichen planus. *Homeopathy*. 2009;98:40–44.
53. Smith SA, Baker AE, Williams JH. Effective treatment of seborrheic dermatitis using a low dose, oral homeopathic medication consisting of potassium bromide, sodium bromide, nickel sulfate, and sodium chloride in a double-blind, placebo-controlled study. *Altern Med Rev*. 2002;7:59–67.
54. Papp R, Schuback G, Beck E, et al. Oscillococinum in patients with influenza-like syndromes: a placebo controlled double-blind evaluation. *Br Homeopath J*. 1998;87:69–76.
55. Ferley JP, Amirou D, D'Adhemar D, et al. A controlled evaluation of a homeopathic preparation in the treatment of influenza-like syndromes. *Br J Clin Pharmacol*. 1989;27:329–335.
56. Lipman D, Sexton G, Schlessler J. A randomized double-blind placebo-controlled evaluation of the safety and efficacy of a natural over-the-counter medication in the management of snoring. *Sleep Breath*. 1999;3:53–56.
57. Bracho G, Varela E, Fernandez R, et al. Large-scale application of highly-diluted bacteria for leptospirosis epidemic control. *Homeopathy*. 2010;99:156–166.
58. Chapman EH, Weintraub RJ, Milburn MA, et al. Homeopathic treatment of mild traumatic brain injury: a randomized double-blind, placebo-controlled clinical trial. *J Head Trauma Rehabil*. 1999;14:521–542.
59. Zabolotnyi DI, Kneis KC, Richardson A, et al. Efficacy of a complex homeopathic medication (Sinfrontal) in patients with acute maxillary sinusitis: a prospective, randomized, double-blind, placebo-controlled, multicenter clinical trial. *Explore (NY)*. 2007;3:98–109.
60. Wiesenauer M, Gaus W. Double-blind trial comparing the effectiveness of the homeopathic preparation of Galphimia potentization D6, Galphimia dilution 10-6 and placebo on pollinosis. *Arzneimittelforschung*. 1985;35:1745–1747.
61. Lewith GT, Watkins AD, Hyland ME, et al. Use of ultramolecular potencies of allergen to treat asthmatic people allergic to house dust mite: double blind randomized controlled clinical trial. *BMJ*. 2002;324:520–523.
62. Frenkel M, Mudund Mishra B, Sen S, et al. Cytotoxic effects of ultra-diluted remedies on breast cancer cells. *Int J Oncol*. 2010;36:395–403.
63. Overbaum M, Yaniv I, Ben-Gal Y, et al. A randomized, controlled clinical trial of the homeopathic medication Traumeel S in the treatment of chemotherapy-induced stomatitis in children undergoing stem cell transplantation. *Cancer*. 2001;92:684–690.
64. Bradley GW, Clover A. Apparent response of small cell lung cancer to an extract of mistletoe and homeopathic treatment. *Thorax*. 1989;44:1047–1048.
65. Pommier B, Gomez F, Sunyach MP, et al. Phase III randomized trial of Calendula officinalis compared with trolamine for the prevention of acute dermatitis during irradiation for breast cancer. *J Clin Oncol*. 2004;22:1447–1453.
66. Schlappack O. Homeopathic treatment of radiation-induced itching in breast cancer patients: a prospective observational study. *Homeopathy*. 2004;93:210–215.
67. Jacobs J, Jimenez LM, Gloyd SS, et al. Treatment of acute childhood diarrhea with homeopathic medicine: a randomized clinical trial in Nicaragua. *Pediatrics*. 1994;93:719–725.
68. Eid P, Felisi E, Sideri M. Applicability of homeopathic Caulophyllum Thalictroides during labour. *Br Homeopath J*. 1993;82:245–248.
69. Oberbaum M, Galoyan N, Lerner-Geva L, et al. The effect of homeopathic remedies Arnica Montana and Bellis Perennis on mild postpartum bleeding: a randomized, double-blind, placebo-controlled study. Preliminary results. *Complement Ther Med*. 2005;13:87–90.
70. Berrebi A, Parant O, Ferval F, et al. Treatment of pain due to unwanted lactation with a homeopathic preparation given in the immediate post-partum period [in French]. *J Gynecol Obstet Biol Reprod (Paris)*. 2001;30:353–357.



# Human Energetic Therapies

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We are surrounded by energy and vibration, and in truth, physics informs us that we ourselves *are* energy and vibration. One of the best-known of all physics equations,  $e = mc^2$ , defines a link, albeit challenging to describe without the use of mathematics, between energy and matter. We perceive photons, which behave as both particles and waves, as our sense of sight. We are aware of vibrations in the air as sound. Even our most basic sense, touch, is fundamentally based in the interactions among fields. Matter is mostly space that contains (or perhaps gives rise to) a smattering of subatomic particles that influence one another through mysterious forces of attraction and repulsion. The nature of the links among energy, physical reality, and consciousness is one of the great mysteries of our times.

How may these concepts of physics—vibrations, fields, and energy—inform healing? Dozens, if not hundreds, of different cultures and traditions have words referring to a life force that animates living things. Examples include chi, prana, pneuma, fohat, mana, and orgone. Many people within these cultures have suggested the possibility both to perceive and to manipulate this life force. Human energetic therapies have been practiced for millennia.

In the first section of this chapter, key concepts of energy medicine are introduced, and some of the most commonly used human energetic therapies are described. Research related to human energetic therapies is then summarized, and suggestions are offered on how health care providers can work collaboratively with energy medicine practitioners.

The final section is for those practitioners who are interested in exploring energy medicine in greater depth through their own experience. Exercises that can be incorporated into any form of integrative practice are described, and the reader is offered additional resources for further exploration.

One caveat: Energy medicine is perhaps one of the most mysterious and controversial of all forms of therapy. At the time of this chapter's writing, whether the National Institutes of Health will continue to fund research in this area is unclear. Even for some of the most objective of scientists, the topic of energy medicine strikes a highly emotional chord.

As integrative medicine providers explore the use of these therapies, the concept of “scope of practice” takes on a new meaning. At some point, every integrative provider will be required to determine his or her stance regarding the validity and utility of these approaches.

Of course, a textbook chapter can offer only a taste of this varied and complex array of therapies. Trying to understand energy medicine solely by reading about it is akin to trying to appreciate a Beethoven symphony without ever having heard it. The reader is strongly encouraged to learn and explore through direct experience.

Truly learning about human energetic therapies requires one to experience them firsthand.

## Defining Energy Medicine

The National Center for Complementary and Alternative Medicine classifies human energetic therapies according to whether the energy they profess to manipulate is (1) veritable (dealing with forms of energy that can be measured in a laboratory) or (2) putative (held by most, although not all, researchers as not being measurable with current technology).<sup>1</sup> The approaches described in this chapter are typically classified as putative—or subtle—energy therapies, but many practitioners claim to have measured these energies through different means.<sup>2</sup>

According to the 2007 National Health Information Survey, at least 0.5% of the U.S. population had used some form of energy medicine in the past year.<sup>3</sup> A 2002 study by the Centers for Disease Control and Prevention found that 0.5% of respondents had used qi gong and 1% had used Reiki.<sup>4</sup> Surveys may underestimate energy medicine's use because practitioners of other modalities, such as massage therapists, chiropractors, and naturopathic doctors, commonly blend energy medicine into their practices without labeling what they are doing as energy medicine per se. More

than 50 hospitals and clinics in the United States offer some form of biofield therapy to their patients.<sup>5</sup>

Many different schools, or styles, of human energetic therapies exist, especially if one includes the various shamanic techniques that have arisen in many of the world's indigenous cultures. *The Encyclopedia of Energy Medicine* identifies nearly 50 popular approaches used in the United States.<sup>6</sup>

Although various approaches to energy medicine may work with different aspects, or parts, of the energy field or enlist different techniques for manipulating or maneuvering energy, most share some common elements<sup>7</sup>:

- They assume the presence of an energetic anatomy, or pattern, that has an influence on health. Common examples include the chakra system, the aura, and the meridian system used in acupuncture. Some schools of thought propose the existence of several different layers, or levels, of the energy body, each with unique characteristics. Because the chakra system is intrinsic to most techniques, and because it is often referenced by integrative medicine patients, it is described in more detail, in [Table 112-1](#).
- Patterns in the energy body may precede or cause physical problems. They may also be linked to emotional, mental, social, or spiritual issues.
- Most energy practitioners enlist one or more methods of perceiving the energy field. For example, some practitioners claim to see it, some feel it through touch, some

enlist the use of pendulums or other dowsing techniques to assess it, and some report being guided by intuition or direct knowing. Many enlist the assistance of “helper” energies in their work.

- Many healers have experienced a health crisis (taken the healer's journey) themselves that precipitated their foray into energy healing.
- Energy is said to respond to intention. Practitioners may manipulate energy through any number of means, which may include healing rituals, hands-on techniques, visualization exercises, or nonlocal (distant) healing practices.

[Table 112-2](#) lists various forms of human energetic therapies, with key Web sites for each.

Although styles and forms of biofield therapies are myriad, many of them share common elements.

## Energy Medicine Research

Through technology, we routinely perceive and manipulate various forms of energy. Our cellular phones and televisions can pick up precise frequencies from among thousands that bounce through the atmosphere. Western medicine relies on energetic properties of the body to obtain electrocardiograms

**TABLE 112-1. The Chakras**

CHAKRA NAME(S)*	LOCATION IN THE BODY	COLOR	ASSOCIATED ISSUES
First (root)	Base of spine	Red	Physical health and security, materialism, body awareness
Second	Lower abdomen, just below umbilicus	Orange	Emotions, especially toward oneself, reproduction, creativity (in some traditions)
Third	Solar plexus (just below xyphoid)	Yellow	Mental well-being, logic, will, sense of control
Fourth	Heart area, but in midline rather than to the left	Green (sometimes rose)	Connections to others, relationships, forgiveness, compassion
Fifth	Throat	Blue (sometimes turquoise)	Self-expression, creative pursuits, speaking one's truth
Sixth (third eye)	Center of forehead	Indigo or violet	Vision, perception, intuition, dreams
Seventh (crown)	Top and center of scalp	Purple or white	Spirituality, connection with a higher power, unity
Eighth and higher	Vary greatly among traditions; some describe an eighth chakra 6–12 inches over the seventh chakra and a ninth chakra 6–12 inches below the feet	Varies (the one below the feet is said to be brown)	Variable; eighth chakra sometimes described as a point where the boundaries of an individual begin to disappear; in some traditions, linked to the collective consciousness or past lives; ninth chakra may be tied to grounding, connection with the earth

For more information on how energetic anatomy is conceptualized in different traditions, see the various Web sites listed in [Table 112-2](#).

\*Names, numbers of chakras, and locations vary among different traditions. In Indian traditions, each chakra 1 to 7 has an associated sound (lam, vam, ram, yam, ham, am, om, respectively), as well as a musical key (the first starts with C and the others follow up the scale). Each chakra is linked to different glands as well; this often guides how energy medicine practitioners work with different conditions. In some traditions, the glands are, from chakras 1 to 7, the adrenals, gonads, pancreas, thymus, thyroid, pituitary, and pineal, respectively. Some traditions ascribe adrenals to the third, and some link the prostate to the first.

**TABLE 112-2. Energy Healing Modalities: Descriptions and Key Web Sites\***

ENERGY MODALITY	DESCRIPTION AND RELATED WEB SITE*
Acupuncture and acupressure	Needles are inserted into points said to be located along different meridians, or energy channels, within the body. In electroacupuncture, electricity is passed through the needles. <a href="http://www.yinyanghouse.com/">http://www.yinyanghouse.com/</a>
Barbara Brennan School of Healing	This approach focuses on energy healing according to detailed descriptions of energy anatomy and flow. Many schools of healing are based on the experiences or techniques of a specific individual, and this is one example. <a href="http://www.barbarabrennan.com/">http://www.barbarabrennan.com/</a>
Crystal therapy and Gem therapy	Minerals are used to influence the energy field. Different stones are believed to have specific vibrational properties. <a href="http://healing.about.com/od/crystaltherapy/Crystal_Therapy.htm">http://healing.about.com/od/crystaltherapy/Crystal_Therapy.htm</a>
Emotional Freedom Techniques and Thought Field Therapy	These methods were created by Gary Craig and Roger Callahan, respectively. Tapping of various meridian points is said to release stored negative emotional energy. <a href="http://www.emofree.com/">http://www.emofree.com/</a> and <a href="http://www.rogercallahan.com/index.php">http://www.rogercallahan.com/index.php</a>
Eye Movement Desensitization and Reprocessing (EMDR)	Rapid alternation of eye movements from left to right and tapping of specific groups of points on the body are used in various patterns to release energy-based problems. <a href="http://www.emdr.com/">http://www.emdr.com/</a>
Flower essences	Various flower extracts are said to influence people according to the nature or energy of the extracts' plants of origin. <a href="http://www.bachcentre.com/">http://www.bachcentre.com/</a>
Healing Touch	Developed in the 1980s by Janet Mentgen, RN, this method is based on principles used in therapeutic touch and other such techniques. Extensive instruction and training are required for certification. <a href="http://www.healingtouchinternational.org/">http://www.healingtouchinternational.org/</a>
Homeopathy	Created by Samuel Hahnemann in 1796, this approach uses highly diluted solutions said to hold the vibrational principle of a given remedy, which is carefully tailored after a detailed evaluation of a person's symptoms. <a href="http://www.homeopathic.org/">http://www.homeopathic.org/</a>
Jin Shin Jyutsu	Developed by Jiru Murai in the early 1900s and brought to the West by Mary Burmeister in the 1960s, this method focuses on the use of 26 safety energy locks to unlock energy flow. <a href="http://www.jsjinc.net/">http://www.jsjinc.net/</a>
Johrei	Founded by Mokichi Okada, who envisioned a "paradise on earth" brought about through energetic detoxification and adherence to seven key principles, this method does not involve direct physical touch. <a href="http://www.johreifoundation.org">http://www.johreifoundation.org</a>
Matrix Energetics	This system of "consciousness technology" was created by Richard Bartlett DC, ND. It holds that anyone can be a healer through manipulating the matrix of information that is the foundation on which a person's reality is built. <a href="http://www.matrixenergetics.com/">http://www.matrixenergetics.com/</a>
Polarity Therapy	Based on the work of Randolph Stone, this approach combines diet, exercise, and other techniques to optimize the health of the energy field. <a href="http://www.polaritytherapy.org/">http://www.polaritytherapy.org/</a>
Pranic Healing	Systematized by Choa Kok Sui and tied to Arhatic yoga, this method involves visualizing colors and directing them through different techniques. <a href="http://www.pranichealing.org/">http://www.pranichealing.org/</a>
Qi gong	This technique enlists various precise body movements to alter one's capacity to store and manipulate qi, or energy. <a href="http://www.qigonginstitute.org/main_page/main_page.php">http://www.qigonginstitute.org/main_page/main_page.php</a>
Quantum-Touch	In this system created by Richard Gordon, energy is directed through intention, breathwork, and other techniques, with a strong focus on musculoskeletal issues, among others. <a href="http://www.quantumtouch.com/">http://www.quantumtouch.com/</a>
Reflexology	Certain parts of the feet, believed to be correlated with various body parts, are massaged or treated with essential oils. <a href="http://www.reflexology-usa.org/">http://www.reflexology-usa.org/</a>
Reiki	This technique originated in Japan with Mikao Usui. Trainees are given attunements said to allow them to pass universal healing energy through them to others. Many different schools exist. <a href="http://www.reiki.com/">http://www.reiki.com/</a>
Shamanic healing	This modality is often classed as spiritual, rather than energetic. The healer intuitively determines the source of a health problem and enlists ritual, helpful spirits, journeys to the spirit world, or other techniques to bring about healing. Hundreds of shamanic traditions exist. <a href="http://www.shamanresource.com/">http://www.shamanresource.com/</a>
Therapeutic Touch	This technique was developed in the 1970s by Dolores Krieger, a nurse, and Dora Kunz. Gentle touch is used to influence the biofield. <a href="http://www.therapeutictouch.org/">http://www.therapeutictouch.org/</a>
Zero Balancing	Created by Fritz Smith, MD, in the 1970s, this method holds that gentle touch and traction can balance energy at a "zero point," a place where the energetic and physical bodies are aligned. <a href="http://www.zerobalancing.com">http://www.zerobalancing.com</a>

This list is by no means comprehensive. For instance, prayer and spiritual healing are also classified by some investigators as human energetic therapies. All Web sites accessed 11.11.11.

\*Table based in part on data from Rindfleisch JA. Biofield therapies: energy medicine and primary care. *Prim Care*. 2010;27:165-179.

(ECGs), electroencephalograms (EEGs), magnetic resonance imaging (MRI) scans, computed tomography (CT) scans, x-ray studies, and many other tests. All these devices are powered by electricity, another form of energy.

Research has shown that human energetic therapies can positively influence outcomes in numerous circumstances, but much remains to be learned about the mechanism of action, the differences in effect among different energy modalities, and the best ways to integrate these approaches into other types of healing practices.

We know that individuals' energy fields interact. When people are near one another, one person's pattern on an EEG will reflect another's pattern on an EEG, and vice versa.<sup>8</sup> A 1994 study reported that one person's brain could share information with another's.<sup>9</sup> This was the case even when the people were in different rooms and one of those rooms was an electromagnetically impenetrable (Faraday) chamber. In some instances, after pairs of subjects meditated together and established a rapport (found they liked each other), investigators reported that flashing lights viewed by one subject influenced the EEG for the ophthalmic region of the brain of his or her partner in the sealed room.<sup>9</sup> A 2004 study found similar results.<sup>10</sup>

What is the status of energy medicine research? The current body of research on human energetic therapies is relatively small, but some fascinating discoveries have been made.

Three important suppositions related to energetic therapies require validation for energy medicine to be considered plausible from a scientific standpoint. The following must be established:

1. Subtle energy exists, and it has explicable mechanisms of action through which it influences biologic systems.
2. People can perceive and manipulate this energy.
3. Manipulating this energy has clinically important effects on human health.

As far as suppositions 1 and 2 are concerned, suffice it that fascinating studies have been conducted, many with remarkable findings, but much remains to be learned. Quantum theory, biophoton emissions, and an array of novel measurement devices have offered insights into the mechanism of action of energy therapies. Other research indicates that test subjects can influence random number generators and gather information about distant, unseen objects better than would be predicted by chance alone. The following books, which summarize this research in detail, are recommended:

- Jonas WB, Crawford CC, eds. *Healing, Intention and Energy Medicine: Science, Research Methods, and Clinical Implications*. New York: Churchill Livingstone; 2003.
- Laszlo E. *Science and the Akashic Field: An Integral Theory of Everything*. Rochester, VT: Inner Traditions; 2007.
- McTaggart L. *The Field: The Quest for the Secret Force of the Universe*. New York: Harper; 2008.
- Oschman J. *Energy Medicine: The Scientific Basis*. New York: Churchill Livingstone; 2002.
- Oschman J. *Energy Medicine in Therapeutics and Human Performance*. Edinburgh: Butterworth Heinemann; 2003.

- Schwartz GE, Simon WL. *The Energy Healing Experiments: Science Reveals Our Natural Power to Heal*. New York: Atria Books; 2007.

As for the third supposition, that energy therapies have clinically meaningful effects, the body of research is slowly growing. Many studies have raised the possibility that human energetic therapies may influence patients. For instance, a study conducted in Hawaii found that 11 healers, from various traditions, affected the brain activity on functional MRI scans of people with whom they felt a close connection. This result occurred even with the healers and their partners separated by hundreds of miles. The healers were asked to send "distant intentionality" at random 2-minute intervals; the recipients were unaware of the timing of this transmission. Functional MRI findings indicated that activity levels in several areas of the brain changed at precisely the time the healers were sending their intentions ( $P = .0000127$ ).<sup>11</sup>

Table 112-3 summarizes some of the key clinical studies of the effectiveness of human energetic therapies and focuses primarily on meta-analyses and systematic reviews.<sup>12-33</sup> The most commonly studied therapies are healing touch, Reiki, qi gong (which is also, to some degree, a movement-based therapy), and therapeutic touch.

## Guidelines for Making an Energy Medicine Referral

The keys to making an appropriate referral to an energy medicine practitioner are in many ways the same as when one refers to any sort of nonbiomedical practitioner:

1. Know the practice and the practitioner. This not only includes knowing in general about the nature of the modality practiced, but it also means being aware of the practitioner's qualifications and training. How willing is the practitioner to work collaboratively with Western medicine practitioners? Both innate talent and amount of experience influence a given healer's effectiveness.<sup>8</sup> The best way to get to know providers is to experience their practice as a client.
2. Know when to refer. Many energy medicine practitioners suggest that any patient-related concern is "fair game" when someone is referred for energy work. However, keep in mind that not all providers work according to Western medicine diagnostic categories. Trust your instincts as the referring provider. In my experience, energy medicine is especially worthy of consideration for the following:
  - People with generally heightened sensitivity. These people are often uncomfortable with crowds, highly intuitive, finely attuned to the feelings of others, or very sensitive to foods, medications, or environmental pathogens.
  - People with a history of severe emotional traumas
  - People with pain (physical or otherwise)
  - People with fatigue or a sense that they can never "keep their energy in." This can include those who are constantly giving to or supporting others and not taking time for their own needs.
  - Those who seem "starved for energy." This group includes those patients who leave a provider completely drained at the end of a visit.

**TABLE 112-3. Summary of Key Systematic Reviews, Meta-Analyses, and Randomized Controlled Trials Relating to Clinical Efficacy of Human Energetic Therapies**

FOCUS OF STUDIES	FINDINGS
<b>General Reviews</b>	<ul style="list-style-type: none"> <li>• A 2010 systematic review of 67 biofield therapy studies concluded that biofield therapies "...are promising complementary interventions for reducing pain intensity in numerous populations, reducing anxiety for hospitalized populations, and reducing agitated behaviors in dementia, beyond what may be expected from standard treatment or nonspecific effects. Effects on longer term clinical outcomes are less clear, and more systematic research is needed."<sup>12</sup></li> <li>• A 2008 Cochrane Review evaluated findings for 1153 patients in 5 Healing Touch, 15 Therapeutic Touch, and 5 Reiki trials to determine whether touch therapies were helpful for pain. Pain was reduced an average of 0.83 points on the 10-point pain rating scale, with a 95% confidence interval of -1.16 to -0.5. The investigators concluded "touch therapies may have a modest effect on pain relief."<sup>13</sup></li> <li>• A 2003 research survey reviewed 2200 published reports related to spiritual healing, energy, medicine, and the effects of mental intention. Findings were summarized as follows<sup>14,15</sup>: <ul style="list-style-type: none"> <li>• 75% of 130 studies on the link between religious/spiritual practices and health showed positive findings, but overall study quality was poor. Nearly all the research was observational.</li> <li>• 11 out of 19 trials of energy healing involving 1122 people reported positive effects (Cohen's D effect of 0.6). Overall research quality was judged as fair (Jadad score, 3-4 out of 5). Most trials involved Therapeutic Touch.</li> </ul> </li> </ul>
<b>Healing Touch</b>	<ul style="list-style-type: none"> <li>• A 2004 review concluded that although 30 available studies of Healing Touch did not allow for generalized conclusions, the technique holds promise.<sup>16</sup></li> <li>• A 2010 pilot study found that Healing Touch lowered stress and improved heart rate variability in 9 pediatric oncology patients.<sup>17</sup></li> <li>• Vitality, pain, and physical functioning was improved in a group of 78 women with gynecologic cancers who were undergoing radiation therapy.<sup>18</sup></li> <li>• Healing Touch decreased anxiety and length of stay in patients recovering from coronary bypass surgery, but it led to no change in pain medication or antiemetic use or atrial fibrillation incidence.<sup>19</sup></li> </ul>
<b>Qi Gong</b>	<ul style="list-style-type: none"> <li>• A 2010 study of 162 oncology patients found that medical qi gong improved quality of life, reduced treatment side effects, and reduced inflammation with no adverse effects.<sup>20</sup></li> <li>• Of 58 studies of qi gong's in vitro effects reviewed in 2003, most showed positive effects, but trial quality was poor. The same was true for 33 clinical studies.<sup>15</sup></li> <li>• Qi gong training for 5 weeks decreased tinnitus in 80 patients for more than 3 months.<sup>21</sup></li> <li>• A small noncontrolled trial involving 18 patients with chronic fatigue found that qi gong training significantly improved pain, sleep, mental attitude, and general mobility.<sup>22</sup></li> </ul>
<b>Reiki</b>	<ul style="list-style-type: none"> <li>• A 2009 review that included 12 studies found that 9 of 12 of them reported significant therapeutic effects of Reiki, but 11 of the 12 were ranked as poor quality based on the Jadad score.<sup>23</sup></li> <li>• A 2010 study conducted in a Yale University cardiology ward found that heart rate variability and positive emotional status improved markedly with the provision of Reiki to patients, as compared with patients in the control group or those who listened to meditative music.<sup>24</sup></li> <li>• Review of study data through 2007 concluded that the benefit of Reiki "remains unproven."<sup>25</sup></li> <li>• A review by Vitale in 2007 held that the Reiki literature includes 1 of 4 studies with significant findings for stress and depression, 1 study with significant findings for acute pain, and 1 of 3 studies that showed benefit for chronic pain.<sup>26</sup></li> </ul>
<b>Therapeutic Touch</b>	<ul style="list-style-type: none"> <li>• A 2010 study found that Therapeutic Touch improved pain and fatigue in a study of 90 patients undergoing chemotherapy.<sup>27</sup></li> <li>• A 2010 study of 21 postoperative patients found that Therapeutic Touch significantly decreased pain, cortisol, and natural killer cell levels.<sup>28</sup></li> <li>• A 2010 Cochrane Review found Therapeutic Touch not helpful for acute wound healing, given that 2 trials showed improvement and 1 trial showed slowed healing.<sup>29</sup></li> <li>• A 2007 Cochrane Review did not find any good-quality studies to assess the general effect of Therapeutic Touch on anxiety.<sup>30</sup></li> <li>• A 2008 review concluded that Therapeutic Touch does reduce pain and anxiety in patients with cancer.<sup>31</sup></li> <li>• Therapeutic Touch was found to decrease behavioral symptoms in people with dementia.<sup>32</sup> In a subsequent study of a group of 64 residential patients, this technique was found to decrease restlessness and cortisol variability significantly.<sup>33</sup></li> </ul>

- Anyone who lacks focus or seems "ungrounded"
- Patients suffering from an array of nonspecific or unrelated complaints or whose symptoms are not easily explained from a biomedical perspective
- Patients whose chief complaints have something of a supernatural or paranormal bent. Again, the integrative providers' belief system will guide how they approach such concerns.

3. Be aware of safety concerns. Energy medicine has a very low risk of negative effects or outcomes, although one must use caution about relying on human energetic therapies to the exclusion of conventional, potentially lifesaving interventions, especially during life-threatening emergencies or when dealing with severe physical trauma. In addition, patients with psychosis may not do well with energetic approaches.

Energy medicine can be considered for use to maintain health or to treat practically any condition, with minimal adverse effects. Caution is recommended with use in people with a history of psychosis or when use could lead to a delay in potentially life-saving allopathic interventions.

4. Obtain feedback from the recipients of the care. Are people getting better after you refer them? Is healing occurring?

## Incorporating Energy Medicine Approaches Into One's Own Practice

As with any approach to healing, practitioners must find appropriate mentorship when adopting new techniques. However, energy medicine is something that anyone can try. Many practitioners teach the family members or friends of an ill person techniques they can practice with their loved ones themselves.

The exercises in this chapter are starting points. As you gain experience, create your own, tailoring to the needs of your specific practice.

As you experiment with these exercises, keep in mind that a health care provider should not “take on” the energy of others, nor is it appropriate for him or her to feel that personal energy is lost during energy work with another person. Always ask for permission before doing one of these exercises with someone. Be sure to allow the recipient of the practice to have sufficient time to recover afterward; some people move into a trancelike state as they work with these techniques. Persons familiar with Interactive Guided Imagery and mindfulness practices will note that many energy exercises contain elements of both.

The following four practices can be readily incorporated into a patient encounter:

1. Grounding
2. Charging up your energy
3. Setting appropriate boundaries
4. Draining away a symptom

### Grounding

This exercise can be used when people seem overly distracted by their emotions or too much “in their head,” thinking about an issue but not remaining aware in other ways. Grounding can be helpful for bringing someone into the present moment or into a more enhanced awareness of their physical state. It is also good for people who tend to go off on tangents in conversation. This exercise can be useful for providers before, between, or following encounters with patients. Caution: Some people cope with pain or suffering by not being grounded; this exercise may be stressful to them.

- Remove your footwear as able. Socks are permissible.
- Sit up or lie straight. If possible, the soles of your feet should be kept in contact with the floor.
- Keep your legs and arms uncrossed, if possible.

- After a few slow, deep breaths, bring all your attention to the soles of the feet. Imagine the breath moving in and out through them. Continue until this feels comfortable. If you feel any resistance, simply note it and continue to breathe.
- Feel, visualize, or imagine on the outward breath that the feet are extending into the ground like the roots of the tree, slowly spreading through the soil. Sense how these roots add stability and a sense of connection with the earth.
- With each inward breath, feel, visualize, or imagine energy flowing into the feet through those roots, the way that nutrients and water flow into a tree. Let the energy move into the body up through the feet and to wherever it is needed.
- Continue this exercise for at least 20 breaths.
- It may be helpful to follow this exercise with an overall body scan, in which a person is asked to tune in sequentially, without judging or analyzing, to various parts of the body. (e.g., “Focus on your left toes...then your left foot...then the ankle...knee...thigh”)

### Charging Up Your Energy

Many variations of this exercise exist. It can be done by anyone who is feeling fatigued or weary, as well as by someone intending to share energy with another person. The best approach always is to maintain your own energy level and allow additional energy to flow through to others without ever feeling that you are losing your own energy in the process.

- In a place that feels safe, assume a comfortable position and close your eyes. You may find it helpful to place your hands on your lap, with the palms facing upward.
- Bring your awareness to the breath, and take several deep breaths.
- When you inhale, begin by imagining white light moving in through the soles of the feet and up through the body to the heart.
- After the flow from the feet to the heart can be perceived, do the same with the top of the head, and imagine white light moving in, down through the center of the head, neck, and chest, to the heart.
- Continue this process, and allow the heart to fill to overflowing with the white light. Thinking about whatever fills your heart with the strongest sense of joy, compassion, love, or enthusiasm is often helpful.
- Once the heart feels full, it should remain so through the rest of the exercise. Repeat the previous steps if the heart does not continue to feel full.
- As the heart overflows, send the white light (or, if preferred, the feeling of love or compassion) from the heart and down the arms into the hands. This energy is ready to be shared with another part of your own body by placing the palms over wherever extra energy is desired. It may also be shared with another person, with permission.

### Setting Appropriate Boundaries

This exercise is especially helpful to people who feel overwhelmed by the energy, emotions, or simply the physical presence of others. It may be useful for people with fibromyalgia,



whose senses are heightened to a point of causing dysfunction, or for people with chronic fatigue, whose energy seems to leak out of them in a way they cannot control. This practice also may be useful for people who feel as though others are somehow draining their energy. It can help a person feel less defensive or adversarial.

- Ideally, this exercise should be done at a time and place where you feel safe enough to close your eyes.
- Take a moment to tune in to how you feel, right now. Do you feel drained? Tired? Overwhelmed? Where in the body do you have these feelings? Where do you feel vulnerable?
- After several deep breaths, imagine yourself surrounded by a clear, bright, white, force field. This force field surrounds you like a protective bubble that allows in only what you choose and deflects anything that is unnecessary or harmful away from you.
- Strengthen the force field in any places where you feel vulnerable.
- If desired, you can choose to maintain knowledge of whatever bounces off the force field; understand that you can do this without its affecting you emotionally or energetically.
- Imagine white light radiating from a point at the exact center of the bubble of force that clears out anything that does not belong inside the bubble.
- Enhance the force field further by using additional imagery, sounds, or feelings that you associate with strength and well-being. Pause after adding each extra layer, and focus on the breath.
- With practice, a person can rapidly move through this exercise before entering an uncomfortable environment or facing a challenging interpersonal encounter. This exercise can also be good to use on first awakening or when retiring for the night.

## Draining Away a Symptom

Healing touch and other human energetic therapies often use this technique in various forms. This exercise can be helpful when a symptom can be localized to a specific area of the body. For example, a pain drain can be used for headaches or joint pain. Practitioners can also ask those experiencing emotional pain where in their body they feel it the most.

- Close your eyes and focus on the part of the body where you feel the pain, discomfort, or imbalance most strongly.
- Describe what you notice there. Does it have a color? Is it an image? A memory? What sound do you hear when you tune into this area? What temperature is it, and how does it feel compared with the rest of your body?
- Take some time to focus your awareness on the discomfort. This can be distressing, given that we may spend time trying to avoid, ignore, or control our symptoms. Just observe. Stay as neutral as possible.
- Now, focus on how the area should be. At its healthiest, how does it look, sound, and feel? Take time to develop a strong sense of this. Again, stay objective.

- With each exhalation, envision the symptom—all that you noticed about it—being exhaled. Some people let it leave with the breath, and others release it into the ground through the bottoms of their feet. Some people release it in the form of emotions that arise. For others, it just seems to fade away.
- With each inhalation, breathe in your sense of how the part of your body receiving your attention can feel at its healthiest, at its most whole. Draw in the imagery you generated around health for this location. This can come in with the breath, through the top of the head, through the bottoms of the feet, or in any other way that seems appropriate.

As a provider present with someone doing this exercise, you can often enhance the experience by placing your hand on or near the part of the patient's body that is receiving attention. If it seems appropriate, you may envision sending what is required through yourself. Use the steps outlined in the grounding exercise to ensure that you are not giving your own energy, but rather letting it flow into and through you, as though you are an antenna. Similarly, if you the provider feel comfortable doing so, you may feel or see the symptom being released from the person being healed into your hands. If this occurs, simply intend that whatever is released be deflected away from both the patient and you into the ground.

If you choose to try energy medicine exercises with those who seek your care, feel free to experiment. Shape these or other exercises as you find appropriate, and develop some of your own.

If you find the foregoing exercises helpful, you may want to consider some of the following resources, which offer other useful exercises and ways of conceptualizing human energetic therapies:

- Brennan BA. *Hands of Light: A Guide to Healing Through the Human Energy Field*. New York: Bantam Dell; 1993.
- Brennan BA. *Light Emerging: The Journey of Personal Healing*. New York: Bantam Dell; 1993.
- Bruyere RL. *Wheels of Light: Chakras, Auras, and the Healing Energy of the Body*. New York: Fireside; 1994.
- Dale C. *The Subtle Body: An Encyclopedia of Your Energetic Anatomy*. Boulder, CO: Sounds True; 2009.
- Eden D. *Energy Medicine for Women: Aligning Your Body's Energies to Boost Your Health and Vitality*. New York: Tarcher Penguin; 2008.
- Eden D. *Energy Medicine: Balancing Your Body's Energies for Optimal Health, Joy, and Vitality*. New York: Tarcher Penguin; 2008.
- Gordon R. *Quantum Touch: The Power to Heal*. 3rd ed. Berkeley, CA: North Atlantic Books; 2006.
- Ingerman S. *Shamanic Journeying: A Beginner's Guide*. Boulder, CO: Sounds True; 2008.
- Myss CM. *Anatomy of the Spirit: The Seven Stages of Power and Healing*. New York: Random House; 1996.
- Weil A, Chiasson AM. *Self-Healing with Energy Medicine (Self Healing CD Series)*. Boulder, CO: Sounds True; 2009.

## KEY WEB RESOURCES\*

Alternative Medicine Foundation resource guide on energy work: <a href="http://amfoundation.org/energywork.htm">http://amfoundation.org/energywork.htm</a>	Provides descriptions, links, and introductory readings for a number of different energy medicine modalities.
Association for the Scientific Study of Consciousness: <a href="http://assc.caltech.edu/">http://assc.caltech.edu/</a>	Organization dedicated to the study of consciousness, with regular international conferences
Institute of Noetic Sciences: <a href="http://www.noetic.org/">http://www.noetic.org/</a>	Group dedicated to the study of consciousness and energetic, founded by astronaut Edgar Mitchell
International Society for the Study of Subtle Energies and Energy Medicine: <a href="http://www.issseem.org/">http://www.issseem.org/</a>	Group devoted to the study of energy medicine that publishes a newsletter and hosts annual conferences focused on energy medicine

\*See also the Web sites listed in [Table 112-2](#).

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. brainline.org *Energy Medicine: An overview*. [http://www.brainline.org/content/2009/06/energy-medicine-an-overview\\_pageall.html](http://www.brainline.org/content/2009/06/energy-medicine-an-overview_pageall.html); Accessed 15.02.12.
2. Oschman JL. *Energy Medicine: The Scientific Basis*. New York: Churchill Livingstone; 2002.
3. Barnes PM, Bloom B. *Complementary and Alternative Medicine Use among Adults and Children: United States, 2007*. National Health Statistics reports. 2008. <http://nccam.nih.gov/news/2008/nhsr12.pdf>; Accessed 01.12.10.
4. Barns P, Powell-Griner E, McFann K, et al. Complementary and alternative medicine use among adults: United States, 2002. *Semin Integr Med*. 2004;2:54–71.
5. DiNucci EM. Energy healing: a complementary treatment for orthopaedic and other conditions. *Orthop Nurs*. 2005;24:259–269.
6. Thomas L. *The Encyclopedia of Energy Medicine*. Minneapolis, MN: Fairview Press; 2010.
7. Cassidy CM. What does it mean to practice an energy medicine? *J Altern Complement Med*. 2004;10:79–81.
8. Schwartz GE, Simon WL. *The Energy Healing Experiments: Science Reveals Our Natural Power to Heal*. New York: Atria Books; 2007.
9. Zylberbaum JG, Delaflor M, Attie L, Goswami A. The Einstein-Podolsky-Rosen paradox in the brain: the transferred potential. *Phys Essays*. 1994;7:422–428.
10. Radin D. Event-related electroencephalographic correlations between isolated human subjects. *J Altern Complement Med*. 2004;10:315–323.
11. Achterberg J, Cooke K, Richards T, et al. Evidence for correlations between distant intentionality and brain function in recipients: a functional magnetic resonance imaging analysis. *J Altern Complement Med*. 2005;11:965–971.
12. Jain S, Mills PJ. Biofield therapies: helpful or full of hype? A best evidence synthesis. *Int J Behav Med*. 2010;17:1–16.
13. So PS, Jiang Y, Qin Y. Touch therapies for pain relief in adults. *Cochrane Database Syst Rev*. 2008;(4) CD006535.
14. Jonas WB, Crawford CC. Science and spiritual healing: a critical review of spiritual healing, “energy medicine,” and intentionality. *Altern Ther Health Med*. 2003;9:56–61.
15. Jonas WB, Crawford CC. *Healing, Intention and Energy Medicine: Science, Research Methods, and Clinical Implications*. Philadelphia: Churchill Livingstone; 2003.
16. Wardell DW, Weymouth KE. Review of studies of healing touch. *J Nurs Scholarsh*. 2004;36:147–154.
17. Kemper KJ, Fletcher NB, Hamilton CA, McLean TW. Impact of healing touch on pediatric oncology outpatients: pilot study. *J Soc Integr Oncol*. 2009;7:12–18.
18. Cook CA, Guerrero JF, Slater VE. Healing touch and quality of life in women receiving radiation treatment for cancer: a randomized controlled trial. *Altern Ther Health Med*. 2004;10:34–40.
19. MacIntyre B, Hamilton J, Fricke T, et al. The efficacy of healing touch in coronary artery bypass surgery recovery: a randomized clinical trial. *Altern Ther Health Med*. 2008;4:24–32.
20. Oh B, Butow P, Mullan B, et al. Impact of medical qigong on quality of life, fatigue, mood and inflammation in cancer patients: a randomized controlled trial. *Ann Oncol*. 2010;21:608–614.
21. Biesinger E, Kipman U, Schatz S, Langguth B. Qigong for the treatment of tinnitus: a prospective randomized controlled study. *J Psychosom Res*. 2010;69:299–304.
22. Craske NJ, Turner W, Zammit-Maempe J, Lee MS. Qigong ameliorates symptoms of chronic fatigue: a pilot uncontrolled study. *Evid Based Complement Alternat Med*. 2009;6:265–270.
23. VanderVarart S, Gijzen VMGJ, de Wildt S, Koren G. A systematic review of the therapeutic effects of Reiki. *J Altern Complement Med*. 2009;15:1157–1169.
24. Friedman RSC, Burg MM, Miles P, et al. Effects of Reiki on autonomic activity early after acute coronary syndrome. *J Am Coll Cardiol*. 2010;56:995–996.
25. Lee MS, Pittler MH, Ernst E. Effects of Reiki in clinical practice: a systematic review of randomized clinical trials. *Int J Clin Pract*. 2008;62:947–954.
26. Vitale A. An integrative review of reiki touch therapy research. *Holist Nurs Pract*. 2007;21:167–179.
27. Aghabati N, Mohammadi E, Esmail Z. The effect of therapeutic touch on pain and fatigue of cancer patients undergoing chemotherapy. *Evid Based Complement Alternat Med*. 2010;7:375–381.
28. Coakley AB, Duffy ME. The effect of therapeutic touch on postoperative patients. *J Holist Nurs*. 2010;28:193–200.
29. O’Mathuna DP, Ashford RL. Therapeutic touch for healing acute wounds. *Cochrane Database Syst Rev*. 2010;(4): CD00276.
30. Robinson J, Biley FC, Dolk H. Therapeutic touch for anxiety disorders. *Cochrane Database Syst Rev*. 2007;(3): CD006240.
31. Jackson E, Kelley M, McNeil P, et al. Does therapeutic touch help reduce pain and anxiety in patients with cancer? *Clin J Oncol Nurs*. 2008;12:113–120.
32. Wood DL, Craven RE, Whitney J. The effect of therapeutic touch on behavioral symptoms of persons with dementia. *Altern Ther Health Med*. 2005;11:66–74.
33. Woods DL, Beck C, Sinha K. The effect of therapeutic touch on behavioral symptoms and cortisol in persons with dementia. *Fosrch Komplementmed*. 2009;16:181–189.



# 113

## Creating a Greener Clinic: The Impact of Global Warming on Health

Rian J. Podein, MD, and Michael T. Hernke, PhD

Global warming and climate change are transforming ecosystems on an extraordinary scale and at an extraordinary pace, resulting in what some consider to be the greatest public health disaster facing us today.<sup>1,2</sup> The etiology of climate change has been identified and reported by the Intergovernmental Panel on Climate Change, concluding with strong evidence that most of the global warming that has occurred during the past 50 years is attributable to human activities and specifically the consumption of fossil fuels producing carbon dioxide and other greenhouse gases (GHGs).<sup>3</sup> Because of the familiarity and predominance of carbon dioxide among the greenhouse gases, it is often used as a representative, or surrogate, for estimating, monitoring, and reporting of GHG emissions. Reporting of carbon dioxide emissions can be expressed as the specific carbon dioxide quantity (e.g., tons per year) if this is the only GHG emission measured. When other GHG emissions are taken into account, the result may be expressed in terms of global warming potential (GWP). GWP is a measure of how much a given mass of greenhouse gas is estimated to contribute to global warming relative to the same mass of carbon dioxide over a given time, facilitating measurements in units of carbon dioxide equivalents.<sup>4</sup> All sectors of society, including health care, contribute to the increasing accumulation of atmospheric GHG. For many countries, the health care sector is responsible for consuming significant amounts of goods and services and is an important contributor to gross domestic products. In general, the more that a health care system consumes, the greater the amount of carbon emissions associated with the consumption, and the greater the size of its carbon footprint. Carbon emission estimates have been completed for the United States and the National Health System (NHS) in England. The U.S. health care system emits

more than 434 million tons of carbon dioxide annually, which represents 7% of total annual U.S. carbon emissions; and the NHS England carbon emissions total 18 million tons per year, which represents 3.2% of total carbon emissions in England.<sup>5,6</sup>

Greenhouse gas emissions are represented by the quantity of carbon dioxide measured in tons. Global warming potential incorporates all gases and is a measure of how much a given mass of greenhouse gas is estimated to contribute to global warming relative to the same mass of carbon dioxide over time.

The public health consequences of GHG accumulation and climate change are already present, and future projections are alarming. The direct human health effects as a result of climate change have been reported through a multitude of pathways, including temperature-related illnesses and deaths, extreme weather, air pollution, allergic diseases, infectious diseases, malnutrition, and displaced populations.<sup>7</sup> The global burden of disease morbidity and mortality attributable to the human-caused portion of climate change is significant, with approximately 5 million disability-adjusted life years per year and more than 150,000 lives annually, with projections to more than double by 2030.<sup>8</sup>

Whereas the health care sector can play a key role in helping societies adapt to the effects of climate change and the risk it poses to human health, the role of mitigation has more recently emerged. This was demonstrated by a World Health Organization mandate for member states to develop “programs for health systems that will contribute to reducing their own greenhouse gas emissions.”<sup>9</sup> Individual,

organizational, and national motivations for reducing greenhouse gas emissions may vary, but health care practitioners and health care organizations must be motivated to do no harm, and it is therefore incumbent on us to reduce, with the goal to eliminate, the carbon footprint of medicine and health care.

The U.S. health care system emits more than 434 million tons of carbon dioxide annually, which represents 7% of total annual U.S. carbon emissions. The NHS England carbon emissions total 18 million tons per year, which represents 3.2% of total carbon emissions in England.

## A Primer on Life Cycle Assessment

Quantification of the carbon emissions of a health system, hospital, or clinic is important to approximate the overall impact toward climate change, to identify strategies for carbon reduction, and to clarify the potential value of mitigation efforts. Life cycle assessment (LCA) is a technique that can be used for this process. LCA evaluates the environmental impacts precipitated by a product or a service (i.e., health care) from sourcing materials through end of life. LCA is composed of three stages:

1. Identify and quantify environmental loads—energy and materials usage, emissions, and waste.
2. Assess and evaluate potential environmental impacts associated with the loads.
3. Assess the opportunities for improvement.

LCA considers all processes over the life cycle—extraction and processing, manufacturing, transport and distribution, use, reuse, maintenance, recycling, and final disposal.<sup>10,11</sup>

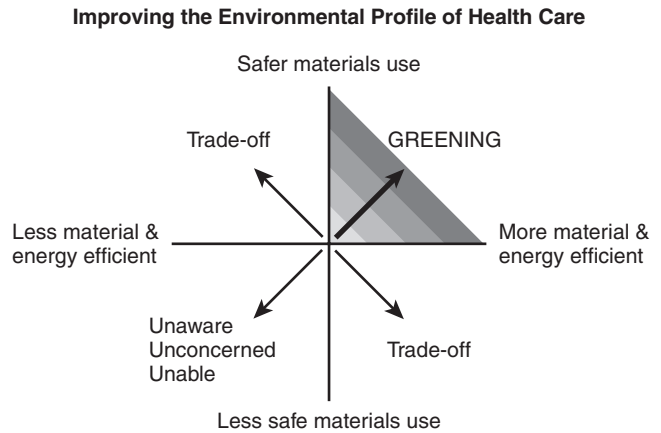
A product life cycle can be seen as a linear progression that starts with extraction of raw materials, such as ore and oil, which are processed into basic materials, such as aluminum and plastics. Finished materials then compose parts and components, such as a car body, which along with other components are assembled into final products. A life cycle also includes the use phase and the end-of-life activities, such as disassembly and recycling. Transportation and distribution between life cycle phases are also considered.

Activities across a life cycle require material and energy resources and generate wastes and emissions, including GHG. LCA gathers information about the quantity of these resources and wastes at each life cycle stage. Thus, the effect of producing an automobile would include not only the impacts at the final assembly facility but also the impact from mining metal ores, making electronic parts, forming windows and parts that are needed to build the car, and of course the emissions precipitated from driving.

LCA provides a fairly complete picture within the scope of investigation of a product's or service's known environmental impacts. It lets you see which parts of a product or facility life cycle most negatively affect the environment and helps prioritize improvements or select alternative products and services to achieve safer and more efficient energy and materials use (Fig. 113-1). LCA approaches alone do not

**FIGURE 113-1**

Improving the environmental profile of health care. (Originally presented by Hernke MT. Customer-focus across the lifecycle. *10th International Greening of Industry Network Conference: Corporate Social Responsibility—Governance for Sustainability*. Göteborg, Sweden; June 23-26, 2002.)



provide a vision of health care in a sustainable society, a task for which broader science-based principles are useful and have been described elsewhere.<sup>12</sup>

The U.S. and England health sector carbon footprint estimates, mentioned previously, were calculated by use of the LCA technique. Their findings identified not only the total GHG emissions but also that the three greatest areas of carbon emissions within health care are attributed to building energy use, pharmaceuticals, and travel, each of which accounted for about 22% of emissions in the England study (Fig. 113-2).<sup>6</sup> In the United States, building energy use and prescription drugs accounted for about 20% and 15% of emissions, respectively; emissions attributable to travel were not considered.<sup>5,13</sup>

## Energy Use

Energy use to heat, to cool, and to power medical facilities is highly intensive and expensive, and it is one of the largest contributors to health care's carbon footprint by the use of non-renewable fossil energy sources. Fortunately, this area offers many opportunities for improving efficiency.

A variety of calculator tools use energy consumption information to enable health care facilities to estimate their GHG (including carbon dioxide) emissions, to compare energy use with similar buildings nationwide, to estimate the health impacts and medical costs due to power plant emissions from the consumed energy, and to obtain third-party recognition and verification for energy consumption benchmarks (see [Key Web Resources](#)).

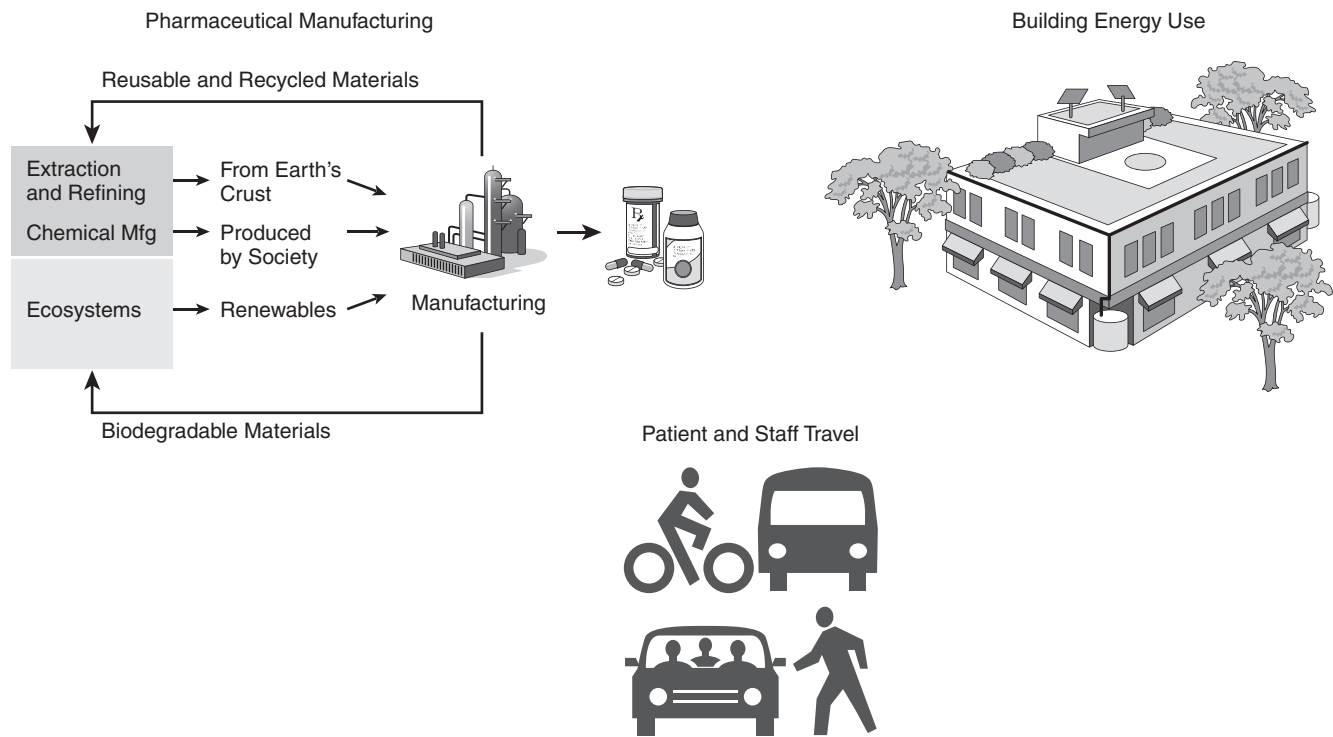
Energy consumption and carbon tracking tools can help people and organizations monitor efforts to reduce energy consumption and resultant carbon emissions. Major targets for energy use mitigation include conserving energy, making operations more energy efficient, and purchasing renewable energy or installing renewable energy infrastructure ([Box 113-1](#)).

New health care facilities can reduce their energy use and subsequent carbon emissions by incorporating energy efficiency and renewable energy into their design

**FIGURE 113-2**

The three greatest areas of carbon emissions within health care.

**Top Three Sources of Carbon Emissions in Health Care**



**BOX 113-1. Energy Operations: Opportunity for Action**

**Make Building Operations More Energy Efficient**

Dedicate personnel and programs to energy conservation, establish baseline energy consumption, install retrofits and institute operational changes, and track progress. Projects may range from minor improvements to capital projects that target a facility's major energy-using systems. Hospitals may bring in an energy use reduction consultant, while Group Purchasing Organizations (GPOs) may make available a contract for energy use reduction consulting. Sample strategies:

- Switch incandescent light bulbs for compact fluorescents and LEDs; install solar parking lot lighting.
- Install occupancy sensor switches in offices and other intermittent use areas.
- Upgrade at least one major piece of mechanical infrastructure equipment (e.g., boiler, chiller, hot water heater) with the most energy efficient available technology.
- Turn down thermostats slightly (a small lowering, one to two degrees, of temperature can have a big impact).

**Install On-Site Renewable Energy Capability**

Solar photovoltaic panels can generate a portion of your facility's required electricity or power a solar thermal hot water heating system. Installing a combined heat and power (CHP) facility on-site can also reduce greenhouse gas emissions and reduce spending on energy. CHP systems generate power and heat from a single fuel source, significantly increasing energy efficiency. See the EPA's Combined Heat and Power Partnership.

**Purchase Energy Efficient Products**

Where Energy Star-qualified or Federal Energy Management Program-designated products are available, hospitals should buy only these products. Group Purchasing Organizations (GPOs) should make these products available on contract. See [http://www.eere.energy.gov/femp/pdfs/eed\\_productfactsheet.pdf](http://www.eere.energy.gov/femp/pdfs/eed_productfactsheet.pdf) for a list of eligible products.

**Reduce "Standby" Energy Use**

Computers and other electronic equipment use energy even when they are turned off or on standby. It is estimated that standby power consumption is responsible for 1% of the world's CO<sub>2</sub> emissions. When possible, plug a computer and related devices into a power strip, then turn off the strip when the equipment is not in use—power strips do not draw power. Another energy-saving tool is a software system that manages the power usage of networked systems.

**Buy Green Power**

Offset 50% or 100% of your power use by purchasing electricity generated renewably.

and construction. To facilitate this goal, the U.S. Green Building Council has created the Leadership in Energy and Environmental Design (LEED) program for the health care industry, a best practices guide for more sustainable building design, construction, and operations.<sup>14</sup> LEED is a certification system providing third-party verification that a building was designed and built with a focus on energy savings, water efficiency, carbon dioxide emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

LEED is perhaps the most well known green building standard but certainly not the only one worth considering. Retzlaff<sup>15</sup> and Haapio and Viitaniemi<sup>16</sup> reviewed LEED and other green building standards to help users understand their substantial differences and merits with respect to various sustainability dimensions, such as the relative emphasis on energy use and indoor air quality and other facility goals, such as community or civic use.

When health care facilities, organizations, and national systems reduce their energy use or increase the contribution of renewable energies, co-benefits in addition to carbon reduction and climate change mitigation are realized through direct public health benefits and economic savings. For example, the health effects due to pollution from the emissions of fossil fuels, especially from coal combustion, include cardiovascular disease, cancer, stroke, and respiratory disease as well as asthma and delayed neurologic development in children.<sup>17-19</sup> In addition, the cost of fossil fuels promises to increase over time as supply decreases, thereby positioning energy conservation, efficiency, and alternative energy measures to provide for long-term financial benefits.

Health systems have been encouraged to respond to the challenge of climate change by addressing our own energy consumption and to lead by example: "The health sector is one of the most trusted and respected sections of society, and it is also one of the largest employers and consumers of energy. This presents both a responsibility and an opportunity to be an 'early mover' to achieve climate-neutrality in its own operations, and to demonstrate that this can go hand-in-hand with improved effectiveness and cost savings."<sup>20</sup>

## Pharmaceuticals

Pharmaceutical medications are also one of the largest contributors to health care's carbon footprint; most of their emissions result directly from the energy used in pharmaceutical production in the manufacturing plants.<sup>6</sup> There has been a steady increase in the demand for pharmaceutical interventions and the use of prescription medications within modern medicine. Globally, pharmaceutical sales are expected to reach \$880 billion in 2011, with the United States as the single largest market with sales of more than \$300 billion.<sup>21</sup>

If health care continues to increase its reliance on and use of pharmaceutical medications, its contribution to the carbon footprint will also continue to increase in addition to significant public health and ecologic consequences. Medication-related errors at all points of care, including prescribing of medications, dispensing by pharmacists, and unintentional nonadherence on the part of patients, are a major contributor to avoidable morbidity, mortality, and cost.<sup>22</sup> Ecologically, pharmaceutical medications are being excreted and discarded into the environment at a rate faster than they can be degraded,

causing them to accumulate in waterways and drinking water. The majority of waterways tested in the United States now show traces of common medications such as acetaminophen, hormones, blood pressure medicine, codeine, and antibiotics, with mounting concerns regarding their deleterious effects on aquatic organisms.<sup>23</sup> Strikingly, a vast array of these pharmaceuticals, including antibiotics, anticonvulsants, mood stabilizers, and sex hormones, have found their way into the drinking water supplies throughout the United States.<sup>24</sup> Because of multiple concerns, including pharmaceutical use in large ongoing amounts, environmental accumulation, resistance of some pharmaceutical parent compounds or active metabolites to biodegradation, newer drugs with poorly understood modes of biochemical actions, potential for ecologic harm, and potential for unknown subtle effects from long-term exposures to low concentrations of bioactive compounds, pharmaceuticals have been named by the Environmental Protection Agency as one of the top five "emerging" contaminants affecting human and ecologic health.<sup>25</sup>

Integrative medicine, with its incorporation of nonpharmaceutical complementary and alternative medicine interventions, is a proven approach that can reduce health care's reliance on pharmaceuticals.<sup>26, 27</sup> Compared with pharmaceutical interventions alone, an integrative medicine approach often holds the potential to be as effective or even better, to be less expensive, and to pose more limited or even positive side effects. One such example is the treatment and prevention of migraine headaches. Acupuncture has demonstrated benefit for the acute treatment of migraine headaches and could therefore be considered in association with or instead of pharmaceuticals.<sup>28</sup> For migraine headache prophylaxis, acupuncture is at least as effective as or possibly more effective than pharmaceutical drug treatment, has fewer adverse effects, and can be cost-effective.<sup>28-30</sup> In addition, another nonpharmaceutical intervention, biofeedback, has been shown to be equally efficacious compared with the commonly used pharmaceutical propranolol for migraine headache prevention.<sup>31</sup>

Efforts within the practice of medicine and health care to facilitate pharmaceutical reductions are crucial for the goal of reducing carbon emissions and for providing optimal quality patient care. A couple of areas warrant an increased focus for change. First, providers, organizations, and health systems would benefit by addressing the great imbalance of resources currently provided for disease treatment and away from wellness promotion and disease prevention. The benefits of this would reduce the need for pharmaceutical and nonpharmaceutical interventions alike. Second, support for the education of health professional students and providers regarding the role of an integrative medicine approach is already under way, with an increasing presence of complementary and alternative medicine electives in medical schools, integrative medicine curriculum within medical residency programs, integrative medicine fellowships, and continuing medical education programs, all of which will contribute to an increasing base of providers who will have the knowledge and training to consider nonpharmacologic interventions when appropriate.

## Procurement and Transportation

Other noteworthy areas for carbon mitigation efforts within health care include food procurement and on-road transportation. According to the National Academy of Sciences,

outside of direct energy use, these have been identified as the two biggest lifestyle factors when it comes to the net contribution to climate change.<sup>32</sup>

Environmentally preferable purchasing (EPP) is the act of purchasing products and services whose environmental impacts have been considered and found to be less damaging to the environment and human health compared with competing products or services that serve the same purpose. Although EPP can be used for all products and services, one emerging example within health care is the purchase of more local, healthy, and sustainable foods. Most foods travel an average of 1500 miles from “farm to plate,” with significant GHG emissions as a result of transportation and fossil fuel use.<sup>33</sup> More locally produced foods reduce the “food miles” of a product, with a resultant reduction in the amount of carbon and GHG emissions. In addition are the co-benefits of reduced air and water pollution associated with long-distance transport. More specifically, one of the leading contributors to food system climate change is recognized to be meat consumption and production, responsible for nearly a fifth of total global GHG emissions.<sup>34</sup> Some health care organizations have acted by significantly reducing their meat offerings. Notably, the British NHS has instituted vegetarian menus and reduced meat offerings in all of the nation’s public hospitals to reduce its carbon footprint.<sup>35</sup> Inspired by the Meatless Monday project, a nonprofit initiative in association with the Johns Hopkins Bloomberg School of Public Health, numerous health care organizations within the United States have endorsed a voluntary one-day per week meatless menu (to learn more, visit [www.meatlessmonday.com](http://www.meatlessmonday.com)). The United Nations climate chief has validated the utility of these efforts, stating that having a meat-free day every week is the biggest single contribution people could make to curbing climate change in their personal lives.<sup>36</sup>

*People should have one meat-free day a week if they want to make a personal and effective sacrifice that would help tackle climate change.*

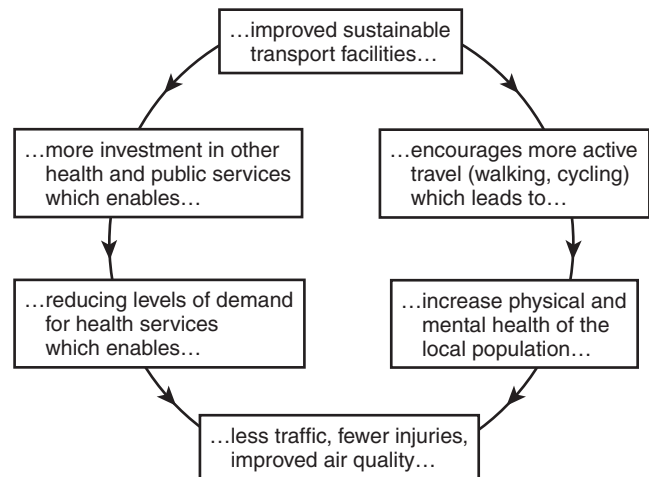
Rajendra Pachauri, Chair of the United Nations Intergovernmental Panel on Climate Change (Originally published in *The Guardian*, September 7, 2008.)

Supporting more sustainable food procurement products, including reduced meat consumption, provides health care organizations an opportunity to model healthy eating patterns for patients, reduces carbon and GHG emissions, and offers health benefits too. The regular consumption of meat products increases the risk of chronic diseases, especially some of the leading causes of death, such as cardiovascular disease, stroke, diabetes, and some cancers.

Road transportation in the form of staff and patients driving automobiles plays a significant role in health care’s carbon footprint. Health care organizations have the opportunity to encourage staff and patients to shift from sedentary automobile travel to more active and healthy travel, such as walking, cycling, and public transport. In addition to reducing carbon and GHG emissions, these more active transportation methods provide exercise, reduce fatal accidents, increase social contact, and reduce air pollution.<sup>37</sup>

**FIGURE 113-3**

Virtuous cycle for transportation. (From *Saving Carbon, Improving Health*. NHS Carbon Reduction Strategy for England, January 2009.)



Consideration should be given to senior-level creation of an active travel plan for the organization, incentives for staff and patients for active travel, establishment of monitoring metrics for monitoring, routine review of organizational travel needs and alternatives (e.g., teleconferencing), and moving health care delivery closer to the home. Efforts to reduce carbon emissions, including for transportation, have the potential to save money, to benefit population health, and to reduce health inequalities. In fact, many efforts that improve health also contribute to more sustainable development and vice versa. This may be illustrated as a virtuous cycle, a condition in which a favorable circumstance or result gives rise to another that subsequently supports the first, as demonstrated for transportation (Fig. 113-3).

## Conclusion

In 1987, the United Nations published a report that provided guiding principles for sustainable development.

*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.* World Commission on Environment and Development (Originally published in *Our Common Future*. New York: Oxford University Press; 1987.)

The more recent Millennium Ecosystem Assessment, an extensive assessment of the consequences of ecosystem change for human well-being, has highlighted our global unsustainability according to this principle, concluding that human actions are depleting Earth’s natural capital, putting such strain on the environment that the ability of the planet’s ecosystems to sustain future generations can no longer be taken for granted.<sup>38</sup> Reducing carbon and GHG emissions is a critical component in mitigating the consequences of global climate change and for moving toward a more sustainable society. The common mission of health care



professionals and their institutions to facilitate health and to reduce suffering along with good societal standing positions them well to model carbon reduction practices. To transition toward a reduced carbon medical practice and health care system, we may look to prior successes, such as addressing global health interdependence by promoting peace and

nuclear disarmament and antismoking advocacy. With climate change, the stakes are high for global catastrophe, as they are with nuclear weapons. In addition, the scientific evidence supports the risks of exposure to secondhand smoke, and the evidence for global warming and climate change is unequivocal that secondhand carbon is harmful too.

## KEY WEB RESOURCES

### Energy and Greenhouse Gas Emission Calculator Tools

Practice Greenhealth (membership organization for health care institutions): <http://practicegreenhealth.org/tools-resources/energy-impact-calculator>

Energy Star (a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy): [www.energystar.gov/index.cfm?c=healthcare.bus\\_healthcare](http://www.energystar.gov/index.cfm?c=healthcare.bus_healthcare)

World Resources Institute and World Business Council for Sustainable Development (a joint project of a global business association and an environmental think tank): [www.ghgprotocol.org/](http://www.ghgprotocol.org/)

Climate Registry (a membership organization for North American organizations): [www.theclimateregistry.org/](http://www.theclimateregistry.org/)

### Energy Impact Calculator

Calculates carbon dioxide emissions on the basis of the amount of energy consumed by the building; estimates health impacts and medical costs due to power plant emissions

### Portfolio Manager

Calculates greenhouse gas emissions (including carbon dioxide, methane, and nitrous oxide) on the basis of the amount of energy consumed by the building; allows comparison of energy use to similar buildings nationwide; potential to earn Energy Star recognition

### Greenhouse Gas Protocol

Provides a comprehensive accounting framework and extensive suite of tools and guidance for emissions accounting for standards and programs around the world, including tools for “office-based and service sector organizations,” suitable for health care

### Climate Registry Information System (CRIS)

Online tool for greenhouse gas calculation, reporting, and third-party verification; emissions can be estimated on the basis of sources and fuel type or directly reported

## References

References available online at [expertconsult.com](http://expertconsult.com).

**Patient Handout: Steps You Can Take to Improve Your Health and Reduce Your Carbon Footprint**

**1. Nutrition: Eat more plants and less meat!**

“People should have one meat-free day a week if they want to make a personal and effective sacrifice that would help tackle climate change.”  
 Dr Rajendra Pachauri, chair of the United Nations Intergovernmental Panel on Climate

Fruits and vegetables play a significant role in preventing certain chronic diseases. When compared to people who eat only small amounts of fruits and vegetables, those who eat more generous amounts, as part of a healthy diet, tend to have reduced risk of chronic diseases. To learn more about how many fruits and vegetables you need each day, how to include fruits and vegetables in your daily diet, delicious recipes, and much more, visit: [www.fruitsandveggiesmatter.gov](http://www.fruitsandveggiesmatter.gov).

“Meatless Monday” is a movement with the goal to help reduce meat consumption which is a significant contributor to climate change and chronic diseases. To learn more and join the growing number of individuals, families and institutions pledging to improve their health and the health of our planet go to [www.meatlessmonday.com](http://www.meatlessmonday.com).

**2. Walk more, drive less.**

“The true miracle is not walking on water or walking in air, but simply walking on this earth.”  
 Thich Nhat Hanh Buddhist monk

Automobile use is a significant contributor to climate change, local air pollution, pedestrian injuries, and obesity. Active travel modes such as walking, cycling and using public transport offer great benefits for your health and the environment. One fun way to set goals and increase your motivation is to measure the number of steps you take during the day with a pedometer, a step counter that you wear on your waist. To learn more about how to start a walking program, the benefits of physical activity and how to use a pedometer see: [www.aafp.org/online/etc/medialib/aafp\\_org/documents/clinical/pub\\_health/aim/onestep.Par.0001.File.tmp/OneStepAtATime.pdf](http://www.aafp.org/online/etc/medialib/aafp_org/documents/clinical/pub_health/aim/onestep.Par.0001.File.tmp/OneStepAtATime.pdf)

**3. Healthy habits, less pharmaceuticals**

“One of the first duties of the physician is to educate the masses not to take medicine.”  
 Sir William Osler, MD, “Father of modern medicine”

Pharmaceutical medications are one of the largest contributors to health care’s carbon footprint due to the increased energy it takes to make and transport them. We are using so many pharmaceutical medications that they are even starting to show up in our drinking water. Often times wellness can be maintained and medical conditions can be treated with the use of lifestyle modifications such as physical activity, nutrition, and stress reduction. Discuss with your health care provider how lifestyle approaches can prevent, reduce, or eliminate the need for pharmaceutical medications.

## References

- Committee on Ecological Impacts of Climate Change. *Ecological Impacts of Climate Change*. Washington, DC: National Academy of Sciences; 2009.
- Maryon-Davis A, Gilmore I, Hamilton P. Climate change and health. We must all act now. *BMJ*. 2007;335:1110.
- IPCC. Summary for policymakers. In: Solomon S, Qin D, Manning M, et al, eds. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. New York: Cambridge University Press; 2007.
- Ramaswamy V, Boucher O, Haigh J, et al. Radiative forcing of climate change. In: Houghton JT, Ding Y, Griggs DJ, et al, eds. *Climate Change 2001: The Scientific Basis: Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. New York: Cambridge University Press; 2001:351–416. 0.
- Chung JW, Meltzer DO. Estimate of the carbon footprint of the US health care sector. *JAMA*. 2009;302:1970–1972.
- Sustainable Development Commission. *NHS England carbon emissions: carbon footprinting study*. London; September 2008. [www.sd-commission.org.uk/publications.php?id=816](http://www.sd-commission.org.uk/publications.php?id=816); Accessed 31.10.10.
- Haines A, Patz JA. Health effects of climate change. *JAMA*. 2004;291:99–103.
- Patz JA, Campbell-Lendrum D, Holloway T, Foley JA. Impact of regional climate change on human health. *Nature*. 2005;438:310–317.
- Workplan on Climate Change and Health*. (Document EB124/11). Endorsed by the World Health Organization Executive Board in resolution EB124.R5, 22. January 2009.
- United Nations Environment Programme. *Life Cycle Assessment: What It Is and How to Do It*. Paris: United Nations; 1996.
- United Nations Environment Programme, Division of Technology, Industry and Economics, and Production and Consumption Unit. *Evaluation of Environmental Impacts in Life Cycle Assessment*. Paris: UNEP; 2003.
- Podein RJ, Hernke MT. Integrating sustainability and health care. *Prim Care*. 2010;37:137–147.
- Personal communication with Jeanette W. Chung, PhD, June 21, 2010.
- U.S. Green Building Council. *LEED for Healthcare*. [www.usgbc.org/DisplayPage.aspx?CMSPageID=1765](http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1765); 8.9.10.
- Retzlaff RC. Green building assessment systems: a framework and comparison for planners. *J Am Planning Assoc*. 2008;74:505–519.
- Haapio A, Viitaniemi P. A critical review of building environmental assessment tools. *Environ Impact Assess Rev*. 2008;28:469–482.
- Brook RD, Franklin B, Cascio W, et al. Air pollution and cardiovascular disease: a statement for healthcare professionals from the Expert Panel on Population and Prevention Science of the American Heart Association. *Circulation*. 2004;109:2655–2671.
- Dominici F, Peng RD, Bell ML, et al. Fine particulate air pollution and hospital admission for cardiovascular and respiratory diseases. *JAMA*. 2006;295:1127–1134.
- Trasande L, Landrigan PJ, Schechter C. Public health and economic consequences of methyl mercury toxicity to the developing brain. *Environ Health Perspect*. 2005;113:590–596.
- Neira M, Bertollini R, Campbell-Lendrum D, et al. The year 2008: a breakthrough year for health protection from climate change? *Am J Prev Med*. 2008;35:424–425.
- IMS Press Releases, October 6, 2010. *IMS Health Forecasts Global Pharmaceutical Market Growth of 5-7 Percent in 2011, Reaching \$880 Billion*. [www.imshealth.com/portal/site/imshealth/menuitem.a46c6d4df3db4b3d488f611019418c22a/?vgnnextoid=119717f27128b210VgnVCM100000ed152ca2RCRD&vgnnextchannel=b5e57900b55a5110VgnVCM10000071812ca2RCRD&vgnnextfmt=default](http://www.imshealth.com/portal/site/imshealth/menuitem.a46c6d4df3db4b3d488f611019418c22a/?vgnnextoid=119717f27128b210VgnVCM100000ed152ca2RCRD&vgnnextchannel=b5e57900b55a5110VgnVCM10000071812ca2RCRD&vgnnextfmt=default); Accessed 5.11.10.
- Kohn LT, Corrigan JM, Donaldson MS, eds. *To Err Is Human: Building a Safer Health System*. Washington, DC: National Academy Press; 2000:27.
- Kolpin D, Furlong ET, Meyer MT, et al. Pharmaceuticals, hormones and other organic wastewater contaminants in US water streams, 1999–2000: a national reconnaissance. *Environ Sci Technol*. 2002;36:1202–1211.
- Donn J, Mendoza M, Pritchard J. *AP Probe Finds Drugs in Drinking Water*. [http://www.usatoday.com/news/nation/2008-03-10-drugs-tap-water\\_N.htm](http://www.usatoday.com/news/nation/2008-03-10-drugs-tap-water_N.htm); 2008. Accessed 8.11.10.
- Daughton CG, Ternes TA. Pharmaceuticals and personal care products in the environment: agents of subtle change? *Environ Health Perspect*. 1999;107(suppl 6):907–938.
- Stewart D, Weeks J, Bent S. Utilization, patient satisfaction, and cost implications of acupuncture, massage, and naturopathic medicine offered as covered health benefits: a comparison of two delivery models. *Altern Ther*. 2001;7:66–70.
- Sarnat RL, Winterstein J. Clinical and cost outcomes of an integrative medicine IPA. *J Manipulative Physiol Ther*. 2004;27:336–347.
- Linde K, Allais G, Brinkhaus B, et al. Acupuncture for migraine prophylaxis. *Cochrane Database Syst Rev*. 2009;(1): CD001218. doi:10.1002/14651858.CD001218.pub2. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD001218.pub2>; Accessed 8.11.10.
- Vickers AJ, Rees RW, Zollman CE, et al. Acupuncture for chronic headache in primary care: large, pragmatic, randomized trial. *BMJ*. 2004;328:744.
- Witt CM, Reinhold T, Jena S, et al. Cost-effectiveness of acupuncture treatment in patients with headache. *Cephalalgia*. 2008;28:334–345.
- Holroyd KA, Penzien DB. Pharmacological versus non-pharmacological prophylaxis of recurrent migraine headache: a meta-analytic review of clinical trials. *Pain*. 1990;42:1–13.
- Unger N, Bond TC, Wang JS, et al. Attribution of climate forcing to economic sectors. *Proc Natl Acad Sci U S A*. 2010;107:3382–3387.
- Leopold Center for Sustainable Agriculture. *How far do your fruit and vegetables travel?* [http://www.leopold.iastate.edu/pubs/staff/ppp/food\\_chart0402.pdf](http://www.leopold.iastate.edu/pubs/staff/ppp/food_chart0402.pdf); 2002. Accessed 8.11.10.
- Steinfeld H, Gerber P, Wassenaar T, et al. *Livestock's Long Shadow: Environmental Issues and Options*. Rome: The Food and Agriculture Organization of the United Nations; 2006. [www.fao.org/docrep/010/a0701e/a0701e00.HTM](http://www.fao.org/docrep/010/a0701e/a0701e00.HTM); Accessed 8.11.10.
- Jowit J. Hospitals will take meat off menus in bid to cut carbon. *The Guardian*. January 26, 2009. [www.guardian.co.uk/society/2009/jan/26/hospitals-nhs-meat-carbon](http://www.guardian.co.uk/society/2009/jan/26/hospitals-nhs-meat-carbon); Accessed 10.11.10.
- Jowit J. UN says eat less meat to curb global warming: climate expert urges radical shift in diet. *The Guardian*. September 7, 2008. <http://www.guardian.co.uk/environment/2008/sep/07/food.foodanddrink>; Accessed 10.11.10.
- Wilkinson R, Marmot M. *Social Determinants of Health: The Solid Facts*. 2nd ed. Copenhagen: World Health Organization, Regional Office for Europe; 2003:28. <http://www.euro.who.int/document/e81384.pdf>; Accessed 10.11.10.
- Millennium Ecosystem Assessment. *Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press; 2005. <http://www.millenniumassessment.org/en/About.aspx#1>; Accessed 10.11.10.



# Creating Ceremony and Ritual in the Medical Encounter

Howard Silverman, MD

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## Philosophy

The use of ceremony and ritual has been connected to health and healing across time and cultures. When the scientific revolution began in earnest, the ceremonial roots of the healers' art began to separate from the specific techniques and approaches used by scientifically based clinicians. Increasingly, clinical interventions are focused almost exclusively on the physical aspects of disease. The impact of this approach has been amazing, yet patients and families are left to make sense of the meaning aspects of illness privately. Clinicians face many of the same issues as the amount of time they spend with patients diminishes and administrative, financial, and legal pressures mount.<sup>1</sup> The growth of interest in complementary and alternative therapies during the past 20 years<sup>2,3</sup> reflects, in part, a compensatory movement; that is, patients are seeking ways to recover the sacred as it relates to health and disease. They are eager for better communication with their clinicians, active participation in their treatment, and approaches that value an emphasis on the whole person.<sup>4</sup>

Few conventionally trained clinicians feel comfortable working on this level with patients and families, although notable exceptions can be found in geriatrics and hospice settings.<sup>5,6</sup> Complementary and alternative medicine (CAM) practitioners vary widely as well, although many of the modalities lend themselves to a more ceremonial application. Consider, for example, the scents and ritual involved in massage or acupuncture. Furthermore, CAM practitioners frequently spend more time with their patients, thereby facilitating this level of interaction.

This chapter discusses what is meant by ceremony and ritual; explores the importance of ceremonies and ritual; discusses the underlying structure of ceremonies and rituals,

including examples; and offers specific suggestions for incorporation of ceremony and ritual appropriately into clinical practice.

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## What Do We Mean by Ceremony and Ritual?

It is helpful to define what we mean by the terms *ceremony* and *ritual*.<sup>7,8</sup> They can be defined as follows:

The words “ritual” and “ceremony” are so widely used that they mean many things to different people. Generally, both words refer to processes that separate the ordinary from the extraordinary. Some of these processes are repetitive (“rituals”) and others may be performed only on special occasions (“ceremonies”).<sup>7</sup>

We all perform various rituals many times per day—brushing our teeth or driving to work. Often, we perform these activities on “autopilot.” For example, we may arrive home and not even remember specific locations or turns along the way. Some might call this daydreaming, but it is associated with an altered mental state that may be accompanied by time distortion and amnesia, common counterparts of hypnotic states. Most rituals offer a limited opportunity to suspend the pressures of the day and allow some “downtime.” Activities such as meals are often mere rituals, but they can also be valuable family ceremonies with some minor alterations.<sup>9</sup>

Ceremonies, on the other hand, generally occur only on special occasions, have a specific purpose, and are consciously designed to have beneficial effects. In the space that is created, extraordinary things are allowed to happen, at least for a while. Things can be safely said that might not

otherwise be comfortable to share. Connections can be made that might not occur in day-to-day life. Powerful insight may come in the twinkling of an eye. Yet the paradox is that one can never predict whether such a thing will happen, when it will happen, or how. We offer our intention to forces beyond our understanding but cannot control the outcome. Ceremonies may be derived from family or religious traditions. With the increasingly mobile nature of our culture and resulting disruptions in stable communal life, ceremonies are increasingly becoming lost or fractured. In addition, it is often challenging or inhibiting to find common ground with regard to ceremony, particularly if the participants come from different cultures or religions. Sadly, we increasingly see negative ceremonies, such as gang initiations, replacing functional ceremonies that are rooted in communal life.

Ceremonies provide the opportunity to reframe, reformat, reinvent, and retell the stories through which we orient and explain our lives and are healing not only for patients but for clinicians as well.

The good news is that the human need for ceremony in connection with healing is so strong that ceremonies persist even in conventional medicine. As discussed in more detail later, this statement applies to medical procedures such as surgery and office visits as well as to medical education (e.g., grand rounds or ward rounds). The difficulty, however, is that the meaning and connection have been lost, and therefore these ceremonies no longer retain their full vibrancy and healing potential.

## The Importance of Ceremonies

One view of what is really happening within a ceremony is that first we suspend our ordinary time-space relationships in a safe place. When we do so, the way is opened for extraordinary things to happen. In this protected time-space, we can revitalize our sustaining connections to the truth within ourselves and to things other than ourselves: to people, forests, animals, land, and some things we believe in. Ceremonies provide the opportunity to reframe, reformat, reinvent, and retell the stories through which we orient and explain our lives.

A ceremony usually occurs on a special occasion and has a specific purpose to beneficial effects. During this time, things can be safely discussed that may not be comfortable to share outside the ceremony.

What is ultimately possible is rarely achieved through certainty; more often it takes a “leap of faith.” Ceremonies provide a lens through which we can see things in a new light. They provide the structure by which we can lift our hearts from self-doubt. They provide an access into the world of faith and the human spirit. Ceremonies help provide roadmaps that restore our dreams, express our visions, and give us hope. They give us a time to experience awe, a state in which we lift ourselves out of the ordinary into a different level of consciousness. Awe is the ultimate reminder that we are small and the universe is large. Awe helps us find the faith to move forward.

Two powerful effects of ceremonies are (1) offering an opportunity to exert control over situations and (2) linking members of a community to provide mutual support.

## Control

Individuals who are diagnosed with serious or life-threatening illness face an enormous loss of control in their lives. They lose a sense of predictability over their futures and frequently perceive no choice other than to simply defer to their clinicians' recommendations for diagnosis and treatment. In some cases, they may experience significant loss of function, dignity, or body parts. In wishing to re-exert control over their situation, some may inappropriately reject conventional interventions, often to their detriment. Another option to regain control over a situation like this is to reframe the significance and meaning related to it. For example, a parent may feel helpless to affect the outcome of a disabled child, but even in the face of this situation, he or she can choose to accept the loss and seek whatever good might arise from this situation. This approach advocates not denial of the reality of the situation but, rather, transcendence of the perception that it is hopeless or all bad. Ceremonial interventions can offer a powerful tool to help patients and families cross the chasm from denial toward acceptance while alleviating undue fear, suffering, depression, and dysfunction.

Black Elk, a legendary Oglala Sioux medicine man, lived in the early part of the twentieth century. In his biography of this remarkable man, John Neihardt<sup>10</sup> quotes Black Elk as saying, “A [person] who has a vision is not able to use the power of it until after he has performed the vision on earth for the people to see.” That is, it is not enough to try to think differently about your situation; at some point, you need to act out a new vision before other people. Ceremony is one technique that allows this revisioning to happen. This is not a new concept, as reflected in our legal traditions, such as witnessing or notarizing the signing of important documents. One could argue that witnessing and notarizing are simply legal requirements to prevent fraud, but they nonetheless retain a vestigial ceremonial aspect. Ceremonies are an important tool to reestablish control over difficult situations, and studies support the positive health effects of perceiving that one has control over one's situation. An example is that people in assisted living and care center settings live longer when they have a choice about their food, furniture arrangement, plants, and pets.<sup>11,12</sup>

## Community

Human beings rely on one another for support and interaction. If we were to remove ourselves entirely from contact with others, we would likely die. As mentioned previously, increasing mobility exerts a significant disruptive effect on our communal connections. Paradoxically, we most need community when facing a serious illness, but illness can disrupt a person's communal fabric in many ways:

1. One often experiences a significant diversion of time for medical diagnosis and treatments.
2. The stigma of disease may cause friends and family members to limit or avoid contact.
3. Impairments from acute or chronic conditions may limit one's ability to participate in meaningful communal life.

The second major benefit of ceremonies is that they can act as powerful glue to initiate, renew, and sustain functional communities. The presence of friends and family during a ceremony serves the purpose of witnessing, but there is more to it. Everyone can remember a time when they participated in a ceremony and felt strongly connected to the other participants. It might have been a reunion, a wedding, or participation in team sports. Whatever the circumstance, most people report a strong sense of connection and bonding that persists long after the event is over. The social networks established and maintained in this way are important in maintaining health and even more so in addressing the logistical, emotional, and spiritual effects of illness.

## Structure of Ceremonies

Some ceremonies derive from ancient or family traditions, and others are created to serve a specific purpose. Before the exploration of how ceremonies are put together, it is important to note a few caveats:

- Ceremonies are best used to bring meaning, control, and connection into patients' lives. Under no circumstances should one think of them as inviting some kind of “magical” cure.
- From an ethical and effectiveness perspective, it is crucial that ceremonies remain entirely patient centered, particularly with respect to purpose, process, and symbols.

## Components

One useful way to think about the inner structure of ceremonies is listed in [Box 114-1](#).

### Shared Purpose

It is important that all of the participants of the ceremony understand and share the purpose for the event. This idea should be clarified and communicated clearly and should be realistic. For example, parents of a disabled child may state that they wish to let go of their grief about the disability and move into the future. This is a suitable, clear, and realistic purpose. Saying they want to hold a ceremony to “cure” the child, however, is neither suitable nor realistic.

### BOX 114-1. Components of a Ceremony

Shared purpose  
 Shared preparation  
 Community and facilitator  
 Opening  
 Materials  
   Sacraments  
   Ceremonial objects  
   Ceremonial dress  
 Process  
   Sharing  
   Metaphor and symbols  
   Trance  
   Ceremonial language  
 Closure

### Shared Preparation

There is a practical element to preparation, in that the materials and processes for the ceremony need to be assembled during the preparation phase. Preparation is a time laden with possibility. Relationships can be forged or strengthened as participants work together toward a common purpose. It is also a wonderful opportunity for reflection and introspection. For example, the preparation involved for a wedding is a time for the two families to get to know each other and (it is hoped) work in unison toward a common goal.

### Community and Facilitator

For the ceremony to proceed smoothly, it must have a clearly designated facilitator who keeps people and processes on track. This is usually a person who has experience in such facilitation work and knows how to balance structuring of the unfolding events with being open to new possibilities that might arise. Ideally designated as the purpose is being defined, the facilitator also supervises planning and preparation. The community also must be defined, invited, and, when appropriate, prepared for or involved in the preparation phase. Ceremonies that people drift in and out of are generally not nearly as effective.

### Opening

Because the ceremonial “bubble” is one in which extraordinary things can occur and a different quality of attention is invited from the facilitator and community, it is important to clarify when the ceremony has begun and when it has ended. This clarification can be made in a variety of ways—a reading, a song, lighting of a candle, or greeting the patient as one enters the examination or operating room.

### Materials

#### ■ Sacraments

The word *sacraments* has a special meaning in some religious contexts, but here it is used in a more general way to denote anything that affects the senses. Thus, sacraments can be ingested, felt, heard, or smelled. Of these, olfactory sacraments seem to be the most powerful, an observation that is consistent with the fact that our sense of smell is connected into our limbic systems and bypasses cortical areas. In some cultures, hallucinogens are ingested, and religious ceremonies may involve wine or special foods.

Another manifestation of the erosion of communal ceremonies in modern culture is the widespread abuse of sacraments, particularly tobacco, food, and alcohol. When sacraments are used outside a proper ceremony, their effect is lessened. This process leads to a kind of “sacramental tachyphylaxis,” that is, more and more of the substance must be used to achieve the desired effect, in contrast to a small amount of the substance typically used in a ceremony. Thus, part of the effectiveness of addiction treatment programs such as Alcoholics Anonymous is related to the introduction of functional ceremony in the context of a supportive community.

#### ■ Ceremonial Objects

Ceremonial objects are items usually only used during the ceremony; they may be created during the preparation phase or may be objects used over time for similar purposes. They should be chosen in service of the purpose and process and with sensitivity to the beliefs of the participants. Ceremonial objects that

**TABLE 114-1.** Examples of Nonclinical Ceremonies

COMPONENT	MARRIAGE	SUPER BOWL SUNDAY
Shared purpose	Forge a union between two individuals and two families	Go, team, go!
Shared preparation	Invitations, planning ceremony, food	Inviting friends and assembling food and drink
Community and facilitator	Minister, invited family members	Party host, family, and friends
Opening	Opening processional	Opening kickoff (for some, it's the pregame show)
Materials		
Sacraments	Wine, candles, incense, flowers	Beer
Ceremonial objects	Family bible	A special football
Ceremonial dress	Wedding dress, tuxedos	Team shirts, hats
Process		
Sharing	Vows	Screaming and shouting
Metaphor and symbols	Best man, bridesmaids, processional, rings	The forces of good versus evil
Trance	Sense of a "cocoon"	Frequent as a result of beer and evidenced by football "widows/widowers"
Ceremonial language	Blessings	Technical football jargon and stats
Closure	Recessional and reception	Closing gun

have been used over time or have a strong connection to the past are particularly powerful. Some people might believe that surgeons who become upset if their special instruments are not available are acting "childish"; however, if they are seen as ceremonial objects, the reaction is much more understandable.

#### ■ Ceremonial Dress

Although it is not universal, the facilitator and participants may create or require various types of clothing that serve the purpose and process of the ceremony. Like ceremonial objects, ceremonial dress in most cases is used uniquely in the context of ceremony and may be assembled during the preparation phase. A wedding gown is a good example; imagine the power of wearing one's grandmother's gown or one handmade by a favorite relative. The white coat in medical care is another that is now used in ceremonies "welcoming entering medical students and [which] helps establish a psychological contract for the practice of medicine."<sup>13</sup>

#### Process

##### ■ Sharing

All ceremony involves some kind of sharing, usually in words although not exclusively so. A skilled facilitator will find ways to make sharing happen in a meaningful yet safe way and will give participants multiple options to share. For example, in a traditional Native American talking circle, an eagle feather (= ceremonial object) is passed around the circle of participants, and each is invited to talk if he or she wishes to. One participant in such a circle asked, "What was put in that feather? I fondly remembered things I haven't thought about in years!"

##### ■ Metaphor and Symbols

Humans respond strongly to metaphor and symbols, and a skilled facilitator makes use of this response during the ceremony. For example, in a ceremony to release unrealistic hopes and dreams for a disabled child, the hopes and dreams could be written on paper and burned. This is an area in which knowledge of the patient coupled with creativity and sensitivity can produce significant breakthroughs.

##### ■ Trance

Trance states are frequently involved in ceremonies. In some cultures, trance states may be intentionally induced through the use of hallucinogenic sacraments, drumming, or chanting. These states are frequently associated with a sense of time distortion, focal attention to the events of the ceremony, or amnesia. Trance states often happen in the operating room when excellent surgeons are at work and completely focused on the task at hand.

##### ■ Ceremonial Language

Specialized language that is common to the participants is often used during ceremonies. For example, in traditional religious ceremonies, Latin or Hebrew may be spoken. Interestingly, medical ceremonies have a highly specialized language or jargon, although it is usually not well understood by patients or family members.

#### Closure

See earlier discussion of opening. It is often desirable for the closure to be done in some way that connects with the opening, for example, blowing out a candle lit during the opening for closure with a patient in the examination room.

#### Examples

Examples of how these components apply to common nonclinical and clinical ceremonies are described in [Tables 114-1](#) and [114-2](#). This type of analysis could be applied to a wide variety of clinical procedures and encounters. Observations over time indicate the following:

- There are very few widely shared ceremonies within the United States, with the possible exception of the Super Bowl.
- The common feature of medical ceremonies is the relative lack of sharing with regard to purpose and preparation. This generally results in an unsatisfying and sometimes unproductive experience for both the clinician and the patient.

**TABLE 114-2. Clinical Ceremonial Examples**

COMPONENT	CHILDBIRTH	SURGERY
Shared purpose	Have a healthy baby, decrease pain, and minimize morbidity	Patient and surgeon may have varying understandings of the purpose of the surgery
Shared preparation	Extensive—prenatal care	Usually separate—patient is in preoperative area and surgeon is elsewhere
Community and facilitator	Obstetrician usually facilitates; patient, coach, family, and labor and delivery staff	Family and operating room crew Facilitator may be surgeon, anesthesiologist, or scrub nurse, depending on who you ask
Opening	Variable—onset of contractions, admission to labor and delivery unit	Surgical incision
Materials		
Sacraments	Pain medications, music	Preoperative and intraoperative medications Coffee for operating room staff
Ceremonial objects	Forceps when necessary	Surgeon's special instruments, other
Ceremonial dress	Special gowns	Scrubs, hospital gowns
Process		
Sharing	Entire delivery process is a team effort Many times, there is sharing of support, hopes, excitement	Very little
Metaphor and symbols	Many possibilities, e.g., asking father to cut umbilical cord	Very little
Trance	Definitely on the part of mother	Focused awareness, particularly noted in experienced surgeons
Ceremonial language	Medical jargon, but language often learned in prenatal visits and delivery training courses	Technical jargon
Closure	Crying of baby	Suture of incision

- Childbirth and a hospice death are two of the few medical ceremonies that continue to involve extensive sharing of purpose and preparation, and they remain a revitalizing and meaningful experience for both patient and clinicians.
- Almost any ceremony, medical or otherwise, can be renovated to make it more meaningful and effective (see next section).

## Incorporating Ceremony and Ritual in Your Practice

Some clinicians may wish to engage their patients in the planning, preparation, and execution of formal ceremonies. Although most do not prefer to be in a position to do so, some lessons can be learned from ceremonial practice. These lessons can be easily and innocuously incorporated into clinical practice as follows.

1. Clinical scenarios in which these techniques are most applicable include
  - a. The diagnosis of a life-threatening illness, such as cancer, heart disease, or multiple sclerosis
    - (1) It is critical to assist the patient in gaining a sense of control over the situation and to prepare him or her for the road ahead.
    - (2) Even without a ceremony, it is helpful to help the patient identify the major things he or she has lost as a result of this diagnosis and, for each of these, what he or she might gain as a result.
  - b. Preparation for a significant surgical or diagnostic procedure
2. Reflect on what you do with patients every day, and consider how you might use this information to enliven these interactions. Small things can make a big difference.
  - a. For procedures, enquire whether the patient has some special music he or she would like played or an article of clothing he or she would like to wear that would not interfere with the procedure.
  - b. During office visits, have your staff allow the patient to sit in a chair while waiting for you, and take each history eye to eye with the patient. When examination time comes, moving the patient onto and then off of the table invites a sense of opening and closing. See [Table 114-3](#) for a more detailed set of suggestions regarding office visits.
  - c. Take a few deep breaths before entering the examination room, while reviewing the chart, or while washing your hands before an examination or procedure.
  - d. Empower patients and staff to create appropriate rituals and ceremonies when it feels appropriate to do so.
3. Ceremonies are by definition healing not only for patients but for clinicians as well.
  - a. Some medical clinics and offices have chosen to create and hold periodic office healing ceremonies focused on the well-being of clinicians and staff.
  - b. When appropriate, attending patient life cycle rituals (weddings, births, funerals) can be healing for both the clinician and the family.
4. Experiment in your personal and professional arenas, and invite in the extraordinary and unexpected!



**TABLE 114-3.** Creating Ceremony Around the Healing-Oriented Office Visit

COMPONENT	OFFICE VISIT AS IT NOW IS	HEALING-ORIENTED OFFICE VISIT
Shared purpose	May or may not be mutually reviewed and fixed at the beginning of the office visit Often, nurse writes chief complaint on chart	Create the intention that this visit will focus on getting at the root of the problem
Shared preparation	Initial or interval history	Encourage the patient to tell “your story”
Community and facilitator	Clinician usually acts as facilitator; community is patient and anybody else in examination room	Encourage patient to invite key family and friends, and greet and acknowledge them individually
Opening	Door opening and initial greeting	Offer a moment of silence, reflection Reinforce the purpose by indicating that this is a visit to heal rather than to cure
Materials		
Sacraments	Smells of examination room, cold stethoscope, funky paper gowns	Create a warm and welcoming environment to facilitate introspection (indirect lighting, soft warm colors, comfortable seating)
Ceremonial objects	Otoscope, stethoscope, prescription pad	Encourage the patient, family, and friends to bring objects that are healing symbols for them Use a candle in a talking circle if appropriate
Ceremonial dress	Funky paper gown, white coat	The white coat still holds great power, but avoid the paper gowns
Process		
Sharing	Interactivity during visit	Discussion of what really matters to the patient
Metaphor and symbols	Limited—kind touch, language	Variable—see ceremonial objects
Trance	Limited	Encourage with periods of silence; these do not have to be long or uncomfortable but should be long enough to allow some reflection and “settling” of thoughts and feelings
Ceremonial language	Medical jargon, dosing	Consider inviting affirmations or prayer if appropriate and comfortable
Closure	Leaving examination room	Handshakes, but hugs preferred if appropriate and comfortable

## References

References are available online at [expertconsult.com](http://expertconsult.com).

## References

1. Williams ES, Konrad TR, Linzer M, et al. SGIM Career Satisfaction Study Group. Physician, practice, and patient characteristics related to primary care physician physical and mental health: results from the Physician Worklife Study. *Health Serv Res.* 2002;37:121–143.
2. Eisenberg DM. Unconventional medicine in the United States. *N Engl J Med.* 1993;328:246–252.
3. Eisenberg DM, Davis RB, Ettner SL, et al. Trends in alternative medicine use in the United States, 1990–1997: results of a follow-up national survey. *JAMA.* 1998;280:1569–1575.
4. Vincent C. Why do patients turn to complementary medicine? An empirical study. *Br J Clin Psychol.* 1996;35:37–48.
5. Running A, Tolle LW, Girard D. Ritual: the final expression of care. *Int J Nurs Pract.* 2008;14:303–307.
6. Romanoff BD, Thompson BE. Meaning construction in palliative care: the use of narrative, ritual, and the expressive arts. *Am J Hosp Palliat Care.* 2006;23:309–316.
7. Hammerschlag C, Silverman H. *Healing Ceremonies: Creating Personal Rituals for Spiritual, Emotional, Physical and Mental Health.* New York: Perigee Books; 1997.
8. Farmer S. *Sacred Ceremony: How to Create Ceremonies for Healing, Transitions, and Celebrations.* Carlsbad, CA: Hay House; 2002.
9. Silverman H. Nutrition and ceremony. *Explore (NY).* 2006;2:60–61.
10. Neihardt JG. *Black Elk Speaks.* New York: Washington Square Press; 1959.
11. Langer EJ, Rodin J. The effects of choice and enhanced personal responsibility for the aged. *J Pers Soc Psychol.* 1976;34:191–198.
12. Rodin J. Aging and health: effects of the sense of control. *Science.* 1986;233:1271–1276.
13. The Arnold P. Gold Foundation. *White Coat and Student Clinician Ceremonies.* <http://humanism-in-medicine.org/intros/gCeremonies-Rituals.html>; Accessed 04.01.12.



# Appendix



# Laboratory Testing Resources in Integrative Medicine

David Rakel, MD

TEST	EXPLANATION	LABORATORY
<b>Aging/Resiliency Markers</b> Telomere length	Telomere length is given in relation to age group averages.	SpectraCell Laboratories
<b>Digestion/Nutrition</b> Stool culture and analysis	Digestive stool analysis includes a number of stool markers to assess digestion, absorption, metabolism, pancreatic function, inflammation, and fecal flora.	Doctors Data, Inc. Genova Diagnostics MetaMetrix
Intestinal permeability	This double sugar test measures the variable absorption of lactulose and mannitol after a challenge drink to measure permeability and absorption.	Doctor's Data, Inc. Genova Diagnostics
Small bowel bacterial overgrowth	A lactulose challenge test measures gas production (hydrogen and methane) during 2 hours to determine the level of bacterial fermentation in the distal small intestine.	Genova Diagnostics
Lactose intolerance	A lactose challenge test measures gas production to determine if lactose is digested properly.	EnteroLab
Micronutrient testing	Assesses the level and function of specific nutrients in blood	Doctor's Data, Inc. SpectraCell Laboratories
<b>Essential Fatty Acids</b> Plasma fatty acids	Rapid turnover will be an indication of current fatty acid intake; also allows assessment of triene/tetraene ratio.	MetaMetrix Nutrasource Diagnostics
Red blood cell fatty acids	Measure of erythrocyte cell membrane fatty acids will assess fatty acid intake in the past 2 to 4 months. Correlated with cardiovascular disease risk	Doctor's Data, Inc. Genova Diagnostics
<b>Environmental Testing</b> Drinking water	Evaluates water for heavy metals, fluoride, and pH	Doctor's Data, Inc.
Environmental pollutants	Tests urine for levels of common environmental pollutants, such as xylene, styrene, paraben, and phthalates	US BioTek
<b>Heavy Metals</b> Hair	Although considered of unknown value, these tests have been used for the past 25 years by the Environmental Protection Agency to monitor environmental changes in toxic metals.	Doctors Data, Inc. Genova Diagnostics MetaMetrix

TEST	EXPLANATION	LABORATORY
Urine	Random and timed urine tests can also provide another indication of exposure. This test is particularly important as a baseline evaluation before a chelating agent is given to determine total body burden.	Doctors Data, Inc. Genova Diagnostics MetaMetrix
Post-provocation urine	Chelating agents, including EDTA (to bind lead) and DMSA or DMPS (to bind mercury), are given before a timed urine test to assess total body burden of a given heavy metal. This is useful to monitor treatment in an individual, but post-provocation reference ranges are not available.	Doctors Data, Inc. Genova Diagnostics MetaMetrix
<b>Hormones</b>		
Salivary/adrenal	Salivary hormone levels of DHEA and cortisol measure free hormone availability and have been demonstrated to correspond with adrenal function	Diagnos-Techs Genova Diagnostics MetaMetrix ZRT Laboratory
Salivary/female	Salivary hormone levels of progesterone, testosterone, and estradiol have been normalized and correlate with free hormone availability. Data on changes in salivary levels in the setting of hormone therapy make it unclear as a tool for monitoring treatment levels.	Diagnos-Techs Genova Diagnostics ZRT Laboratory
Serum/hormone metabolites	Ratio of 2-hydroxyestrone/16-hydroxyestrone in blood has been demonstrated in the Women's Health Initiative cohort to be predictive of recurrence of breast cancer.	Genova Diagnostics
Urine/hormone metabolites	Ratio of 2-hydroxyestrone/16-hydroxyestrone in urine has been correlated with risk of breast cancer (low) and risk of osteoporosis (high).	Genova Diagnostics Meridian Valley Laboratory MetaMetrix Rocky Mountain Analytical US BioTek
<b>Immunology</b>		
Immune function	Flow cytometry evaluation of NK-cell function as well as presence/activity of immune cells and cytokines	ImmunoSciences Lab
Food allergies	Measures of IgE and IgG activation in the presence of various food antigens; IgE = allergic reaction, IgG = intolerance	ALCAT Elisa/ACT Genova Diagnostics Immuno Laboratories ImmunoSciences Lab Meridian Valley Laboratory MetaMetrix Rocky Mountain Analytical US BioTek
NutriGenomics	Broad-based term to represent genomic testing performed that highlights individual biochemical needs for particular macronutrients, micronutrients, and medications. It is experimental at this point because no outcome studies have demonstrated clinical validity.	Genova Diagnostics SpectraCell Laboratories
<b>Oxidative Stress Markers</b>		
Lipid peroxides, isoprostane, 8-hydroxydeoxyguanosine	Markers of oxidative end-tissue damage to fats, proteins, and DNA	Brunswick Laboratories Genox Corporation Genova Diagnostics MetaMetrix
Glutathione, total antioxidant capacity (TAC)/total reactive antioxidant potential (TRAP), superoxide dismutase	Markers of capacity to deal with oxidative stress	Brunswick Laboratories Genox Corporation Genova Diagnostics

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852 South Military Trail  
Deerfield Beach, FL 33442  
800-872-5228  
[www.alcat.com/](http://www.alcat.com/)

Brunswick Laboratories  
6 Thacher Lane  
Wareham, MA 02571  
508-291-1830  
[www.brunswicklabs.com](http://www.brunswicklabs.com)

Diagnos-Techs  
6620 S 192nd Place, Bldg J  
Kent, WA 98032  
800-878-3787  
[www.diagnostechs.com](http://www.diagnostechs.com)

Doctor's Data, Inc.  
3755 Illinois Avenue  
St. Charles, IL 60174-2420  
800-323-2784  
[www.doctorsdata.com](http://www.doctorsdata.com)

ELISA/ACT Biotechnologies  
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EnteroLab  
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[www.enterolab.com](http://www.enterolab.com)

Genova Diagnostics  
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Immuno Laboratories  
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ImmunoSciences Lab  
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[www.meridianvalleylab.com](http://www.meridianvalleylab.com)

MetaMetrix Clinical Laboratory  
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Norcross, GA 30092  
800-221-4640  
[www.metametrix.com](http://www.metametrix.com)

Nutrasource Diagnostics  
519-824-4120 x 58817  
[www.omega3testing.com](http://www.omega3testing.com)

Rocky Mountain Analytical  
Unit A, 253147 Bearspaw Road NW  
Calgary, Alberta  
Canada T3L 2P5  
403-241-4513  
[www.rmalab.com/](http://www.rmalab.com/)

SpectraCell Laboratories  
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800-227-5227  
[www.spectracell.com/](http://www.spectracell.com/)

US BioTek  
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Seattle, WA 98133  
877-318-8728  
[www.usbiotek.com](http://www.usbiotek.com)

ZRT Laboratory  
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Beaverton, OR 97006  
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[www.salivatest.com](http://www.salivatest.com)

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