

This material is protected by U.S. copyright law. Unauthorized reproduction is prohibited.
To purchase quantity reprints or request permission to reproduce multiple copies, please e-mail reprints@ons.org.

Herbs or Natural Products That Protect Against Cancer Growth

Part Three of a Four-Part Series

Muriel J. Montbriand, PhD, RN

Purpose/Objectives: To provide evidence-based research information about 47 herbs and natural products that have the potential to protect against the development of cancer.

Data Sources: Natural Medicines Comprehensive Database and Lawrence Review of Natural Products–Monograph System. Information about these herbs has been found in evidence-based studies cited in the references.

Data Synthesis: Early research shows that some herbs and natural products appear to have the potential to prevent cancer growth.

Conclusions: This preliminary evidence may be useful to healthcare professionals or patients who are concerned about cancer.

Implications for Nursing: Oncology nurses who receive this information can become resources for patients or other healthcare professionals.

Consumers and patients with cancer take numerous alternative products to protect themselves from cancer. Evidence indicates that use of alternative products is as high as 89% among all patients and consumers (Eisenberg et al., 1993, 1998; Ernst, 2000a, 2000b; Ernst & Cassileth, 1998; Montbriand, 1994, 1995a, 1995b, 1997, 2000b; Perlman, Eisenberg, & Panush, 1999; Sparber et al., 2000; Sparber & Wootton, 2001; White, 2002). Yet research has shown that only 3% (4 of 150) of nurses, doctors, and pharmacists believed that they had adequate information to give to patients about alternative products (Montbriand, 2000a, 2000b). Conversely, 97% (146 of 150) of these healthcare professionals indicated a willingness to be resources if they could have evidence-based information that was available, succinct, and in one place. This review article provides evidence-based information from preliminary research to assist healthcare professionals' endeavors as resources for patients as well as others.

This is the third article in a four-part series dedicated to providing information about herbs and natural products for healthcare professionals in clinical oncology. The target herbs and natural products are those that may protect

Key Points . . .

- ▶ Some herbs and natural products may protect against cancer growth.
- ▶ The best protection against cancer may be a dietary pattern that emphasizes fruits, vegetables, grains, and beans and limits meats, dairy products, and high-fat foods.
- ▶ Oncology nurses can become better resources for healthcare professionals and patients regarding herbs and natural products.

against cancer growth. The target group for this article is individuals who do not have cancer but are concerned about its development.

As indicated in previous parts of this series, some overlap in categories should be expected because early evidence (especially in vivo and in vitro evidence) often shows contrary results. In Part I (Montbriand, 2004a), fish oils containing vitamins A and D and omega-3 fatty acids are indicated to have a potential role in decreasing cancer growth. In this article, vitamin A and D are indicated for their potential to protect against cancer. The same will be found for soy in Part II (Montbriand, 2004b), which is focused on products with the potential to increase cancer growth. Soy also appears in this

Muriel J. Montbriand, PhD, RN, is an associate professor in the College of Nursing and a research associate in applied research/psychiatry in the College of Medicine at the University of Saskatchewan in Saskatoon, Canada. During this work, the author was a recipient of two Health Services Utilization and Research Commission, Socio-Health Grants, in Saskatoon. (Mention of specific products and opinions related to those products do not indicate or imply endorsement by the Oncology Nursing Forum or the Oncology Nursing Society.)

Digital Object Identifier: 10.1188/04.ONF.E127-E146

article because it has the potential to protect against cancer. This overlap occurs because this series targets two specific groups, individuals who have cancer (Parts I and II) and individuals who do not have cancer (Part III). For each target group, the aim is to identify herbs and natural products with the potential for or against cancer growth. For example, if a woman with breast cancer takes soy, she increases her risk of cancer growth. If a woman who does not have cancer takes soy, she protects herself against cancer.

For this article, the names of herbs and natural products have been selected from listings in the Natural Medicines Comprehensive Database (2004) and Lawrence Review of Natural Products—Monograph System (Facts and Comparisons, 2001). Evidence about these herbs has been found in the studies cited in the references. Other products that interact positively with cancer may exist; however, this review includes only herbs and natural products recognized by the authors, professionals, or advisory boards of these two sources.

Most of the studies cited are in vitro studies, performed in glass on tissue from a living organism, or in vivo studies, performed on tissue not removed from a living organism (animal studies). Most studies have not advanced to clinical trials on humans. The few human studies cited are preliminary clinical trials. Therefore, although results seem favorable or unfavorable, treat these findings with caution.

Neither the author nor publisher makes any medical claims for any of the herbs or natural products in this review or the tables. This is informational literature. Note that some of the herbs described are deadly poisons and some are extremely dangerous.

The American Cancer Society (ACS) 1996 Advisory Committee on Diet, Nutrition, and Cancer Prevention (1996) recommended the dietary intake of more fruits and vegetables to lower the risk of cancer. ACS also indicated that no evidence supports the use of additional vitamin supplements to protect against cancer. Remarkably, many of the herbs and natural products currently investigated and indicated in this article are common foods, reinforcing ACS's stance and providing an update to the society's work.

Table 1 provides names of herbs and natural products discussed in the text. Common names as well as brand names and manufacturers are included. Some products have numerous brand names, making a complete listing prohibitive. The number of brand names found also is included in the table. When a brand name contains only one ingredient, it often bears the product's common name. Single-ingredient products are identified in Table 1. Other brands with numerous ingredients also are indicated. Products with single ingredients should be favored over those with multiple ingredients because as the number of ingredients increases, so does the number of possible side effects. Table 1 can be used as a quick reference to find product names or equivalent common names. The following provides additional information on each herb or natural product.

Herbs and Natural Health Products

Alpha-linolenic acid, which has the same scientific name, is used to treat numerous conditions such as renal disease, migraine headaches, and skin cancer. Individuals also use it to prevent cardiovascular disease and other cancers (Klein et al., 2000; Simopoulos, 1999). Women with higher levels of alpha-

linolenic acid in breast adipose tissues have a lower risk of cancer, leading researchers to propose that this acid may have a protective effect (Klein et al.). However, high intake of this acid may cause prostate cancer (Colditz, 2000; De Stefani, Deneo-Pellegrini, Boffetta, Ronco, & Mendilaharsu, 2000; Freeman et al., 2000; Gann et al., 1994; Giovannucci et al., 1998; Harvei et al., 1997; Ramon et al., 2000). Kolonel, Nomura, and Cooney (1999) and Ramon et al. have speculated that prostate cancer may be attributed to high animal fat intake and consumption of red meat and dairy products, which contain alpha-linolenic acid. Patients and consumers should not be concerned about moderate dietary intake of alpha-linolenic acid. A daily diet containing 1.2–2 g of alpha-linolenic acid seems to prevent coronary heart disease (Ascherio et al., 1996; Christensen, Christensen, Toft, Dyerberg, & Schmidt, 2000; Hu et al., 1999). Self-medication beyond 1.2–2 g of alpha-linolenic acid to prevent breast cancer may impart a risk. See Table 2 for adverse effects.

American pawpaw has a scientific name of *Asimina triloba*, which is synonymous with *Annona triloba*. According to Gruenwald, Brendler, and Jaenicke (1998), this herb is used to treat fever, vomiting, and oral inflammation. Highly cytotoxic acetogenin constituents have been found in American pawpaw, and preliminary studies show that some acetogenins have activity against certain lung and breast cancers (He et al., 1997). Adverse reactions include nausea and urticaria (Gruenwald et al.). No standard dosage is available (Natural Medicines Comprehensive Database, 2004).

Apple has a scientific name of *Malus sylvestris*. Individuals use apples for many conditions from cleaning their teeth to treating diarrhea, constipation, fever, and cancer. The antioxidant flavonoid quercetin in apples seems to have a protective property against lung cancer. This finding was reported by Butland, Fehily, and Elwood (2000), who examined 2,512 individuals' lung functions and diets, and by another group of researchers who compared diet items of 582 individuals with lung cancer to diet items of 582 control participants (LeMarchand, Murphy, Hankin, Wilkens, & Kolonel, 2000). Although apples are considered safe when taken as a dietary fruit source, the seeds contain hydrogen cyanide that is released, generated, or liberated when mixed with saliva. Duke (1987) reported the death of a man who ingested a cup of apple seeds. Stones and seeds of fruit naturally contain two parts glucose, one part benzaldehyde (mildly poisonous), and one part cyanide (Herbert, 1981). The most common dose for self-medication appears to be 500 mg apple pectin capsules (Natural Medicines Comprehensive Database, 2004).

Asparagus has a scientific name of *Asparagus officinalis*. People often self-medicate with this vegetable for urinary conditions (Blumenthal et al., 1998). Fibers from asparagus have a mutagen-absorbing (cancer-preventing) activity (Leung & Foster, 1996). Asparagus can cause mucous membrane irritation (Tyler, Brady, & Robbers, 1981). A typical dosage is prepared as a tea using 40–60 g of cut asparagus root (Blumenthal et al.). Self-medication doses have not been made available.

Barley, with a scientific name of *Hordeum distychum* or *Hordeum vulgare*, is used to prevent cancer. Barley also is used for bronchitis, diarrhea, and gastrointestinal conditions and to lower blood sugar, cholesterol, and lipid levels (Facts and Comparisons, 2001). Studies show a reduction of colon cancer risk in barley-fed rats (Facts and Comparisons). Barley and barley dust can cause asthma and allergic reactions for sensitive individuals (Natural Medicines Comprehensive

Table 1. Herbs and Natural Products With the Potential to Protect Against Cancer Growth: Common and Brand Names

Herb or Natural Product	Brand Name and Manufacturer or Other
Alpha-linolenic acid Other names: ALA, essential fatty acid, LNA, n-3 fatty acid, n-3 polyunsaturated fatty acid, omega-3 fatty acid, omega-3 polyunsaturated fatty acid	Flax Seed Oil 1,000 mg (Jamieson) ^a Flax 1,000 mg (Jamieson) ^a Flax Seed Oil (Mass Quantities, Inc.) ^b Complete Essential Fatty Acids (Source Naturals) ^b 51 brand names found
American pawpaw Other names: custard apple, dog banana, pawpaw	No brand names found
Apple No other names	Apple Cinnamon Celebration–Revival (Physicians Laboratories) ^b Blood Pressure (Nutrivention) ^b Fruitplex (HealthWatchers System) ^b Juice Plus + Orchard Blend (NSA International) ^b Standardized Cider Vinegar With Apple Pectin (The Vitamin Shoppe) ^b 67 brand names found
Asparagus Other names: Asparagi rhizoma root, Asperge, garden asparagus, sativari, spargelkraut, spargelwurzelstock, sparrow grass	Asparagus Extract (PhytoPharmica) ^a Herbaretic (Suddenly Slender) ^b Yin-Yang Beautiful Lady (Flora, Inc.) ^b Phytototality (PhysioLogics) ^b 22 brand names found
Barley Other names: dietary fiber, Hordeum, mai yya, pearl barley, pot barley, Scotch barley	Blast of Grass (Green Foods Corp.) ^a Berry Barley Essence (Green Foods Corp.) ^b Collect-All (Nature's Plus) ^{b, c} 91 brand names found
Beta-sitosterol Other names: angelicin, beta sitosterin, beta sitosterol, betasitosterol, beta-sitosterol glucoside, beta-sitosterol glycoside, B-sitosterol 3-B-D-glucoside, B-sitosterolin, cinchol, cupreol, phytosterols, plant sterols, quebrachol, rhamnol, sitosterin, sitosterol, sitosterolins, sitosterols, sterinol, sterolins, 24-ethyl-cholesterol	#132 Flx Vegetable Omega-3 Flax Seed Oil (Systemic Formulas) ^b DHEAX (HealthWatchers System) ^b Earthmends Breast Health Program (Cancer Wellness Institute) ^b Testosterone Fuel Booster (TwinLab) ^b Wild Yam Extract (PhytoPharmica) ^b 45 brand names found
Bifidobacteria Other names: B. bifidum, bifido, bifidobacteria bifidus, bifidobacterium, bifidum, probiotics	Acidophilus Super Strain (Jamieson) ^b Friendly Flora (Nutri-Quest) ^b From the Earth (The Vitamin Shoppe) ^b Probacillus Plus (Allergon AB) ^b 26 brand names found
Black seed Other names: ajenuz, ara uel, baraka, black caraway, black cumin, charnuska, cominho negro, cominho-negro, fennel flower, fitch, love in a mist, nigelle de crete, nutmeg flower, Roman-coriander, schwarzk mmel, toute pice	No brand names found
Blond psyllium Other names: blond plantago, dietary fiber, Englishman's foot, Indian plantago, ispaghula, ispagol, pale psyllium, Plantaginis ovatae semen, Plantaginis ovatae testa, psyllium, sand plantain, spogel	Psyllium (Secrets of the Psyllium and Orange-Flavored Psyllium Powder) (Trader Joe's) ^a #14 Colon (Systemic Formulas) ^b 62 brand names found
Blueberry Other names: highbush blueberry, hillside blueberry, lowbush blueberry, rab-biteye blueberry	PhytoFruit Concentrates (Now) ^b Glucoril (PhytoPharmica) ^b Earthmends Total Health Program (Cancer Wellness Institute) ^b Dia-Comp (Enzymatic Therapy) ^b 25 brands found

(Continued on next page)

^a This herb or natural product is the only ingredient in this brand.

^b This brand name is an example of a product in which the herb or natural product is included along with other herbs and products. Monitor for all possible side effects of all ingredients in these products.

^c Safety of this product is a concern. The product contains animal material, possibly diseased animals that may harbor bovine spongiform encephalopathy (i.e., mad cow disease).

^d This product contains androstenedione that can increase estrogen levels. Side effects for men may include acne, behavior changes, testicular atrophy, and gynecomastia (King et al., 1999). This product does not increase testosterone levels or significantly improve muscle strength (Brown et al., 2000).

Table 1. Herbs and Natural Products With the Potential to Protect Against Cancer Growth: Common and Brand Names (Continued)

Herb or Natural Product	Brand Name and Manufacturer or Other
Cabbage	Veg-Easy (Progressive Labs) ^b
Other names: colewort	Nature's Life Greens Capsule (Nature's Life) ^b
	21 brand names found
Canthaxanthin	Astaxanthin Complex (Solgar) ^b
Other names: canthaxanthine, carophyll red, CI food orange 8, color index number 40850, E161, roxanthin red 10	1 brand name found
Chaparral	Chaparral and Red Clover (Dial Herbs) ^b
Other names: creosote bush, greasewood, hediondilla, jarilla, larreestat	Herp-Eeze™ (Olympian Labs) ^b
	Hoxsey Formula (The Herbalist) ^b
	T-ACN (Dial Herbs) ^b
	17 brand names found
Choline	#115 BSV Vitamin B Stress Complex (Systemic Formulas) ^{b, c}
Other names: choline bitartrate, choline chloride, intrachol, lipotropic factor	#150 PRO Nutro Protein (Systemic Formulas) ^{b, c}
	#62 LS Liver Stimulant (Systemic Formulas) ^{b, c}
	406 brand names found
Chrysanthemum	Earthmends Breast Health Program (Cancer Wellness Institute) ^b
Other names: florist's chrysanthemum, ju hua, mum	Immunoboost (Shawnee Moon) ^b
	Red Dragon Cold and Flu Relief (Jamieson) ^b
	Udo's Choice Beyond Greens (Flora, Inc.) ^b
	12 brand names found
Conjugated linoleic acid	Conjugated Linoleic Acid 1,000 mg 70% (Now) ^a
Other names: CLA, linoleic	Tonalin 1,000 (Source Naturals) ^a
	Ati-F (Atrium Inc.) ^b
	Trim Advantage Weight Management Support Pack (Nutrilite) ^b
	Myoplex Plus Deluxe (EAS) ^b
	17 brand names found
Cranberry	Cranberry (Pharmanex) ^a
Other names: American cranberry, arandano Americano, arandano trepador, European cranberry, goose moosebeere, kranbeere, moosebeere, mossberry, ronce d'Amerique, trailing swamp cranberry, tsuru-kokemomo	Cranberry Juice Maximum Concentrate (Jamieson) ^a
	Cranberry + (PhysioLogics) ^b
	Cranberry (Aspen Group, Inc.) ^b
	Cranberry Basic Nutrition (GNC) ^b
	Cranberry (Leiner Health Products) ^b
	Cranberry 1,000 mg Concentrated, GNC Herbal Plus (GNC) ^b
	Cranberry Concentrate (Now) ^b
	Cranberry Concentrate (Schiff) ^b
	Cranberry Juice Concentrate 1,000 mg (Jamieson) ^b
	CranExtra (Enzymatic Therapy) ^b
	Ultra Cranberry 1,000 (Nature's Plus) ^b
	78 brand names found
Folic acid	Folic Acid (GNC) ^a
Other names: B complex vitamin, folacin, folate, vitamin B ₉	Folic Acid 0.4 mg (Jamieson) ^a
	Folic Acid 1 mg (Jamieson) ^a
	Folic Acid 400 mcg, GNC A-Z (GNC) ^a
	Folic Acid 800 mcg, GNC A-Z (GNC) ^a
	B-Complex (Nutri-Quest) ^b
	Folic Acid (Leiner Health Products) ^b
	Folic Acid (Nature's Bounty) ^b
	Folic Acid (Source Naturals) ^b
	Folic Acid 400 mcg (Schiff) ^b
	Folic Acid Dophilus Plus B-12 (Dial Herbs) ^b
	Foltx (Pan American Laboratories, Inc.) ^b
	826 brand names found

(Continued on next page)

^a This herb or natural product is the only ingredient in this brand.

^b This brand name is an example of a product in which the herb or natural product is included along with other herbs and products. Monitor for all possible side effects of all ingredients in these products.

^c Safety of this product is a concern. The product contains animal material, possibly diseased animals that may harbor bovine spongiform encephalopathy (i.e., mad cow disease).

^d This product contains androstenedione that can increase estrogen levels. Side effects for men may include acne, behavior changes, testicular atrophy, and gynecomastia (King et al., 1999). This product does not increase testosterone levels or significantly improve muscle strength (Brown et al., 2000).

Table 1. Herbs and Natural Products With the Potential to Protect Against Cancer Growth: Common and Brand Names (Continued)

Herb or Natural Product	Brand Name and Manufacturer or Other
<p>Forskolin Other names: borforsin, colecus forskohlii, coleus forskohlii, coleus forskolii, colforsin, colius forskolii, forskolin, HL-362, L-75-136B</p>	<p>Coleus Forskohlii Extract (Enzymatic Therapy)^a Forskolin Extract (PhytoPharmica)^a Elemax (Naturadoc)^b 16 brand names found</p>
<p>Fructo-oligosaccharides Other names: beta-D-fructofuranosidase, chicory inulin hydrolysate, FOS, fructo oligo saccharides, fructooligosaccharides, inulin hydrolysate, oligofructose, oligosaccharides, prebiotic, SC-FOS, short chain fructo-oligosaccharides</p>	<p>Colon Cleanser Daily (Health Smart Vitamins)^b FOS Daily (Health Smart Vitamins)^b FiberWise (Melaleuca)^b 62 brand names found</p>
<p>Garlic Other names: aged garlic extract, ail, ajo, allii sativi bulbus, allium, camphor of the poor, clove garlic, garlic clove, poor man's treacle, rust treacle, stinking rose</p>	<p>Garlic (Olympian Labs)^a Garlic (Pharmanex)^a Garlic Allicin-Rich (Life Brand)^b Garlic Plus (Aspen Group, Inc.)^b Garlic Complex (Shaklee)^b Garlic EC (USANA Health Sciences)^b Garlite (Nature's Plus)^b 239 brand names found</p>
<p>Glucomannan Other names: konjac, konjac mannan</p>	<p>Atri-Glucomannan (Arrium Inc.)^a Glucomannan 500 mg (Natrol)^b Glucomannan+ (Swanson)^b Multi Fiber Complex (Naturade)^b 23 brand names found</p>
<p>Green tea Other names: Chinese tea, tea, teagreen</p>	<p>Green Tea Extract (HealthWatchers System)^a Green Tea Extract (PhytoPharmica)^a Green Tea Extract (Olympian Labs)^a Green Tea Extract (Nutraceutical Sciences Institute)^a Green Tea Formula GT80 (Jamieson)^b Green Max Power (Swanson)^b Green Tea Complex (Leiner Health Products)^b Green Tea Extract (Nature's Way)^b 287 brand names found</p>
<p>Indole-3-carbinol Other names: indole, indole 3 carbinol, I3C, 3-(hydroxymethyl), 3-hydroxy-methyl indole, 3-(hydroxymethyl) indole, 3 indolylcarbinol</p>	<p>Andro-6 (EAS)^{b, d} Androboic (ProLab)^b Andotesten (MuscleTech)^{b, d} Mixed Vegetables (Nature's Plus)^b Solaray Indole-3-Carbinol (Nutraceutical Corp.)^b 8 brand names found</p>
<p>Jiaogulan Other names: adaptogen, amachazuru, dungkulcha, fairy herb, gynostemma, immortality herb, jiao gu lan, miracle grass, penta tea, Southern ginseng, xianxao</p>	<p>New to traditional Chinese medicine, this plant grows wild in south central China. Sometimes referred to as Southern ginseng, this plant is not of the Ginseng genus (Natural Medicines Comprehensive Database, 2004). No brand names found</p>
<p>Lavender Other names: alhucema, common lavender, English lavender, French lavender, garden lavender, Spanish lavender, spike lavender, true lavender</p>	<p>Chaste Tree–Siberian Ginseng Virtue (Blessed Herbs)^b Easy Now (Traditional Medicinals)^b Happy Camper (Natural Balance)^b Kava Oasis (New Chapter, Inc.)^b Stomach Calm (Enzymes, Inc.)^b 26 brand names found</p>

(Continued on next page)

^a This herb or natural product is the only ingredient in this brand.

^b This brand name is an example of a product in which the herb or natural product is included along with other herbs and products. Monitor for all possible side effects of all ingredients in these products.

^c Safety of this product is a concern. The product contains animal material, possibly diseased animals that may harbor bovine spongiform encephalopathy (i.e., mad cow disease).

^d This product contains androstenedione that can increase estrogen levels. Side effects for men may include acne, behavior changes, testicular atrophy, and gynecomastia (King et al., 1999). This product does not increase testosterone levels or significantly improve muscle strength (Brown et al., 2000).

Table 1. Herbs and Natural Products With the Potential to Protect Against Cancer Growth: Common and Brand Names (Continued)

Herb or Natural Product	Brand Name and Manufacturer or Other
Lutein Other names: xanthophyll, zeaxanthin	Lutein (Nutraceutical Sciences Institute) ^a 86 brand names found that contained other ingredients, except for the above
Lycopene Other names: all-trans lycopene, psi-psi-carotene	Lycopene (Nature's Life) ^b Lycopene (Olympian Labs) ^b Lycopene Rich Tomato Concentrate (Jamieson) ^b Xtend-Life Total Balance (Xtend-Life Nutraceuticals Inc.) ^b 66 brand names found
MGN-3 Other names: biobran hemicellulose complex with arabinoxylane	MGN3 (MGN-3, MGN 3) (LaneLabs) ^b 1 brand name found
Microalgae Other names: astaxanthin	BioAstin (Nutrex, Inc.) ^a Alphastat Rx Prostate (Nature's Plus) ^b Astaxanthin Complex (Solgar) ^b Earthmends Prostate Health Program (Cancer Wellness Institute) ^b 8 brand names found
MSM Other names: crystalline DMSO, dimethyl sulfone, DMSO2, methylsulfonyl methane, methyl sulfonyl methane, optiMSM, sulfonyl sulfur	MSM 1,000 (Jamieson) ^a Arthrimin Joints + Bones (Glucosamine/Chondroitin/MSM/Hyaluronic Acid) Effervescent Drink Crystals Complex (Jamieson) ^b Cardio EDTA Chelate (Olympia Nutrition) ^b Glucosamine Chondroitin Complex With MSM (Source Naturals) ^b Xtend-Life Total Balance (Xtend-Life Nutraceuticals Inc.) ^b 82 brand names found
Olive oil Other names: monounsaturated fatty acid, n-9 fatty acid, Olivae oleum, omega-9, omega-9 fatty acid, salad oil, sweet oil, unsaturated fatty acid	Olive oil may be purchased in grocery stores. 48 brand names found, all with additional ingredients
Peanut oil Other names: arachis, earth-nut oil, groundnut oil, monkey nut oil	Vitamin D 1,000 IU (Jamieson) ^b 1 brand name found
Propolis Other names: bee glue, bee propolis, hive dross, propolis balsam, propolis resin, propolis wax, Russian penicillin	Propo-Mune (Atrium Inc.) ^{b, c} Royal Bee Power (Nature's Plus) ^b Bee Pollen Complex (Puritan's Pride) ^b 55 brand names found
Quercetin Other names: citrus bioflavonoid, meletin, sophretin	Quercetin (Metabolic Response Modifiers) ^a Xtend-Life Total Balance (Xtend-Life Nutraceuticals Inc.) ^b 265 brand names found
Rice bran Other names: dietary fiber, ricebran oil, stabilized rice bran	Rice Bran Oil (Progressive Labs) ^a RiceMucille (NutraStar) ^a RiSolubles (NutraStar) ^a 143 brand names found
Shark cartilage Other names: AE-941, MSI-1256F, shark cartilage extract, shark cartilage powder	Shark Cartilage (Olympian Labs) ^a Shark Cartilage (Leiner Health Products) ^b 27 brand names found
Soy Other names: daidzein, edamame, frijol de soya, genistein, haba soy, hydrolyzed soy protein, isoflavone, isoflavones, legume, miso, natto, phytoestrogen, plant estrogen, shoyu, soja, sojabohne, soy fiber, soy milk, soy protein, soy-protein, soy protein extract, soya, soybean, soybean curd, tempeh, texturized vegetable protein, tofu	Soy Extract (PhytoPharmica) ^a Cayenne (Now) ^b Soy Essentials (Health From the Sun) ^b Soy Preventive (GNC) ^b 362 brand names found

(Continued on next page)

^a This herb or natural product is the only ingredient in this brand.

^b This brand name is an example of a product in which the herb or natural product is included along with other herbs and products. Monitor for all possible side effects of all ingredients in these products.

^c Safety of this product is a concern. The product contains animal material, possibly diseased animals that may harbor bovine spongiform encephalopathy (i.e., mad cow disease).

^d This product contains androstenedione that can increase estrogen levels. Side effects for men may include acne, behavior changes, testicular atrophy, and gynecomastia (King et al., 1999). This product does not increase testosterone levels or significantly improve muscle strength (Brown et al., 2000).

Table 1. Herbs and Natural Products With the Potential to Protect Against Cancer Growth: Common and Brand Names (Continued)

Herb or Natural Product	Brand Name and Manufacturer or Other
<p>Spinach Other names: spinaciae folium, spinatblatter</p>	<p>Life's Greens (Puritan's Pride)^b Source of Life Oxygenic (Nature's Plus)^b Veg-Easy (Progressive Labs)^b 69 brand names found</p>
<p>Tragacanth Other names: goat's thorn, green dragon, gum dragon, gum tragacanth, gummi tragacanthae, hog gum, Syrian tragacanth, tragacanth gum</p>	<p>Ambrotose AO (Mannatech)^b Manna-C (Mannatech)^b 19 brand names found</p>
<p>Turmeric Other names: cucuma, Curcumae longae rhizoma, curcumin, Indian saffron, tumeric, turmeric root</p>	<p>CurcuMax (PhytoPharmica)^{b, c} Curazyme (Enzymatic Therapy)^b Tumeric Extract (Nature's Way)^b 159 brand names found</p>
<p>Vitamin A Other names: antixerophthalmic vitamin, axerophtholum, dehydroretinol, oleovitamin A, retinoids, retinyl acetate, retinyl palmitate, 3-dehydroretinol, vitamin A₁, vitamin A₂, vitaminum A</p>	<p>Vitamin A (Jamieson)^a Vitamin A (Puritan's Pride)^a Vitamin A 10,000 IU (Jamieson)^a Vitamin A (Nature's Way)^b Vitamin A (Nature's Bounty)^b Vitamin A Basic Nutrition (GNC)^b Vitamin A in a Water-Soluble Base (Nature's Bounty)^b A-25 Plex (Progressive Labs)^b Beta Carotene 25,000 IU (Rexall-Sundown)^b Beta-Carotene 25,000 IU (Schiff)^b Renatrate (Progressive Labs)^{b, c} Triple Cod Liver Oil (GNC)^b 324 brand names found</p>
<p>Vitamin D Other names: Alfacalcidol: 1 alpha (HO)D₃, 1-alpha-hydroxycholecalciferol Calcifediol: 25-HCC, 25-hydroxycholecalciferol, 25-hydroxyvitamin D₃, 25-OHCC, 25-OHD₃ Calcipotriene: calcipotriol Calcitriol: 1,25-DHCC, 1,25-dihydroxycholecalciferol, 1,25-dihydroxyvitamin D₃, 1,25-diOHC, 1,25(OH)2D₃ Cholecalciferol: activated 7-dehydrocholesterol, coilecalciferol, vitamin D₃ Dihydrotachysterol: DHT, dichysterol, dihydrotachysterol 2 Ergocalciferol: activated ergosterol, calciferol, ergocalciferolum, irradiated ergosterol, visterol, vitamin D₂ Paricalcitol: 19-nor-1,25-dihydroxyvitamin D₂</p>	<p>Vitamin D 1,000 IU (Jamieson)^a Vitamin D 400 IU (Jamieson)^a Vitamin D (Puritan's Pride)^b Cod Liver Oil (Puritan's Pride)^b Vitamin D Basic Nutrition (GNC)^b Vitamin D 1,000 IU (Jamieson)^b 553 brand names found</p>
<p>Vitamin K Other names: Vitamin K₁: 4-napthoquinone, methylphytyl naphthoquinone, phylloquinone, phytomenadione, phytonadione, 2-methyl-3-phytyl-1 Vitamin K₂: menaquinone, menatetrenone, MK-1, MK-2, MK-4, MK-5, MK-6, MK-7, MK-8, MK-9, MK-10, MK-11, MK-12, MK-13 Vitamin K₃: 4-naphthoquinone, menadione, menadione sodium bisulfide, 2-methyl-1 Vitamin K₄: menadiol diacetate, menadiol sodium diphosphate, menadiol sodium phosphate, menadiolum soluble methylnaphthoquinone Vitamin K₅: 2-amino-2-methyl-1-naphthol</p>	<p>Estroven Joint and Bone (Amerifit Nutrition)^b Vitamin K 100 mcg, GNC A-Z (GNC)^b Vitrin (Nutraceutics Corp.)^b 214 brand names found</p>
<p>Wheat bran Other names: bran, dietary fiber</p>	<p>CholesFiber (Source Naturals)^b Fiber Plan Daily Mix (Shaklee)^b ThinZ Back-to-Nature (Alva-Amco Pharmacal Co., Inc.)^b 21 brand names found</p>

(Continued on next page)

^a This herb or natural product is the only ingredient in this brand.

^b This brand name is an example of a product in which the herb or natural product is included along with other herbs and products. Monitor for all possible side effects of all ingredients in these products.

^c Safety of this product is a concern. The product contains animal material, possibly diseased animals that may harbor bovine spongiform encephalopathy (i.e., mad cow disease).

^d This product contains androstenedione that can increase estrogen levels. Side effects for men may include acne, behavior changes, testicular atrophy, and gynecomastia (King et al., 1999). This product does not increase testosterone levels or significantly improve muscle strength (Brown et al., 2000).

Table 1. Herbs and Natural Products With the Potential to Protect Against Cancer Growth: Common and Brand Names (Continued)

Herb or Natural Product	Brand Name and Manufacturer or Other
<p>Whey protein Other names: bovine whey protein concentrate</p>	<p>Actisyn (SportPharma)^b Athletic Strength (Vidafit)^b Triple Whey Fuel (TwinLab)^b Wheyfit 2,000 (Young Living Essential Oils)^b #32 GB Pituitary (Systemic Formulas)^{b, c} #150 Pro Nutro Protein (Systemic Formulas)^{b, c} 81 brand names found</p>
<p>Yucca Other names: Adams's needle, aloe yucca, bear grass, dagger plant, Joshua tree, Mohave yucca, our-Lord's-candle, soapweed, Spanish bayonet</p>	<p>Arth-Rid Us (The Herbalist)^b Joint Essentials (Swanson)^b Yucca-AR Formula (Nature's Way)^b 36 brand names found</p>

^a This herb or natural product is the only ingredient in this brand.

^b This brand name is an example of a product in which the herb or natural product is included along with other herbs and products. Monitor for all possible side effects of all ingredients in these products.

^c Safety of this product is a concern. The product contains animal material, possibly diseased animals that may harbor bovine spongiform encephalopathy (i.e., mad cow disease).

^d This product contains androstenedione that can increase estrogen levels. Side effects for men may include acne, behavior changes, testicular atrophy, and gynecomastia (King et al., 1999). This product does not increase testosterone levels or significantly improve muscle strength (Brown et al., 2000).

Database, 2004). Gruenwald et al. (1998) indicated that medicinal preparations and combination products are made from barley malt extract. No suggested dosage is available.

Beta-sitosterol has scientific names of *22,23-dihydrostigmasterol*; *24-beta-ethyl-delta-5-cholesten-3beta-ol*; *24-ethyl-cholesterol*; and *3-beta-stigmast-5-en-3-ol*. Self-medication with beta-sitosterol is for numerous conditions from asthma and allergies to preventing colon or cervical cancer, the common cold, and tuberculosis (Natural Medicines Comprehensive Database, 2004). In vitro, beta-sitosterol can inhibit human colon cancer cells (Awad, Chen, Fink, & Hennessey, 1996; Awad, von Holtz, Cone, Fink, & Chen, 1998). Beta-sitosterol typically is well tolerated, but it can cause nausea, indigestion, flatulence, diarrhea, or constipation (Berges, Windeler, Trampisch, & Senge, 1995; Klippel, Hiltl, & Schipp, 1997; Micromedex Inc., 2004). Typical doses of beta-sitosterol used for benign prostatic hyperplasia and prostatitis are 60–130 mg divided into two or three daily doses (Martindale, 1999; Micromedex Inc.).

Bifidobacteria has scientific names of *Bifidobacterium adolescentis* and *Bifidobacterium bifidum*. Bifidobacteria is used to replenish normal flora of the bowel when patients have diarrhea during radiation, chemotherapy, or antibiotic therapy, for example. Preliminary research shows that bifidobacteria may protect the body against cancer by decreasing fecal enzymes that metabolically activate some mutagens and carcinogens (Roberfroid, 2000). No adverse effects have been reported (Natural Medicines Comprehensive Database, 2004). The strength of the preparation is dependent on the number of living organisms per capsule. The typical dose is 1 billion–10 billion viable cells daily, divided into three or four doses (Murray & Pizzorno, 1998).

Black seed, with a scientific name of *Nigella sativa*, is used in self-medication for gastrointestinal conditions and as an immunoprotectant against cancer (Facts and Comparisons, 2001). Preliminary studies show that black seed is an anticancer agent, inhibiting stomach tumors, carcinoma, and Ehrlich ascites

carcinoma (Badary, Al-Shabanah, Nagi, Al-Rikabi, & Elmazar, 1999; Salomi, Nair, Jayawardhanan, Varghese, & Panikkar, 1992). Other in vitro studies examined the potent enzyme glyceraldehyde-3-phosphate dehydrogenase from Ehrlich ascites carcinoma cells (Bagui, Ray, & Ray, 1999) and concurred with Badary et al.'s and Salomi et al.'s findings. No typical dosage is given in Natural Medicines Comprehensive Database (2004). No adverse effects from oral use of black seed have been reported. In use for at least 1,400 years, black seed was found in King Tutankhamen's tomb (Facts and Comparisons).

Blond psyllium has the scientific name of *Plantago ovata*, which is synonymous with *Plantago decumbens* and *Plantago isphagula*. People self-medicate with blond psyllium for numerous gastrointestinal disorders, hypercholesterolemia, hyperglycemia, and cancer (Natural Medicines Comprehensive Database, 2004). Initial research has indicated that psyllium seems to preserve normal colon cell proliferation and possibly decrease absorption of carcinogens and unconjugated estrogens (Alabaster, Tang, Frost, & Shivapurkar, 1993; Gerber, 1996). Commonly used doses for laxative properties range from 7–40 g per day, taken in two or three doses (Blumenthal et al., 1998; Gruenwald et al., 1998). Individuals self-medicating with blond psyllium should start with the lowest dose and gradually increase the dose as needed. They should consume at least 240 ml of water for every 5 g ingested (Schneider, 1989). Blond psyllium may cause allergic symptoms such as rhinitis, sneezing, conjunctivitis, urticarial rash, and asthma (Freeman, 1994; Suhonen, Kantola, & Bjorksten, 1983). Caution patients against using blond psyllium found in the wild. Chewing or crushing psyllium wild seeds releases a pigment that can damage renal tubules (Leung & Foster, 1996).

Blueberry has a scientific name of *Vaccinium angustifolium*. People self-medicate with blueberry for eye conditions, ulcers, urinary tract infections, multiple sclerosis, fever, varicose veins, hemorrhoids, and constipation (Duke, 1997; Robbers & Tyler, 1999). The antioxidant effects of blueberry

Table 2. Herbs or Natural Products With Toxic or Negative Side Effects

Herb or Natural Product	Major Adverse Reaction or Toxicity
Alpha-linolenic acid	Self-medication beyond 1.2–2 g to prevent breast cancer may increase the risk of heart disease, myocardial infarction, or cancer.
American pawpaw	Nausea and urticaria
Apple	The seeds contain hydrogen cyanide that is released, generated, or liberated when mixed with saliva.
Asparagus	Mucous membrane irritation
Barley	Sensitive individuals may develop asthma and allergic reactions from barley or barley dust.
Beta-sitosterol	Nausea, indigestion, flatulence, diarrhea, or constipation
Blond psyllium	Allergic symptoms such as rhinitis, sneezing, conjunctivitis, urticarial rash, and asthma; wild psyllium seeds can cause damage to renal tubules.
Canthaxanthin	Large amounts can cause orange discoloration of body secretions and skin, as well as diarrhea, nausea, and stomach cramps. One death from oral ingestion of canthaxanthin for tanning purposes has been reported.
Chaparral	This is an unsafe herb. Ingestion has been known to cause serious poisoning, acute hepatitis, liver and kidney damage, and irreversible renohepatic failure. Two liver transplants, resulting from use of chaparral, have been reported.
Choline	The risk of adverse effects, including sweating, fish-like body odor, vomiting, and diarrhea, increases with doses of more than 3.5 g per day.
Chrysanthemum	Photosensitivity and contact dermatitis
Conjugated linoleic acid	Gastrointestinal disturbances and fatigue
Cranberry	Chronic ingestion of more than 1 L of cranberry juice per day increases the risk of renal calculus.
Folic acid	Excessive amounts can exacerbate or precipitate neuropathy in patients with a vitamin B ₁₂ deficiency.
Fructo-oligosaccharides	If more than 10 g are ingested daily, expect adverse effects such as abdominal pain, belching, bloating, and flatulence.
Garlic	Garlic has anticoagulant properties; therefore, use caution when combined with other anticoagulant and antiplatelet herbs, natural products, and prescriptions.
Glucomanan	The tablet form of glucomanan has caused esophageal and gastrointestinal obstruction.
Green tea	Heavy consumption of green tea is linked to esophageal cancer because of the caffeine constituents. Adverse effects include headache, diuresis, anxiety, insomnia, tremor, tachyrythmias, premature heartbeat, nausea, vomiting, diarrhea, ringing in the ears, elevated blood sugar, delirium, and convulsions.
Indole-3-carbinol	High doses of more than 400 mg per day can cause dysequilibrium symptoms, tremor, and nausea.
Jiaogulan	Oral use has resulted in severe diarrhea and nausea.
MSM (Methylsulfonylmethane)	Nausea, diarrhea, and headaches
Olive oil	Individuals with gallstones could experience biliary colic.
Peanut oil	Severe allergic reactions can result from using peanut products.
Propolis	Those individuals who are allergic to bees or bee stings may have allergic reactions to propolis. Oral ulcerations are possible from lozenges containing propolis.
Quercetin	Headaches and tingling in the extremities
Rice bran	Flatulence, abdominal discomfort, and erratic bowel habits; rice bran could reduce absorption of some prescription drugs, herbs, or supplements.
Shark cartilage	Nausea, vomiting, dyspepsia, constipation, hypotension, dizziness, hyperglycemia, hypercalcemia, altered consciousness, decreased motor strength, general weakness, and fatigue; watch for signs of acute hepatitis, including low-grade fever, jaundice, yellowing of the eyes, right upper-quadrant tenderness, and liver enzymes elevation.
Tragacanth	If taken without sufficient fluids, obstruction of ileum or esophagus can occur.
Turmeric	Overuse can cause gastrointestinal complaints.
Vitamin A	High doses or chronic use can cause blood cell changes, anemia, and liver damage.
Vitamin D	Use this vitamin in recommended nutritional doses only. Toxic effects from high doses are hypercalcemia, osteoporosis, serum electrolyte imbalances, cardiac dysrhythmias, and irreversible calcification of soft tissue.
Wheat bran	In daily doses of more than 20–40 g, wheat bran has a tendency to cause flatulence and gastrointestinal discomfort.
Whey protein	With high doses, expect increased stools, nausea, thirst, bloating, cramps, reduced appetite, fatigue, and headache.
Yucca	Stomach irritation, nausea, vomiting, and a bitter taste

extracts may have anticancer activities, according to preliminary research (Bomser, Madhavi, Singletar, & Smith, 1996). Blueberry seems to have no adverse effects (Natural Medicines Comprehensive Database, 2004). Blueberry must not be confused with bilberry, which has a scientific name of *Vaccinium myrtillus* (Robbers & Tyler). Three tablespoons of dried blueberries or a decoction of crushed fruit is a typical dose for diarrhea (Natural Medicines Comprehensive Database).

Cabbage has a scientific name of *Brassica oleracea*. Although cabbage has a history in self-medication for gastrointestinal disorders, asthma, morning sickness, and preventing osteoporosis, individuals also use it to prevent lung, stomach, colorectal, breast, and other cancers (Natural Medicines Comprehensive Database, 2004). Constituents in cabbage are released when it is chewed, and these constituents may change the way that estrogen is metabolized. Therefore, cabbage may have anticarcinogenic properties (Bradlow, Michnovicz, Telang, & Osborne, 1991; Grubbs et al., 1995; He, Friesen, Ruch, & Schut, 2000; Michnovicz, 1998; Michnovicz & Bradlow, 1990; Yuan et al., 1999). As an augmentation to diet, cabbage has been pressed into juice, and as much as 1 L has been consumed daily with no adverse effects (Gruenwald et al., 1998).

Canthaxanthin has scientific names of *4,4-diketo-beta-carotene* and *Beta, beta-carotene-4,4-dione*. Individuals ingest canthaxanthin to produce an artificial tan (Martindale, 1999; Micromedex Inc., 2004). In several in vivo and in vitro animal studies, canthaxanthin inhibited tumor growth and transformation of tumor cells (Huang, Odeleye, & Watson, 1992; Vainio & Rautalahti, 1998). However, large amounts of canthaxanthin can cause orange discoloration of body secretions and skin (Natural Medicines Comprehensive Database, 2004) as well as diarrhea, nausea, and stomach cramps (Micromedex Inc.). One death from ingestion of canthaxanthin for tanning purposes has been reported (Bluhm, Branch, Johnston, & Stein, 1990). A typical dose for tanning is 120 mg per day for several days (Micromedex Inc.). Canthaxanthin is in nonprescription drugs sold in Canada for tanning purposes.

Chaparral has two scientific names, *Larrea divaricata* and *Larrea tridentata*, which are synonymous with *Larrea mexicana* and *Zygophyllum tridentatum*. Chaparral is used to treat conditions such as arthritis, cancer, the common cold, tuberculosis, and venereal disease (Newall, Anderson, & Phipson, 1996). Preliminary research has found that a constituent of chaparral, nordihydroguaiaretic acid, has the potential for anticarcinogenic and antimutagenic activity (Anesini, Ferraro, Lopez, & Borda, 2001; McDonald et al., 2001).

Chaparral is considered unsafe, causing serious poisoning, acute hepatitis, liver and kidney damage, and irreversible renal failure. Multiple reports have cited liver and kidney damage requiring at least two liver transplants (Batchelor, Heathcote, & Wanless, 1995; Estes et al., 2003; Gordon, Rosenthal, Hart, Sirota, & Baker, 1995; Katz & Saibil, 1990; Newall et al., 1996; Sheikh, Philen, & Love, 1997). These researchers also indicated chaparral's potential interaction with hepatotoxic herbs and drugs and liver function tests and exacerbation of liver disease. No typical dose is available for this toxic herb. Chaparral and red clover are components of Jason Winters tea, a popular alternative therapy cancer remedy. The manufacturer of Herp-Eeze™ (Olympian Labs, Scottsdale, AZ) claims that its chaparral product is rendered nontoxic by the manufacturing process (Natural Medicines

Comprehensive Database, 2004); however, no studies have substantiated this claim.

Choline has scientific names of *Trimethylethanolamine* and *beta-hydroxyethyl trimethylammonium hydroxide*. Individuals are known to self-medicate with choline for many psychological and brain-related conditions such as schizophrenia, dementia, and Tourette syndrome. Some athletes take choline for endurance (Natural Medicines Comprehensive Database, 2004). Preliminary research has found that choline has a potential role in cancer prevention (Albright et al., 1997; Yen, Mar, & Zeisel, 1999; Zeisel, 1992). The typical North American diet supplies 200–600 mg of choline daily (Covington, 1996) in liver, muscle meats, fish, nuts, beans, peas, and eggs (Gennaro, 1995). Adults self-medicating with doses exceeding 3.5 g per day put themselves at risk for adverse effects (Yates, Schlicker, & Sutor, 1998), such as sweating, a fish-like body odor, vomiting, and diarrhea (Covington).

Chrysanthemum has several scientific names: *Anthemis grandiflorum*, *Anthemis stipulacea*, *Chrysanthemum morifolium*, *Dendranthema morifolium*, and *Matricaria morifolia*. Initial tests show that a product called hua-sheng-ping (chrysanthemum, licorice, and Panax notoginseng) may reverse precancerous gastrointestinal lesions (Yu, 1993). However, chrysanthemum causes photosensitivity and contact dermatitis (Bleumink, Mitchell, Geismann, & Towers, 1996; de Jong, Vermeulen, van Wijk, & de Groot, 1998; Kuno, Kawabe, & Sakakibara, 1999; Paulsen, Sogaard, & Andersen, 1998). To make an extract of chrysanthemum, 300 mg of the dried flower in 500 ml water are allowed to concentrate by condensation (time is not given). A typical dose of 25 ml can be taken up to three times daily (Huang, 1999).

Conjugated linoleic acid has scientific names of *cis-9, trans-11 conjugated linoleic acid* and *trans-10, cis-12 conjugated linoleic acid*. Individuals self-medicate with conjugated linoleic acid for atherosclerosis, bodybuilding, cancer, obesity, and other conditions (Natural Medicines Comprehensive Database, 2004). Conjugated linoleic acid seems to enhance immune function and inhibit cyclooxygenase and lipoxygenase pathways in tumor cells (O'Shea, Stanton, & Devery, 1999; Sebedio, Gnaedig, & Chardigny, 1999). This acid may modulate cellular response to tumor necrosis (Pariza, Park, & Cook, 1999). Gastrointestinal disturbances and fatigue are the most common adverse effects (Blankson et al., 2000). A typical dose is 2–7 g per day (Blankson et al.).

Cranberry has numerous scientific names such as *Vaccinium macrocarpon*, which is synonymous with *Oxycoccus macrocarpos*. Additional species have either genus name. Popular as a self-medication in preventing urinary infections or as an antibiotic in treating urinary infections (Harkins, 2000; Jackson & Hicks, 1997), cranberry also is used to treat or prevent cancer (Natural Medicines Comprehensive Database, 2004). Cranberry's proanthocyanide fraction may have anticarcinogenic activity (Bomser et al., 1996). Animal models show that cranberry products and juice can reduce the number of breast cancer tumors, delay tumor development, and slow metastases of cancer to lungs and lymph nodes (Natural Medicines Comprehensive Database). Oral intake of cranberry usually is well tolerated. Chronic ingestion of more than 1 L of cranberry juice per day can increase the risk of renal calculus (Jackson & Hicks).

Folic acid has scientific names of *Pterolglutamic acid*, *Pteroylmonoglutamic acid*, and *Pterolpolyglutamate*. Often used in self-medication to prevent folate or vitamin B₁₂ deficiency,

it also is used to prevent colon cancer (McKevo, 1998; Micromedex Inc., 2004). Folic acid also is known as vitamin B₉. Early studies indicate that folic acid may protect patients with ulcerative colitis against cancer (Lashner, 1993). Excessive amounts of folic acid can exacerbate or precipitate neuropathy for patients with a vitamin B₁₂ deficiency (Natural Medicines Comprehensive Database, 2004). The recommended daily dose for individuals older than age 13 is 400 mcg (Yates et al., 1998). Health and Welfare Canada (1990) advised a dose of 217 mcg for a 70 kg man and 170 mcg for a 55 kg woman.

Forskolin has scientific names of *17beta-acetoxy-8,13-epoxy-1alpha* and *6beta,9alpha-trihydroxylabd-14-en-11-one*. Individuals self-medicate with forskolin for gastrointestinal, urinary, and cardiac conditions, as well as cancer. Preliminary studies show that the product has the potential for blocking tumor cell-induced human platelet aggregation, preventing growth of tumor cells, and preventing metastases (Agarwal & Parks, 1983; Tzanakakis, Agarwal, & Vezeridis, 1990). No adverse effects have been reported for oral use of forskolin, and no typical dose has been made available.

Fructo-oligosaccharides have the scientific name of *Beta-D-fructofuranosidase*. A self-medication for constipation, fructo-oligosaccharides appear to protect against colon cancer (Pierre et al., 1997). Side effects of abdominal pain, belching, bloating, and flatulence tend to be more severe when fructo-oligosaccharides are taken in amounts of 10 g or more daily (Circosta et al., 1984; Stone-Dorshow & Levitt, 1987).

Garlic has a scientific name of *Allium sativum*. Self-medication with garlic is for the treatment of numerous conditions including cardiovascular atherosclerosis, HIV drug-induced lipid disorders, cancer prevention, colds and the flu, and tick bite prevention (Bloch, 2000; Blumenthal et al., 1998; Micromedex Inc., 2004; Newall et al., 1996). Humoral and cellular immunity seems to be stimulated by garlic (Sato & Miyata, 2000). Another constituent in garlic seems to be active against erythroleukemia as well as breast and prostate cancer cells (Efendy, Simmons, Campbell, & Campbell, 1997; Ide & Lau, 1997, 1999; Imai et al., 1994; Moriguchi, Saito, & Nishiyama, 1996; Sigounas, Hooker, Anagnostou, & Steiner, 1997; Zhang, Moriguchi, Saito, & Nishiyama, 1998). Anticoagulant properties of garlic call for caution in its use with other anticoagulant and antiplatelet herbs and products such as ginkgo, ginseng, and vitamin E and with anticoagulant and antiplatelet agents such as warfarin sodium. Most clinical studies use a standardized dose of garlic powder containing 1.3% alliin (Auer et al., 1990; Holzgartner, Schmidt, & Kuhn, 1992; Jain, Vargas, Gotzkowsky, & McMahon, 1993; Sato & Miyata; Silagy & Neil, 1994). Alliin is the medicinal ingredient in garlic. Four grams of fresh garlic contain 1% alliin (Natural Medicines Comprehensive Database, 2004).

Glucomannan, a polysaccharide, is found in the tubers (underground stems) of a plant with the scientific name of *Amorphophallus konjac*. Self-medication with glucomannan is usually for constipation, control of blood glucose, or reduction of serum cholesterol (Facts and Comparisons, 2001). A Chinese study (Luo, 1992) found that glucomannan protected mice against clinically induced lung cancer. The tablet form of glucomannan has caused esophageal and gastrointestinal obstruction (Luo; Martindale, 1999). Typical doses are approximately 3 g daily (Walsh, Yaghoubian, & Behrooz, 1984).

Green tea has the scientific name of *Camellia sinensis*, which is synonymous with *Camiellia thea*. Individuals self-

medicate with green tea for headaches, for gastrointestinal conditions, to maintain remission of Crohn's disease (Alic, 1999), and to prevent prostate, colon, and gastric cancers (Gupta, Ahmad, & Mukhtar, 1999; Taylor & Wilt, 1999; Tsubono et al., 2001). Green tea also is used to prevent skin cancer or damage from ultraviolet radiation (Katiyar, Ahmad, & Mukhtar, 2000). Catechins in green tea, especially epigallocatechin-3-gallate, seem to reduce the risk of some cancers by preventing blood vessel growth in tumors (Cao & Cao, 1999; L'Allemain, 1999). Green tea also seems to reduce oxidative DNA damage, lipid peroxidation, and free radical generation, which appears to decrease mutagenic activity for smokers (Lee et al., 1997). In addition, green tea appears to prevent ultraviolet radiation-induced immunosuppression and protect against skin cancers (Katiyar et al.).

Alternatively, heavy consumption of green tea has been linked to esophageal cancer (Facts and Comparisons, 2001) because of the caffeine constituent of tea. Adverse reactions include headache, diuresis, anxiety, insomnia, tremor, tachyrythmias, premature heartbeat, nausea, vomiting, diarrhea, ringing in the ears, elevated blood sugar, delirium, and convulsions (Facts and Comparisons; Gruenwald et al., 1998; Hardman & Limbird, 1996; Schulz, Hansel, & Tyler, 1998). Doses of green tea vary but often range from 1–10 cups daily (Fetrow & Avila, 1999). Table 1 shows brand names of green tea in tablet and capsule form. According to the Natural Medicines Comprehensive Database (2004), these tablets contain standardized extracts of as much as 97% polyphenols, which is equivalent to drinking four cups of green tea. No typical or safe dose is available, except to follow Tyler's (1993, 1994) guide to consume no more than 250 mg of caffeine per day. A 6 oz cup of tea has 10–50 mg of caffeine.

Indole-3-carbinol has a scientific name of *indole-3-methanol*. Individuals self-medicate with indole-3-carbinol to prevent all types of cancer, including breast and colon cancers. Self-prescription is carried out to maintain hormonal balance, detoxify the bowels and liver, and boost the immune system (Natural Medicines Comprehensive Database, 2004). Researchers suspect that indole-3-carbinol is one of several vegetable components that may be protective against breast, cervical, endometrial, and colorectal cancers (Grubbs et al., 1995; He et al., 2000; Kojima, Tanaka, & Mori, 1994; Wong et al., 1997; Yuan et al., 1999). Research findings are controversial; some research has shown that indole-3-carbinol may be helpful against hormone-dependent cancers such as breast cancer (Bradlow et al., 1991; Grubbs et al.; Kojima et al.; Michnovicz, 1998; Michnovicz & Bradlow, 1990; Yuan et al.). However, other research raises concerns that indole-3-carbinol may increase the carcinogenicity of certain toxins (Bailey et al., 1991; Dashwood, 1998; Kim et al., 1997; Pence, Buddingh, & Yang, 1986). Whether indole-3-carbinol increases or decreases cancer risk may depend on duration and timing of exposure to this component in addition to dietary factors. High doses of indole-3-carbinol (i.e., more than 400 mg per day) can result in dysequilibrium symptoms, tremor, and nausea (Rosen, Woodson, Thompson, Hengesteg, & Bradlow, 1998). Bell et al. (2000) reported the use of 200 mg for cervical dysplasia. Rosen et al. reported the use of 300 mg per day for breast cancer prevention. Typically, 20–120 mg of indole-3-carbinol are in a daily dietary intake (Natural Medicines Comprehensive Database).

Jiaogulan has a scientific name of *Gynostemma pentaphyllum*, which is synonymous with *Gynostemma pedatum*. Jiaogulan is used for the self-medication of numerous conditions such as cardiovascular and gastrointestinal disorders, cancer, diabetes, and obesity, as well as strengthening the immune system. It also is used as an anti-inflammatory agent, antioxidant, or detoxifying agent (Natural Medicines Comprehensive Database, 2004). This herb seems to have anticancer activity and immunostimulatory abilities (Facts and Comparisons, 2001); however, severe diarrhea and nausea have resulted from oral use of jiaogulan (Facts and Comparisons). An extract of 10 mg three times daily is noted by Natural Medicines Comprehensive Database, but this is not indicated as a safe or typical dose.

Lavender has the scientific name of *Lavandula angustifolia*, which is synonymous with *Lavandula officinalis*. Individuals self-medicate with lavender to treat cancer and numerous other conditions such as insomnia, loss of appetite, gastrointestinal disorders, headache, and nervousness. In vitro and animal studies have shown some anticancer activity for this herb (Facts and Comparisons, 2001). Considered a safe food additive (Leung & Foster, 1996), the typical oral dose is one cup of tea several times a day (Bisset & Wichtl, 1994).

Lutein has a scientific name of *beta, epsilon-carotene-3, 31-diol*. Individuals self-medicate with lutein to prevent age-related macular degeneration and colon cancer (Natural Medicines Comprehensive Database, 2004). Epidemiologic studies by Slattery et al. (1997) and Steinmetz and Potter (1991) have indicated that carotenoids seem to decrease the risk of cancer. Lutein typically is present in two carotenoids, stereoisomer and zeaxanthin; both are found in a pigment of human macula and retina (Snodderly, 1995). No adverse reactions have been noted when lutein is ingested. Chasan-Taber et al. (1999) and Pratt (1999) indicated that 44 mg of lutein are in a cup of cooked kale, 26 mg are in a cup of cooked spinach, and 3 mg are in a cup of broccoli. Corn, orange peppers, kiwi fruit, grapes, orange juice, zucchini, and some squashes also are rich in lutein and other carotenoids (Sommerburg, Keunen, Bird, & van Kuijk, 1998).

Lycopene has scientific names of *all-trans-lycopene* and *psi-psi-carotene*. Self-medication typically is intended for preventing atherosclerosis and cancer. The red color of fruits and vegetables comes from the pigment lycopene (Rao & Agarwal, 1998, 2000). Lycopene has no vitamin A activity, yet it is a carotenoid (Rao & Agarwal, 1998, 2000). Rao and Agarwal (1998, 2000) have studied lycopene's potential in cancer prevention. Some evidence shows that when serum or tissue lycopene concentrations are low, the risk of prostate cancer is increased (Clinton et al., 1996; Gann et al., 1999; Giovannucci, 1999; Giovannucci et al., 1995; Tzonou et al., 1999). No adverse effects have been reported (Natural Medicines Comprehensive Database, 2004). At least 6 mg of lycopene per day from food is needed to protect against prostate cancer (Giovannucci et al., 1995), and at least 12 mg of lycopene per day from food is needed to protect against lung cancer in nonsmoking men (Michaud et al., 2000). A cup of tomato juice contains about 23 mg of lycopene.

MGN-3 has no scientific name, but it also is known as bio-bran hemicellulose complex with arabinoxylane. Individuals self-medicate with MGN-3 to treat and prevent cancer and to treat AIDS, hepatitis, diabetes, and chronic fatigue syndrome (Natural Medicines Comprehensive Database, 2004). MGN-

3 is produced by hydrolyzing rice bran using enzymes from mycelia of shitake, kawaratake, and suehirotake mushrooms. Some studies show that MGN-3 can increase natural killer cell activity and production of tumor necrosis factor-alpha (Natural Medicines Comprehensive Database). Small studies comparing healthy individuals and individuals with cancer suggest that use of MGN-3 increases the activity of natural killer cells (Ghoneum, 1998). No adverse effects have been reported, but the dose used in human tests was 3 g per day (Natural Medicines Comprehensive Database).

Microalgae has scientific names of *3,3'-dihydroxy-4,4'-dike-to-beta-carotene*; *3S, 3'S-astaxanthin*; *3'R-astaxanthin*; and *3R,3'S-astaxanthin*. This product is used in self-medication to protect against cancer, reduce cholesterol, aid in stroke recovery, and prevent macular degeneration in the eyes (Natural Medicines Comprehensive Database, 2004). A constituent of microalgae, astaxanthin (a reddish carotenoid pigment) is a powerful antioxidant that stimulates immunity (Chew, Park, Wong, & Tong, 1999; Chew, Wong, Park, & Wong, 1999) and has the potential to protect against mammary, liver, bladder, or oral cancers (Chew, Wong, et al.; Gradelet, Le Bon, Berges, Suschetet, & Astorg, 1998; Tanaka et al., 1994, 1995). Adverse reactions have not been reported, and the typical dose is 2.5 mg per day (Natural Medicines Comprehensive Database).

MSM has scientific names of *methylsulfonylmethane* and *Dinethylsulfone*. Individuals self-medicate with MSM for numerous conditions, such as breast and colon cancer, chronic pain, arthritis, scar tissue, wrinkles, eye inflammation, allergies, gastrointestinal and cardiovascular conditions, obesity, Alzheimer disease, snoring, headaches, and hangovers (Herschler, 1986). O'Dwyer et al. (1988) found that MSM delayed the onset of chemically induced colon cancer in animals. MSM also delayed the onset of chemically induced mammary tumors in rats (McCabe et al., 1986). If taken orally, MSM can cause nausea, diarrhea, and headaches (Natural Medicines Comprehensive Database, 2004). Typically, MSM is taken in oral doses of 1,000–3,000 mg daily with meals or 250–500 mg daily as a dietary supplement (Natural Medicines Comprehensive Database).

Olive oil has a scientific name of *Olea europaea*. People self-medicate with olive oil to prevent cardiovascular conditions (Trevisan et al., 1990) or treat diabetes (Keys et al., 1986). Although some individuals take it to treat breast cancer (la Vecchia et al., 1995), others take it to prevent colorectal cancer (Stoneham, Goldacre, Seagroatt, & Gill, 2000). Ingestion of olive oil seems to reduce a bile acid, deoxycholic acid, involved in mucosal changes and polyp formation prior to colon cancer (Stoneham et al.). Individuals with gallstones may experience biliary colic if they consume olive oil (Blumenthal et al., 1998; Brinker, 1998; Gruenwald et al., 1998). A dose of 30–40 g per day (1.2–1.6 oz) of extra virgin olive oil is used as a diet supplement therapy for hypertension (Ferrara et al., 2000).

Peanut oil has a scientific name of *Arachis hypogaea*. Peanut oil often is used to lower cholesterol, aid in weight loss, or prevent heart disease or cancer (Natural Medicines Comprehensive Database, 2004). Beta-sitosterol and resveratrol may contribute to the cardiovascular and cancer protective activity of peanuts (peanut oil) (la Vecchia et al., 1995). However, severe allergic reactions can result from ingestion of peanut products (Eigenmann, Burks, Bannon, & Sampson, 1996).

The typical dosage for peanut oil is not available (Natural Medicines Comprehensive Database).

Propolis has no scientific name. The resinous material from poplar and conifer buds, propolis is used to treat numerous infections such as tuberculosis and those of bacteria, fungal, and protozoal origins. Individuals also self-medicate with propolis for nasopharyngeal carcinoma (Foster & Tyler, 1993). Propolis contains caffeic acid phenethyl ester, which is thought to have cancer chemopreventive activities (Lee et al., 1999). Allergic reactions to propolis are possible, especially in those who are allergic to bees or bee stings. Oral ulcerations may occur from propolis-containing lozenges (Facts and Comparisons, 2001; Hay & Greig, 1990). No typical doses have been reported.

Quercetin has a scientific name of 3,3',4',5,7-Penthydroxyflavone. Individuals self-medicate with quercetin to treat allergies, atherosclerosis, cataracts (Li, Blacklock, & Garside, 1985), coronary heart disease, diabetes (Lean et al., 1999), inflammation, asthma, gout, and viral infections and to prevent cancer (Natural Medicines Comprehensive Database, 2004). The antioxidant and anti-inflammatory activities of this product seem to inhibit division and growth of T cells and some cancer cells (Shoskes, Zeitlin, Shahed, & Rajfer, 1999). Quercetin may inactivate malignant precursors or inhibit carcinogenesis (Li et al.). According to a preliminary study conducted by El Attar and Virji (1999), various kinds of cancers, including breast, leukemia, colon, ovary, oral squamous cell, endometrial, gastric, and non-small cell lung, may be inhibited by consuming this product. Quercetin also has an antiestrogenic effect in cultures of breast cancer cells (Miodini, Floravanti, Di Fronzo, & Cappelletti, 1999). Huang, Fasco, and Kaminsky (1997) found that quercetin inhibits estrone sulfatase and estrogen synthesis in liver cells. If taken orally, this product can cause headaches and tingling in the extremities (Shoskes et al.). A common dose is 400–500 mg three times daily (Natural Medicines Comprehensive Database).

Rice bran has a scientific name of *Oryza sativa*. Rice bran is taken to treat diabetes and hypertension, induce weight loss, and prevent cardiovascular disease or cancer (Natural Medicines Comprehensive Database, 2004). Increasing fecal bulk appears to decrease the risk of bowel cancer because secondary bile acids are eliminated from the body more quickly (Weisburger et al., 1993). Rice bran has the ability to increase stool size, but it can cause flatulence, abdominal discomfort, and erratic bowel habits (Covington, 1996). McKevo (1998) indicated that the use of rice bran may result in a tendency to slow or reduce absorption of some prescription drugs, herbs, or supplements. Typical doses range from 12–84 g of rice bran per day or 4.8 g of rice bran oil per day (Gerhardt & Gallo, 1998; Ohkawa, Ebisuno, Kitagawa, Morimoto, & Miyazaki, 1983; Ohkawa et al., 1984; Watkins, Geller, Kooyenga, & Bierenbaum, 1999).

Shark cartilage has a scientific name of *Squalus acanthias*. Individuals self-medicate with shark cartilage to prevent and treat cancer (Hunt & Connelly, 1995; Lane & Comac, 1992; Miller, Anderson, Stark, Granick, & Richardson, 1998). Some preliminary evidence shows that shark cartilage may have some anticancer properties. Researchers hypothesized that this cartilage may prevent the new vessel growth that is required for solid tumor proliferation (Hunt & Connelly). Preliminary research has revealed that shark cartilage has possible antitu-

rogenic, antioxidant, anti-inflammatory, and analgesic activities (Fontenele, Araujo, de Alencar, & Viana, 1997; Fontenele, Viana, Xavier-Filho, & de-Alencar, 1996; Gomes, Souto, & Felzenszwalb, 1996). Adverse effects include nausea, vomiting, dyspepsia, constipation, hypotension, dizziness, hyperglycemia, hypercalcemia, altered consciousness, decreased motor strength, general weakness, and fatigue (Lane & Comac; Miller et al.). Other adverse effects found by Ashar and Vargo (1996) are signs of acute hepatitis, including low-grade fever, jaundice, yellowing of the eyes, right upper-quadrant tenderness, and elevated liver enzymes. Typical doses suggested by commercial product manufacturers range from 500 mg–4.5 g, divided into two to six doses per day (Fetrow & Avila, 1999). These doses cannot be considered as recommended or safe.

Soy has a scientific name of *Glycine max*, which is synonymous with *Glycine soja*. Some people use soy products as a substitution for cow's milk in diets, but soy also is taken for numerous illness conditions, as well as prevention of breast or prostate cancer. Soy also is used commonly to treat hot flashes caused by breast cancer treatments. Diets that are high in soy products appear to be related to a reduced risk of prostatic disease and cancer (Evans, Griffiths, & Morton, 1995). However, a controversy about the action of soy exists. Some scientists have reported that soy may increase the risk of breast cancer, whereas others believe that soy may have some protective effect for breast cancer (Hakkak et al., 2000; McMichael-Phillips et al., 1998; Petrakis et al., 1996). Women with breast cancer or with a history of breast cancer should avoid therapeutic doses of soy products especially if they are taking tamoxifen (Facts and Comparisons, 2001; Massey, Palmer, & Horner, 2001; Montbriand, 2004b; Smolinske, 1999). Two or more glasses of soy milk daily have been suggested to reduce the risk of prostate cancer (Jacobsen, Knutsen, & Fraser, 1998). Safe therapeutic doses of soy vary from 20–60 g per day for adults (Natural Medicines Comprehensive Database, 2004).

Spinach has a scientific name of *Spinacia oleracea*. People self-medicate with spinach to treat gastrointestinal complaints and fatigue, induce blood building, and stimulate the appetite (Blumenthal et al., 1998). Ahn (1997) found that consumption of fresh spinach, not supplements that include spinach, is associated with a decreased risk of human stomach cancer. Notably, more than 60 products were found with spinach as an ingredient. No adverse reactions or typical doses have been found (Natural Medicines Comprehensive Database, 2004).

Tragacanth has a scientific name of *Astragalus gummifera*. Tragacanth is used to treat diarrhea (Facts and Comparisons, 2001); conversely, it also is used as a laxative (Gruenwald et al., 1998). Early studies indicate that tragacanth may inhibit cancer cell growth (Leung & Foster, 1996). If this herb is taken with insufficient amounts of fluids, obstruction of the ileum or esophagus can occur (Gruenwald et al.). No typical dose has been identified.

Turmeric has the scientific name of *Curcuma longa*, which is synonymous with *Curcuma domestica*. Individuals self-medicate with turmeric to ease gastrointestinal discomfort and to treat colorectal cancer (Gruenwald et al., 1998). This herb may have bile-stimulating, liver-protectant, antioxidant, and anticancer effects (Facts and Comparisons, 2001; Gruenwald et al.). Its overuse may cause gastrointestinal complaints (Gruenwald et al.; Robbers & Tyler, 1999). A typical dose is as much as 1.5–3 g per day, according to Blumenthal et al. (1998).

Vitamin A has no scientific name. People self-medicate with vitamin A for numerous conditions such as cataracts, acne, cold sores, diabetes, and gastrointestinal disorders, as well as the treatment or prevention of cancer (McKevo, 1998; Micromedex Inc., 2004). Vitamin A is made up of a 20-carbon-structure molecule with various chemical groups at 15 carbon positions. Different forms of vitamin A, called retinoids, are formed at variations of these 15 positions. Several in vitro studies have suggested that retinoids in vitamin A may help prevent cancer (Sporn, 2000; Widschwendter et al., 2000). High doses or chronic use of vitamin A can cause blood cell changes, anemia, and liver damage among other less severe symptoms (McKevo; Micromedex Inc.). The recommended daily dose of vitamin A is 800–1,000 retinol equivalents for adults aged 19 and older (Health and Welfare Canada, 1990).

Vitamin D has scientific names of *calcifediol*; *25-hydroxy-cholecalciferol*; *calcitrol*; *1,25-dihydroxycholecalciferol*; *cholecalciferol*; *dihydroxycholecalciferol*; *ergocalciferol*; *calcipotriene*; *paricalcitol*; and *alfacalcidol*. Vitamin D is used to build bones, protect against bone loss and muscle weakness, promote strong teeth, and decrease the risk of breast, colon, and prostate cancers (McKevo, 1998). Preliminary negative evidence suggests that vitamin D may be associated with increased risk of colon, breast, and prostate cancers (McKevo). However, Gesensway (2000) reported that vitamin D may have an antiproliferative effect on colon, breast, or prostate cancer. Symptoms of vitamin D toxicity are similar to those of hypercalcemia: osteoporosis, serum electrolyte imbalances, cardiac dysrhythmias, and irreversible calcification of soft tissues (McKevo; Micromedex Inc., 2004). The recommended nutritional dose for vitamin D is 400 units or 10 mcg daily (Micromedex Inc.; Yates et al., 1998). Health and Welfare Canada (1990) recommended a nutritional dosage of 5 mcg for individuals aged 13 or older.

Vitamin K has scientific names of *phytonadione* (K_1), *menaquinone* (K_2), *menadione* (K_3), *menadiol acetate* (K_4), and *4-amino-2methyl-1-naphthol* (K_5). Self-medication is based on the vitamin's number. For example, vitamin K_1 is used for vitamin K deficiency or to decrease bleeding or hemorrhage. Vitamin K_2 is used to treat osteoporosis or lower cholesterol in patients on dialysis. Vitamin K_3 is used in combination with vitamin C to treat or prevent breast and prostate cancers. Vitamin K_4 is used to treat poor absorption of vitamin K. Natural Medicines Comprehensive Database (2004) reported that recent evidence has shown that a combination of vitamins K_3 and C may have potential in the treatment of prostate and breast cancers. Few adverse effects have been reported for oral use of vitamin K (McKevo, 1998; Micromedex Inc., 2004). No typical dose has been identified (Health and Welfare Canada, 1990). McKevo suggested that doses be individualized and used under medical supervision.

Wheat bran has a scientific name of *Triticum aestivum*. Individuals self-medicate with wheat bran to prevent colon cancer and other colon conditions (Foster & Tyler, 1993). Some people use it to prevent breast cancer ("Consensus Statement on Cereals, Fibre and Colorectal and Breast Cancers," 1998). Wheat bran may reduce the risk of cancer by lowering plasma estrogen levels. This action seems to involve interference with enterohepatic circulation and an increase in the rate of fecal estrogen excretion (Bouhnik et al., 1992). Digestion of grains and starches reduces ammonia produced by fermentation of foods high in fat and sugar; this possibly

prevents cell damage and reduces the risk of colon cancer (Govers, Gannon, Dunshea, Gibson, & Muir, 1999). Wheat bran has a tendency to cause flatulence and gastrointestinal discomfort; however, McRorie et al. (2000) found no gastrointestinal discomfort in a carefully controlled study with participants taking 20–40 g of wheat bran daily. This result also was found by Sauvaire et al. (1998).

Whey protein has no scientific name. Individuals self-prescribe whey protein to prevent colon cancer (McIntosh, 1993), to treat metastatic carcinoma (Kennedy, Konok, Bounous, Baruchel, & Lee, 1995; Papenburg, Bounous, Fleiszer, & Gold, 1990), or as a substitute for milk if they are lactose intolerant. Whey protein also is known as bovine whey protein concentrates. Researchers are interested in whey protein as a potential cancer prevention because when gamma-glutamylcysteine, a component of whey protein and a precursor of glutathione (GSH), is introduced to tissue, GSH substrates increase (Bounous, Batist, & Gold, 1991). Kennedy et al., who used a dose of 30 g in their study, postulated that whey protein may exert antitumor effects on cells by increasing GSH, thus making cells more vulnerable to chemotherapy. Other researchers have reported that dietary whey protein may protect against certain cancers (Hakkak et al., 2000; McIntosh; Papenburg et al.). Whey protein usually is well tolerated, but with high doses (i.e., 2–6.5 g/kg daily), consumers should expect increased stools, nausea, thirst, bloating, cramps, reduced appetite, fatigue, and headache. Whey protein also increases blood urea nitrogen (Natural Medicines Comprehensive Database, 2004).

Yucca has a scientific name of *Yucca glauca*. Yucca is used to treat arthritis, hypertension, headaches, diabetes, and gastrointestinal conditions (Leung & Foster, 1996; Newall et al., 1996). The polysaccharides in yucca exhibit antitumor activity against B16 melanoma but not against L1210 and P388 leukemias in mice (Facts and Comparisons, 2001; Foster & Duke, 1990; Leung & Foster; Newall et al.). Yucca can cause stomach irritation, nausea, and vomiting, and it has a bitter taste (Gruenwald et al., 1998). No typical dosage has been identified (Natural Medicines Comprehensive Database, 2004).

Conclusion and Implications

This review article provides information about 47 herbs and natural products that have the potential to protect humans against cancer. The majority of these herbs and natural products are fruits, vegetables, animal or fish products, grains, and molecular components of plants or herbs that are found in human diets. Therefore, findings in this review are similar to the ACS 1996 Advisory Committee on Diet, Nutrition, and Cancer Prevention's (1996) conclusions that the best protection against cancer is a dietary pattern that emphasizes fruits, vegetables, grains, and beans and limited amounts of meat, dairy, and high-fat foods.

Another one of the ACS 1996 Advisory Committee on Diet, Nutrition, and Cancer Prevention's (1996) conclusions was that no conclusive evidence is available to support taking supplements to reduce the risk of cancer. Alternately, consider the healthy food choices available that give protection against cancer. Notice the choices in this review. Alpha-linolenic acid is found in red meat and dairy products. Choline is abundant in liver, muscle meats, fish, nuts, beans, peas, and eggs. Eggs and fatty fish such as herring, mackerel, sardines, and tuna are rich

in vitamin D. Many foods are fortified with vitamin D. Vitamin D also is available to the body when the skin is exposed, in moderation, to the sun. However, McKevooy (1998) indicated that excessive sun exposure results in photodegeneration of vitamin D. Vitamin K₂ is available in meat and cheese.

Several grains such as barley, rice bran, and wheat bran (outer hull of wheat found in whole wheat bread) protect against cancer. Various vegetables, fruits, and plants also show promise as protection against cancer: apple, asparagus, blueberry, cabbage, cranberry, green tea, lavender tea, olive oil, peanut oil, and spinach.

Molecular components available in vegetables and animal products have the potential to protect against cancer. For example, folic acid is available in all vegetables and animal products, especially liver, leafy vegetables, fruit, pulses, and yeast. Indole-3-carbinol is found in vegetables such as brussels sprouts, cabbage, collards, cauliflower, kale, kohlrabi, mustard greens, rapeseed, turnips, and rutabagas. All red-colored fruits and vegetables contain the pigment lycopene, a protection against cancer. Corn, orange peppers, kiwi fruit, grapes, orange juice, zucchini, and some squashes are rich in lutein. Green and yellow vegetables, especially carrots, are rich in vitamin A. Brussels sprouts, plant oil, and margarine also are rich in vitamin K₁, a possible protection against cancer.

Individuals who are concerned about cancer have a rich array of potential cancer protection available to them in a healthy diet. More importantly, the risk of overdose or adverse side effects is considerably less or nonexistent when individuals seek cancer protection through a healthy diet. Conversely, the potential for adverse health risks and side effects are high when taking supplements. Table 1 provides numerous

instances when supplements contain other ingredients along with the herb or product found potentially useful in this review. When additional ingredients are in the supplement, the potential for adverse effects is even higher.

Healthcare professionals will find exceptions in this review that are not in the human diet. Some herbs and natural products are only available in plant form or supplements. Furthermore, some individuals will continue to take supplement forms of products instead of dietary forms. When individuals approach healthcare professionals about these products, the information about possible dosage may be useful. In some cases, such as chaparral, advise potential users of the herb or product's toxicity and encourage avoidance.

Questions for healthcare professionals to ask consumers include the following. Why seek protection from cancer by taking supplements that have not shown the potential to decrease the risk of cancer in evidence-based research? Why take products with the potential for many adverse side effects that may destroy your present good health? Why take supplements when enjoying a nutritious diet that is rich in fruit and vegetables can be your best protection against the risk of cancer? With the information available in this review article, healthcare professionals have an opportunity to encourage safer and healthier ways to protect against cancer.

The author gratefully acknowledges the continuing support of Carl D'Arcy, PhD, director of applied research/psychiatry at the University of Saskatchewan in Saskatoon, Canada.

Author Contact: Muriel J. Montbriand, PhD, RN, can be reached at montbriand@skyway.usask.ca, with copy to editor at rose_mary@earthlink.net.

References


- Agarwal, K.C., & Parks, R.E. (1983). Forskolol: A potential antimetastatic agent. *International Journal of Cancer*, 32, 801–804.
- Ahn, Y.O. (1997). Diet and stomach cancer in Korea. *International Journal of Cancer*, 10(Suppl.), 7–9.
- Alabaster, O., Tang, Z.C., Frost, A., & Shivapurkar, N. (1993). Potential synergism between wheat bran and psyllium: Enhanced inhibition of colon cancer. *Cancer Letters*, 75, 53–58.
- Albright, C.D., Liu, R., Mar, M.H., Shin, O.H., Vrablic, A.S., Salganik, R.I., et al. (1997). Diet, apoptosis, and carcinogenesis. *Advances in Experimental Medicine and Biology*, 422, 97–107.
- Alic, M. (1999). Green tea for remission maintenance in Crohn's disease. *American Journal of Gastroenterology*, 94, 1710–1711.
- American Cancer Society 1996 Advisory Committee on Diet, Nutrition, and Cancer Prevention. (1996). Guidelines on diet, nutrition, and cancer prevention: Reducing the risk of cancer with healthy food choices and physical activity. *CA: A Cancer Journal for Clinicians*, 46, 325–341.
- Anesini, C., Ferraro, G., Lopez, P., & Borda, E. (2001). Different intracellular signals coupled to the antiproliferative action of aqueous crude extract from *Larrea divaricata* Cav. and nor-dihydroguaiaretic acid on a lymphoma cell line. *Phytomedicine*, 8(1), 1–7.
- Ascherio, A., Rimm, E.B., Giovannucci, E.L., Spiegelman, D., Stampfer, M., & Willett, W.C. (1996). Dietary fat and risk of coronary heart disease in men: Cohort follow up study in the United States. *BMJ*, 313, 84–90.
- Ashar, B., & Vargo, E. (1996). Shark cartilage-induced hepatitis. *Annals of Internal Medicine*, 125, 780–781.
- Auer, W., Eiber, A., Hertkorn, E., Hoehfeld, E., Koehrl, U., Lorenz, A., et al. (1990). Hypertension and hyperlipidaemia: Garlic helps in mild cases. *British Journal of Clinical Practice Supplement*, 69, 3–6.
- Awad, A.B., Chen, Y.C., Fink, C.S., & Hennessey, T. (1996). Beta-sitosterol inhibits HT-29 human colon cancer cell growth and alters membrane lipids. *Anticancer Research*, 16, 2797–2804.
- Awad, A.B., von Holtz, R.L., Cone, J.P., Fink, C.S., & Chen, Y.C. (1998). Beta-sitosterol inhibits growth of HT-29 human colon cancer cells by activating the sphingomyelin cycle. *Anticancer Research*, 18, 471–473.
- Badary, O.A., Al-Shabanah, O.A., Nagi, M.N., Al-Rikabi, A.C., & Elmarz, M.M. (1999). Inhibition of benzo(a)pyrene-induced forestomach carcinogenesis in mice by thymoquinone. *European Journal of Cancer Prevention*, 8, 435–440.
- Bagui, S., Ray, M., & Ray, S. (1999). Glyceraldehyde-3-phosphate dehydrogenase from Ehrlich ascites carcinoma cells. *European Journal of Biochemistry*, 262, 386–395.
- Bailey, G.S., Dashwood, R.H., Fong, A.T., Williams, D.E., Scanlan, R.A., & Hendricks, J.D. (1991). Modulation of mycotoxin and nitrosamine carcinogenesis by indole-3-carbinol: Quantitative analysis of inhibition versus promotion. *IARC Scientific Publications*, 105, 275–280.
- Batchelor, W.B., Heathcote, J., & Wanless, I.R. (1995). Chaparral-induced hepatic injury. *American Journal of Gastroenterology*, 90, 831–833.
- Bell, M.C., Crowley-Nowick, P., Bradlow, H.L., Sepkovic, D.W., Schmidt-Grimminger, D., Howell, P., et al. (2000). Placebo-controlled trial of indole-3-carbinol in the treatment of CIN. *Gynecologic Oncology*, 78, 123–129.
- Berges, R.R., Windeler, J., Trampisch, H.J., & Senge, T. (1995). Randomised, placebo-controlled, double-blind clinical trial of beta-sitosterol in patients with benign prostatic hyperplasia. Beta-sitosterol Study Group. *Lancet*, 345, 1529–1532.
- Bisset, N.G., & Wichtl, E. (Eds.). (1994). *Herbal drugs and phytopharmaceuticals. A handbook for practice on a scientific basis*. London: Medpharm.
- Blankson, H., Stakkestad, J.A., Fagertun, H., Thom, E., Wadstein, J., & Gudmundsen, O. (2000). Conjugated linoleic acid reduces body fat mass in overweight and obese humans. *Journal of Nutrition*, 130, 2943–2948.
- Bleumink, E., Mitchell, J.C., Geismann, T.A., & Towers, G.H. (1976).

- Contact hypersensitivity to sesquiterpene lactones in chrysanthemum dermatitis. *Contact Dermatitis*, 2, 81–88.
- Bloch, A.S. (2000). Pushing the envelope of nutrition support: Complementary therapies. *Nutrition*, 16, 236–239.
- Bluhm, R., Branch, R., Johnston, P., & Stein, R. (1990). Aplastic anemia associated with canthaxanthin ingested for 'tanning' purposes. *JAMA*, 264, 1141–1142.
- Blumenthal, M., Busse, W.R., Goldberg, A., Gruenwald, J., Hall, T., Riggins, C.W., et al. (Eds.). (1998). *The complete German commission E monographs: Therapeutic guide to herbal medicines* (S. Klein, Trans.). Boston: American Botanical Council.
- Bomser, J., Madhavi, D.L., Singletar, K., & Smith, M.A. (1996). In vitro anticancer activity of fruit extracts from *Vaccinium* species. *Planta Medica*, 62, 212–216.
- Bouhnik, Y., Pochart, P., Marteau, P., Arlet, G., Godere, I., & Rambaud, J.C. (1992). Fecal recovery in humans of viable bifidobacterium ingested in fermented milk. *Gastroenterology*, 102, 875–878.
- Bounous, G., Batist, G., & Gold, P. (1991). Whey proteins in cancer prevention. *Cancer Letters*, 57, 91–94.
- Bradlow, H.L., Michnovicz, J., Telang, N.T., & Osborne, M.P. (1991). Effects of dietary indole-3-carbinol on estradiol metabolism and spontaneous mammary tumors in mice. *Carcinogenesis*, 12, 1571–1574.
- Brinker, F. (1998). *Herb contraindications and drug interactions* (2nd ed.). Sandy, OR: Eclectic Medical.
- Brown, G.A., Vukovich, M.D., Reifenrath, T.A., Uhl, N.L., Parsons, K.A., Sharp, R.L., et al. (2000). Effects of anabolic precursors on serum testosterone concentration and adaptations to resistance training in young men. *International Journal of Sport Nutrition and Exercise Metabolism*, 10, 340–359.
- Butland, B.K., Fehily, A.M., & Elwood, P.C. (2000). Diet, lung function, and lung function decline in a cohort of 2512 middle aged men. *Thorax*, 55, 102–108.
- Cao, Y., & Cao, R. (1999). Angiogenesis inhibited by drinking tea [Letter to the editor]. *Nature*, 398, 381.
- Chasan-Taber, L., Willett, W.C., Seddon, J.M., Stampfer, M.J., Rosner, B., Colditz, G.A., et al. (1999). A prospective study of carotenoid and vitamin A intakes and risk of cataract extraction in U.S. women. *American Journal of Clinical Nutrition*, 70, 509–526.
- Chew, B.P., Park, J.S., Wong, M.W., & Tong, T.S. (1999). A comparison of the anticancer activities of dietary beta-carotene, canthaxanthin and astaxanthin in mice in vivo. *Anticancer Research*, 19, 1849–1854.
- Chew, B.P., Wong, M.W., Park, J.S., & Wong, T.S. (1999). Dietary beta-carotene and astaxanthin but not canthaxanthin stimulate splenocyte function in mice. *Anticancer Research*, 19, 5223–5228.
- Christensen, J.H., Christensen, M.S., Toft, E., Dyerberg, J., & Schmidt, E.B. (2000). Alpha-linolenic acid and heart rate variability. *Nutrition, Metabolism, and Cardiovascular Diseases*, 10, 57–61.
- Circosta, C., Occhiuto, F., Ragusa, S., Trovato, A., Tumino, G., Briguglio, F., et al. (1984). A drug used in traditional medicine: *Harpagophytum procumbens* DC. II. Cardiovascular activity. *Journal of Ethnopharmacology*, 11, 259–274.
- Clinton, S.K., Emenhiser, C., Schwartz, S.J., Bostwick, D.G., Williams, A.W., Moore, B.J., et al. (1996). Cis-trans lycopene isomers, carotenoids, and retinol in the human prostate. *Cancer Epidemiology, Biomarkers and Prevention*, 5, 823–833.
- Colditz, G.A. (2000). Changing dietary patterns and cancer prevention: Alpha-linolenic acid health risks and benefits. *Cancer Causes and Control*, 11, 677–678.
- Consensus statement on cereals, fibre and colorectal and breast cancers. Proceeding of the European Cancer Prevention consensus meeting. Santa Margherita, Italy, 2–5 October 1997. (1998). *European Journal of Cancer Prevention*, 7(Suppl. 2), S1–S83.
- Covington, T.R. (Ed.). (1996). *Handbook of nonprescription drugs* (11th ed.). Washington, DC: American Pharmaceutical Association.
- Dashwood, R.H. (1998). Indole-3-carbinol: Anticarcinogen or tumor promoter in brassica vegetables? *Chemico-Biological Interactions*, 110(1–2), 1–5.
- de Jong, N.W., Vermeulen, A.M., van Wijk, R.G., & de Groot, H. (1998). Occupational allergy caused by flowers. *Allergy*, 53, 204–209.
- De Stefani, E., Deneo-Pellegrini, H., Boffetta, P., Ronco, A., & Mendilaharsu, M. (2000). Alpha-linolenic acid and risk of prostate cancer: A case-control study in Uruguay. *Cancer Epidemiology, Biomarkers and Prevention*, 9, 335–338.
- Duke, J.A. (1987). *CRC handbook of medicinal herbs*. Boca Raton, FL: CRC Press.
- Duke, J.A. (1997). *The green pharmacy*. Emmaus, PA: Rodale Press.
- Efendy, J.L., Simmons, D.L., Campbell, G.R., & Campbell, J.H. (1997). The effect of the aged garlic extract 'Kyolic,' on the development of experimental atherosclerosis. *Atherosclerosis*, 132(1), 37–42.
- Eigenmann, P.A., Burks, A.W., Bannon, G.A., & Sampson, H.A. (1996). Identification of unique peanut and soy allergens in sera adsorbed with cross-reacting antibodies. *Journal of Allergy and Clinical Immunology*, 98, 969–978.
- Eisenberg, D.M., Davis, R.B., Ettner, S.L., Appel, S., Wilkey, S., Van Rompay, M., et al. (1998). Trends in alternative medicine in the United States, 1990–1997. *JAMA*, 280, 1569–1575.
- Eisenberg, D.M., Kessler, R.C., Foster, C., Norlock, F.E., Calkins, D.R., & Delbanco, T.L. (1993). Unconventional medicine in the United States: Prevalence, cost and patterns of use. *New England Journal of Medicine*, 328, 246–252.
- El Attar, T.M., & Virji, A.S. (1999). Modulating effect of resveratrol and quercetin on oral cancer cell growth and proliferation. *Anticancer Drugs*, 10, 187–193.
- Ernst, E. (2000a). Prevalence of use of complementary/alternative medicine: A systematic review. *Bulletin of the World Health Organization*, 78, 252–257.
- Ernst, E. (2000b). The role of complementary and alternative medicine in cancer. *Lancet Oncology*, 1(3), 176–180.
- Ernst, E., & Cassileth, B.R. (1998). The prevalence of complementary alternative medicine in cancer: A systematic review. *Cancer*, 83, 777–782.
- Estes, J.D., Stolpman, D., Olyaei, A., Corless, C.L., Ham, J.M., Schwartz, J.M., et al. (2003). High prevalence of potentially hepatotoxic herbal supplement use in patients with fulminant hepatic failure. *Archives of Surgery*, 138, 852–858.
- Evans, B.A., Griffiths, K., & Morton, M.S. (1995). Inhibition of 5 alpha-reductase in genital skin fibroblasts and prostate tissue by dietary lignans and isoflavonoids. *Journal of Endocrinology*, 147, 295–302.
- Facts and Comparisons. (2001). *The Lawrence review of natural products—monograph system*. St. Louis, MO: Walter Kluwer.
- Ferrara, L.A., Raimondi, A.S., D'Episcopo, L., Guido, L., Dello Russo, A., & Marotta, T. (2000). Olive oil and reduced need for antihypertensive medications. *Archives of Internal Medicine*, 160, 837–842.
- Fetrow, C.W., & Avila, J.R. (1999). *Professional's handbook of complementary and alternative medicines*. Springhouse, PA: Springhouse.
- Fontenele, J.B., Araujo, G.B., de Alencar, J.W., & Viana, G.S. (1997). The analgesic and anti-inflammatory effects of shark cartilage are due to a peptide molecule and are nitric oxide (NO) system dependent. *Biological and Pharmaceutical Bulletin*, 20, 1151–1154.
- Fontenele, J.B., Viana, G.S., Xavier-Filho, J., & de-Alencar, J.W. (1996). Anti-inflammatory and analgesic activity of a water-soluble fraction from shark cartilage. *Brazilian Journal of Medical and Biological Research*, 29, 643–646.
- Foster, S., & Duke, J.A. (1990). *A field guide to medicinal plants*. New York: Houghton Mifflin.
- Foster, S., & Tyler, V.E. (1993). *Tyler's honest herbal: A sensible guide to the use of herbs and related remedies* (3rd ed.). Binghamton, NY: Haworth Herbal Press.
- Freeman, G.L. (1994). Psyllium hypersensitivity. *Annals of Allergy*, 73, 490–492.
- Freeman, V.L., Meydani, M., Yong, S., Pyle, J., Flanigan, R.C., Waters, W.B., et al. (2000). Prostatic levels of fatty acids and the histopathology of localized prostate cancer. *Journal of Urology*, 164, 2168–2172.
- Gann, P.H., Hennekens, C.H., Sacks, F.M., Grodstein, F., Giovannucci, E.L., & Stampfer, M.J. (1994). Prospective study of plasma fatty acids and risk of prostate cancer. *Journal of the National Cancer Institute*, 86, 281–286.
- Gann, P.H., Ma, J., Giovannucci, E., Willett, W., Sacks, F.M., Hennekens,

- C.H., et al. (1999). Lower prostate cancer risk in men with elevated plasma lycopene levels: Results of a prospective analysis. *Cancer Research*, 59, 1225–1230.
- Gennaro, A. (1995). *The science and practice of pharmacy* (19th ed.). Easton, PA: Mack.
- Gerber, M. (1996). Fiber and breast cancer: Another piece of the puzzle—But still an incomplete picture. *Journal of the National Cancer Institute*, 88, 857–858.
- Gerhardt, A.L., & Gallo, N.B. (1998). Full-fat rice bran and oat bran similarly reduce hypercholesterolemia in humans. *Journal of Nutrition*, 128, 865–869.
- Gesensway, D. (2000). Vitamin D. *Annals of Internal Medicine*, 133, 318.
- Ghoneum, M. (1998). Enhancement of human natural killer cell activity by modified arabinosylane from rice bran (MGN-3). *International Journal of Immunotherapy*, 14, 89–99.
- Giovannucci, E. (1999). Tomatoes, tomato-based products, lycopene, and cancer: Review of the epidemiologic literature. *Journal of the National Cancer Institute*, 91, 317–331.
- Giovannucci, E., Asherio, A., Rimm, E.B., Stampfer, M.J., Colditz, G.A., & Willett, W.C. (1995). Intake of carotenoids and retinol in relation to risk of prostate cancer. *Journal of the National Cancer Institute*, 87, 1767–1776.
- Giovannucci, E., Leitzmann, M., Spiegelmann, D., Rimm, E.B., Colditz, G.A., Stampfer, M.J., et al. (1998). A prospective study of physical activity and prostate cancer in male health professionals. *Cancer Research*, 58, 5117–5122.
- Gomes, E.M., Souto, P.R., & Felzenszwalb, I. (1996). Shark-cartilage containing preparation protects cells against hydrogen peroxide induced damage and mutagenesis. *Mutation Research*, 367, 204–208.
- Gordon, D.W., Rosenthal, G., Hart, J., Sirota, R., & Baker, A.L. (1995). Chaparral ingestion: The broadening spectrum of liver injury caused by herbal medications. *JAMA*, 273, 489–490.
- Govers, M.J., Gannon, N.J., Dunshea, F.R., Gibson, P.R., & Muir, J.G. (1999). Wheat bran affects the site of fermentation of resistant starch and luminal indexes related to colon cancer risk: A study in pigs. *Gut*, 45, 840–847.
- Gradelet, S., Le Bon, A.M., Berges, R., Suschetet, M., & Astorg, P. (1998). Dietary carotenoids inhibit aflatoxin B₁-induced liver preneoplastic foci and DNA damage in the rat: Role of the modulation of aflatoxin B₁ metabolism. *Carcinogenesis*, 19, 403–411.
- Grubbs, C.J., Steele, V.E., Casebolt, T., Juliana, M.M., Eto, I., Whitaker, L.M., et al. (1995). Chemoprevention of chemically-induced mammary carcinogenesis by indole-3-carbinol. *Anticancer Research*, 15, 709–716.
- Gruenewald, J., Brendler, T., & Jaenicke, C. (Eds.). (1998). *PDR® for herbal medicines*. Montvale, NJ: Medical Economics.
- Gupta, S., Ahmad, N., & Mukhtar, H. (1999). Prostate chemoprevention by green tea. *Seminars in Urologic Oncology*, 17, 70–76.
- Hakkak, R., Korourian, S., Shelnut, S.R., Lensing, S., Ronis, M.J., & Badger, T.M. (2000). Diets containing whey proteins or soy protein isolate protect against 7,12-dimethylbenz(a)anthracene-induced mammary tumors in female rats. *Cancer Epidemiology, Biomarkers and Prevention*, 9, 113–117.
- Hardman, J.G., & Limbird, L.L. (Eds.). (1996). *Goodman and Gilman's the pharmacological basis of therapeutics* (9th ed.) New York: McGraw-Hill.
- Harkins, K. (2000). What's the use of cranberry juice? *Age and Ageing*, 29(1), 9–12.
- Harvei, S., Bjerve, K.S., Tretli, S., Jellu, E., Robsahm, T.E., & Vatten, L. (1997). Prediagnostic level of fatty acids in serum phospholipids: Omega-3 and omega-6 fatty acids and the risk of prostate cancer. *International Journal of Cancer*, 71, 545–551.
- Hay, K.D., & Greig, D.E. (1990). Propolis allergy: A cause of oral mucositis with ulceration. *Oral Surgery, Oral Medicine, and Oral Pathology*, 70, 584–586.
- He, K., Zhao, G.X., Shi, G., Zeng, L., Chao, J.F., & McLaughlin, J.L. (1997). Additional bioactive annonaceous acetogenins from *Asminia triloba* (Annonaceae). *Bioorganic and Medicinal Chemistry*, 5, 501–506.
- He, Y.H., Friesen, M.D., Ruch, R.J., & Schut, H.A. (2000). Indole-3-carbinol as a chemopreventive agent in 2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine (PhIP) carcinogenesis: Inhibition of PhIP-DNA adduct formation, acceleration of PhIP metabolism, and induction of cytochrome P450 in female F344 rats. *Food and Chemical Toxicology*, 38(1), 15–23.
- Health and Welfare Canada. (1990). *Nutrition recommendations*. Ottawa: Canadian Government Publishing Centre.
- Herbert, V. (1981). *Nutrition cultism facts and fictions*. Philadelphia: Stickley.
- Herschler, R. (1986). *U.S. Patent No. 4,616,039*. Washington, DC: U.S. Patent and Trademark Office.
- Holzgartner, H., Schmidt, U., & Kuhn, U. (1992). Comparison of the efficacy and tolerance of a garlic preparation vs. bezafibrate. *Arzneimittel-Forschung*, 42, 1473–1477.
- Hu, F.B., Stampfer, M.J., Manson, J.E., Rimm, E.B., Wolk, A., Colditz, G.A., et al. (1999). Dietary intake of alpha-linolenic acid and risk of fatal ischemic heart disease among women. *American Journal of Clinical Nutrition*, 69, 890–897.
- Huang, D.S., Odeleye, O.E., & Watson, R.R. (1992). Inhibitor effects of canthaxanthin on in vitro growth of murine tumor cells. *Cancer Letters*, 65, 209–213.
- Huang, K.C. (1999). *The pharmacology of Chinese herbs* (2nd ed.). Boca Raton, FL: CRC Press.
- Huang, Z., Fasco, M.J., & Kaminsky, L.S. (1997). Inhibition of estrone sulfatase in human liver microsomes by quercetin and other flavonoids. *Journal of Steroid Biochemistry and Molecular Biology*, 63(1–3), 9–15.
- Hunt, T.J., & Connelly, J.F. (1995). Shark cartilage for cancer treatment. *American Journal of Health-System Pharmacy*, 52, 1756–1760.
- Ide, N., & Lau, B.H. (1997). Garlic compounds protect vascular endothelial cells from oxidized low density lipoprotein-induced injury. *Journal of Pharmacy and Pharmacology*, 49, 908–911.
- Ide, N., & Lau, B.H. (1999). Aged garlic extract attenuates intracellular oxidative stress. *Phytomedicine*, 6, 125–131.
- Imai, J., Ide, N., Nagae, S., Moriguchi, T., Matsuura, H., & Itakura, Y. (1994). Antioxidant and radical scavenging effects of aged garlic extract and its constituents. *Planta Medica*, 60, 417–420.
- Jackson, B., & Hicks, L.E. (1997). Effect of cranberry juice on urinary pH in older adults. *Home Healthcare Nurse*, 15, 199–202.
- Jacobsen, B.K., Knutsen, S.F., & Fraser, G.E. (1998). Does high soy milk intake reduce prostate cancer incidence? *Cancer Causes and Control*, 9, 553–557.
- Jain, A.K., Vargas, R., Gotzkowsky, S., & McMahon, F.G. (1993). Can garlic reduce levels of serum lipids? A controlled clinical study. *American Journal of Medicine*, 94, 632–635.
- Katiyar, S.K., Ahmad, N., & Mukhtar, N. (2000). Green tea and skin. *Archives of Dermatology*, 136, 989–994.
- Katz, M., & Saibil, F. (1990). Herbal hepatitis: Subacute hepatic necrosis secondary to chaparral leaf. *Journal of Clinical Gastroenterology*, 12, 203–206.
- Kennedy, R.S., Konok, G.P., Bounous, G., Baruchel, S., & Lee, T.D. (1995). The use of a whey protein concentrate in the treatment of patients with metastatic carcinoma: A phase I–II clinical study. *Anticancer Research*, 15, 2643–2649.
- Keys, A., Menotti, A., Karvonen, M.J., Aravanis, C., Blackburn, H., Buzina, R., et al. (1986). The diet and 15-year death rate in the seven countries study. *American Journal of Epidemiology*, 124, 903–915.
- Kim, D.J., Han, B.S., Ahn, B., Hasegawa, R., Shirai, T., Ito, N., et al. (1997). Enhancement by indole-3-carbinol of liver and thyroid gland neoplastic development in a rat medium-term multiorgan carcinogenesis model. *Carcinogenesis*, 18, 377–381.
- King, D.S., Sharp, R.L., Vukovich, M.D., Brown, G.A., Reifenrath, T.A., Uhl, N.L., et al. (1999). Effects of oral androstenedione on serum testosterone and adaptations to resistance training in young men: A randomized controlled trial. *JAMA*, 281, 2020–2028.
- Klein, V., Chajes, V., Germain, E., Schulgen, G., Pinault, M., Malvy, D., et al. (2000). Low alpha-linolenic acid content of adipose breast tissue is associated with an increased risk of breast cancer. *European Journal of Cancer*, 36, 335–340.
- Klippel, K.F., Hiltl, D.M., & Schipp, B. (1997). A multicentric, placebo-

- controlled, double-blind clinical trial of beta-sitosterol (phytosterol) for the treatment of benign prostatic hyperplasia. *British Journal of Urology*, 80, 427–432.
- Kojima, T., Tanaka, T., & Mori, H. (1994). Chemoprevention of spontaneous endometrial cancer in female Donryu rats by dietary indole-3-carbinol. *Cancer Research*, 54, 1446–1449.
- Kolonel, L.N., Nomura, A.M., & Cooney, R.V. (1999). Dietary fat and prostate cancer: Current status. *Journal of the National Cancer Institute*, 91, 414–428.
- Kuno, Y., Kawabe, Y., & Sakakibara, S. (1999). Allergic contact dermatitis associated with photosensitivity, from alantolactone in a chrysanthemum farmer. *Contact Dermatitis*, 40, 224–225.
- L'Allemain, G. (1999). Les multiples actions de l'EGCG anti-oxydant tiré du thé vert [Multiple actions of EGCG, the main component of green tea]. *Bulletin du Cancer*, 86, 721–724.
- Lane, I.W., & Comac, L. (1992). *Sharks don't get cancer*. Garden City, NY: Avery.
- Lashner, B.A. (1993). Red blood cell folate is associated with the development of dysplasia and cancer in ulcerative colitis. *Journal of Cancer Research and Clinical Oncology*, 119, 549–554.
- la Vecchia, C., Negri, E., Franceschi, S., Decrali, A., Giacosa, A., & Lipworth, L. (1995). Olive oil, other dietary fats, and the risk of breast cancer. *Cancer Causes and Control*, 6, 545–550.
- Lean, M.E., Noroozi, M., Kelly, I., Burns, J., Talwar, D., Sattar, N., et al. (1999). Dietary flavonols protect diabetic human lymphocytes against oxidative damage to DNA. *Diabetes*, 48, 176–181.
- Lee, I.P., Kim, Y.H., Kang, M.H., Roberts, C., Shim, J.S., & Roh, J.K. (1997). Chemopreventive effect of green tea (*Camellia sinensis*) against cigarette smoke-induced mutations (SCE) in humans. *Journal of Cellular Biochemistry Supplement*, 27, 68–75.
- Lee, S.K., Song, L., Mata-Greenwood, E., Kelloff, G.J., Steele, V.E., & Pezuto, J.M. (1999). Modulation of in vitro biomarkers of the carcinogenic process by chemopreventive agents. *Anticancer Research*, 19, 441–449.
- LeMarchand, L., Murphy, S.P., Hankin, J.H., Wilkens, L.R., & Kolonel, L.N. (2000). Intake of flavonoids and lung cancer. *Journal of the National Cancer Institute*, 92, 154–160.
- Leung, A.Y., & Foster, S. (1996). *Encyclopedia of common natural ingredients used in food, drugs, and cosmetics* (2nd ed.). New York: John Wiley and Sons.
- Li, M.K., Blacklock, N.J., & Garside, J. (1985). Effects of magnesium on calcium oxalate crystallization. *Journal of Urology*, 133, 123–125.
- Luo, D.Y. (1992). Inhibitory effect of refined *Amorphophallus konjac* on MNNG-induced lung cancer in mice. *Zhonghua Zhong Liu Za Zhi*, 14, 48–50.
- Martindale, W. (1999). *Martindale: The extra pharmacopoeia*. London: Royal Pharmaceutical Society, Pharmaceutical Press.
- Massey, L.K., Palmer, R.G., & Horner, H.T. (2001). Oxalate content of soybean seeds (Glycine max: Leguminosae), soyfoods, and other edible legumes. *Journal of Agricultural and Food Chemistry*, 49, 4262–4266.
- McCabe, D., O'Dwyer, P., Sickle-Santanello, B., Woltering, E., Abou-Issa, H., & James, A. (1986). Polar solvents in the chemoprevention of dimethylbenzanthracene-induced rat mammary cancer. *Archives of Surgery*, 121, 1455–1459.
- McDonald, R.W., Bunjobon, W., Liu, T., Fessler, S., Pardo, O.E., Freer, I.K., et al. (2001). Synthesis and anticancer activity of nordihydroguaiaretic acid (NDGA) and analogues. *Anticancer Drug Design*, 16, 261–270.
- McIntosh, G.H. (1993). Colon cancer: Dietary modifications required for a balanced protective diet. *Preventive Medicine*, 22, 767–774.
- McKevo, G.K. (Ed.). (1998). *AHFS drug information*. Bethesda, MD: American Society of Health-System Pharmacists.
- McMichael-Phillips, D.F., Harding, C., Morton, M., Roberts, S.A., Howell, A., Potten, C.S., et al. (1998). Effects of soy-protein supplementation on epithelial proliferation in the histologically normal human breast. *American Journal of Clinical Nutrition*, 68(6, Suppl.), 1431S–1435S.
- McRorie, J., Kesler, J., Bishop, L., Fillion, T., Allgood, G., Sutton, M., et al. (2000). Effects of wheat bran and Olestra on objective measures of stool and subjective reports of GI symptoms. *American Journal of Gastroenterology*, 95, 1244–1252.
- Michaud, D.S., Feskani, D., Rimm, E.G., Colditz, G.A., Speizer, F.E., Willett, W.C., et al. (2000). Intake of specific carotenoids and risk of lung cancer in 2 prospective U.S. cohorts. *American Journal of Clinical Nutrition*, 72, 990–997.
- Michnovicz, J.J. (1998). Increased estrogen 2-hydroxylation in obese women using oral indole-3-carbinol. *International Journal of Obesity and Related Metabolic Disorders*, 22, 227–229.
- Michnovicz, J.J., & Bradlow, H.L. (1990). Induction of estrogen metabolism by dietary indole-3-carbinol in humans. *Journal of the National Cancer Institute*, 82, 947–949.
- Micromedex Inc. (2004). *Micromedex healthcare series*. Englewood, CO: Author.
- Miller, D.R., Anderson, G.T., Stark, J.J., Granick, J.L., & Richardson, D. (1998). Phase I/II trial of the safety and efficacy of shark cartilage in the treatment of advanced cancer. *Journal of Clinical Oncology*, 16, 3649–3655.
- Miodini, P., Floravanti, L., Di Fronzo, G., & Cappelletti, V. (1999). The two phyto-oestrogens genistein and quercetin exert different effects on oestrogen receptor function. *British Journal of Cancer*, 80, 1150–1155.
- Montbriand, M.J. (1994). *Decision heuristics of patients with cancer: Alternate and biomedical choices*. Unpublished doctoral dissertation, University of Saskatchewan, Saskatoon, Canada.
- Montbriand, M.J. (1995a). Alternative therapies as control behaviors used by cancer patients. *Journal of Advanced Nursing*, 22, 646–654.
- Montbriand, M.J. (1995b). Decision tree model describing alternate health care choices made by oncology patients. *Cancer Nursing*, 18, 104–117.
- Montbriand, M.J. (1997). Empowerment of seniors through improved communication about medication. In L.F. Heumann (Ed.), *Proceedings of the Sixth International Conference on Systems Science in Health-Social Services for the Elderly and the Disabled* (pp. 258–264). Chicago: University of Illinois of Urbana-Champaign.
- Montbriand, M.J. (2000a). Health professionals' attitudes about alternative therapies. *Canadian Nurse*, 96, 22–26.
- Montbriand, M.J. (2000b). Senior and health-professionals' mismatched perceptions and communication about prescription and non-prescription medication. *Canadian Journal on Aging*, 19, 35–56.
- Montbriand, M.J. (2004a). Herbs or natural products that decrease cancer growth: Part one of a four-part series. *Oncology Nursing Forum*, 31, E75–E90.
- Montbriand, M.J. (2004b). Herbs or natural products that increase cancer growth or recurrence: Part two of a four-part series. *Oncology Nursing Forum*, 31, E99–E115.
- Moriguchi, T., Saito, H., & Nishiyama, N. (1996). Aged garlic extract prolongs longevity and improves spatial memory deficit in senescence-accelerated mouse. *Biological and Pharmaceutical Bulletin*, 19, 305–307.
- Murray, M., & Pizzorno, J. (1998). *Encyclopedia of natural medicine* (2nd ed.). Rocklin, CA: Prima Health.
- Natural Medicines Comprehensive Database. (2004). Therapeutic Research National Faculty database [Data file]. Available at <http://www.naturaldatabase.com>
- Newall, C.A., Anderson, L.A., & Philpson, J.D. (1996). *Herbal medicine: A guide for health care professionals*. London: Pharmaceutical Press.
- O'Dwyer, P.J., McCabe, D.P., Sickle-Santanello, B.J., Woltering, E.A., Clausen, K., & Martin, E.W., Jr. (1988). Use of polar solvents in chemoprevention of 1,2-dimethylhydrazine-induced colon cancer. *Cancer*, 62, 944–948.
- Ohkawa, T., Ebisuno, S., Kitagawa, M., Morimoto, S., & Miyazaki, Y. (1983). Rice bran treatment for hypercalciuric patients with urinary calculous disease. *Journal of Urology*, 129, 1009–1011.
- Ohkawa, T., Ebisuno, S., Kitagawa, M., Morimoto, S., Miyazaki, Y., & Yasukawa, S. (1984). Rice bran treatment for patients with hypercalciuric stones: Experimental and clinical studies. *Journal of Urology*, 132, 1140–1145.
- O'Shea, M., Stanton, C., & Devery, R. (1999). Antioxidant enzyme defense responses of human MCF-7 and SW480 cancer cells to conjugated linoleic acid. *Anticancer Research*, 19, 1953–1960.
- Papenburg, R., Bounous, G., Fleiszer, D., & Gold, P. (1990). Dietary milk proteins inhibit the development of dimethylhydrazine-induced malignancy. *Tumor Biology*, 11, 129–136.

- Pariza, M., Park, Y., & Cook, M.E. (1999). Conjugated linoleic acid and the control of cancer and obesity. *Toxicological Sciences*, 52(2, Suppl.), 107–110.
- Paulsen, E., Sogaard, J., & Andersen, K.E. (1998). Occupational dermatitis in Danish gardeners and greenhouse workers (III). Compositae-related symptoms. *Contact Dermatitis*, 38, 140–146.
- Pence, B.C., Buddingh, F., & Yang, S.P. (1986). Multiple dietary factors in the enhancement of dimethylhydrazine carcinogenesis: Main effect of the indole-3-carbinol. *Journal of the National Cancer Institute*, 77, 269–276.
- Perlman, A.I., Eisenberg, D.M., & Panush, R.S. (1999). Talking with patients about alternative and complementary medicine. *Rheumatic Disease Clinics of North America*, 25, 815–822.
- Petrakis, N.L., Barnes, S., King, E.B., Lowenstein, J., Wiencke, J., Lee, M.M., et al. (1996). Stimulatory influence of soy protein isolate on breast secretion in pre- and postmenopausal women. *Cancer Epidemiology, Biomarkers and Prevention*, 5, 785–794.
- Pierre, F., Perrin, P., Champ, M., Bornet, F., Meflah, K., & Menanteau, J. (1997). Short-chain fructo-oligosaccharides reduce the occurrence of colon tumors and develop gut-associated lymphoid tissue in Min mice. *Cancer Research*, 57, 225–228.
- Pratt, S. (1999). Dietary prevention of age-related macular degeneration. *Journal of the American Optomology Association*, 70, 39–47.
- Ramon, J.M., Bou, R., Romea, S., Alkiza, M.E., Jacas, M., Ribes, J., et al. (2000). Dietary fat intake and prostate cancer risk: A case-control study in Spain. *Cancer Causes and Control*, 11, 679–685.
- Rao, A.V., & Agarwal, S. (1998). Bioavailability and in vivo antioxidant properties of lycopene from tomato products and their possible role in the prevention of cancer. *Nutrition and Cancer*, 31, 199–203.
- Rao, A.V., & Agarwal, S. (2000). Role of antioxidant lycopene in cancer and heart disease. *Journal of the American College of Nutrition*, 19, 563–569.
- Robbers, J.E., & Tyler, V.E. (1999). *Tyler's herbs of choice: The therapeutic use of phytochemicals*. New York: Haworth Herbal Press.
- Roberfroid, M.B. (2000). Prebiotics and probiotics: Are they functional foods? *American Journal of Clinical Nutrition*, 71(6, Suppl.), 1682S–1687S.
- Rosen, C.A., Woodson, G.E., Thompson, J.W., Hengesteg, A.P., & Bradlow, H.L. (1998). Preliminary results of the use of indole-3-carbinol for recurrent respiratory papillomatosis. *Otolaryngology and Head and Neck Surgery*, 118, 810–815.
- Salomi, N.J., Nair, S.C., Jayawardhanan, K.K., Varghese, C.D., & Panikkar, K.R. (1992). Antitumor principles from *Nigella sativa* seeds. *Cancer Letters*, 63, 41–46.
- Sato, T., & Miyata, G. (2000). The nutraceutical benefit, part IV: Garlic. *Nutrition*, 16, 787–788.
- Sauvaire, Y., Petit, P., Broca, C., Manteghetti, M., Baissac, Y., Fernandez-Alvarez, J., et al. (1998). 4-hydroxyisoleucine. A novel amino acid potentiator of insulin secretion. *Diabetes*, 47, 206–210.
- Schneider, R.P. (1989). Perdiem causes esophageal impaction and bezoars. *Southern Medical Journal*, 82, 1449–1450.
- Schulz, V., Hansel, R., & Tyler, V.E. (1998). *Rational phytotherapy: A physician's guide to herbal medicine* (3rd ed.) (T.C. Telger, Trans.). Berlin, Germany: Springer.
- Sebedio, J.L., Gnaedig, S., & Chardigny, J.M. (1999). Recent advances in conjugated linoleic acid research. *Current Opinion in Clinical Nutrition and Metabolic Care*, 2, 499–506.
- Sheikh, N.M., Philen, R.M., & Love, L.A. (1997). Chaparral-associated hepatotoxicity. *Archives of Internal Medicine*, 157, 913–919.
- Shoskes, D.A., Zeitlin, S.I., Shahed, A., & Rajfer, J. (1999). Quercetin in men with category III chronic prostatitis: A preliminary prospective, double-blind, placebo-controlled trial. *Urology*, 54, 960–963.
- Sigounas, G., Hooker, J., Anagnostou, A., & Steiner, M. (1997). S-allylmercaptocysteine inhibits cell proliferation and reduces the viability of erythroleukemia, breast, and prostate cancer cell lines. *Nutrition and Cancer*, 27, 186–191.
- Silagy, C., & Neil, A. (1994). Garlic as a lipid lowering agent—A meta-analysis. *Journal of the Royal College of Physicians of London*, 28, 39–45.
- Simopoulos, A.P. (1999). Essential fatty acids in health and chronic disease. *American Journal of Clinical Nutrition*, 70(3, Suppl.), 560S–569S.
- Slattery, M.L., Potter, J.D., Coates, A., Ma, K.N., Berry, T.D., Duncan, D.M., et al. (1997). Plant foods and colon cancer: An assessment of specific foods and their related nutrients (United States). *Cancer Causes and Control*, 8, 575–590.
- Smolinske, S.C. (1999). Dietary supplement-drug interactions. *Journal of the American Medical Women's Association*, 54, 191–192, 195.
- Snodderly, D.M. (1995). Evidence for protection against age-related macular degeneration by carotenoids and antioxidant vitamins. *American Journal of Clinical Nutrition*, 62(6, Suppl.), 1448S–1461S.
- Sommerburg, O., Keunen, J.E., Bird, A.C., & van Kuijk, F.J. (1998). Fruits and vegetables that are sources for lutein and zeaxanthin: The macular pigment in human eyes. *British Journal of Ophthalmology*, 82, 907–910.
- Sparber, A., Bauer, L., Curt, G., Eisenberg, D., Levin, T., Parks, S., et al. (2000). Use of complementary medicine by adult patients participating in cancer clinical trials. *Oncology Nursing Forum*, 27, 887–888.
- Sparber, A., & Wootton, J.C. (2001). Surveys of complementary and alternative medicine: Part II. Use of alternative and complementary cancer therapies. *Journal of Alternative and Complementary Medicine*, 7, 281–287.
- Sporn, M.B. (2000). Retinoids and demethylating agents—Looking for partners. *Journal of the National Cancer Institute*, 92, 780–781.
- Steinmetz, K.A., & Potter, J.D. (1991). Vegetables, fruit, and cancer. 1. Epidemiology. *Cancer Causes and Control*, 8, 575–590.
- Stone-Dorshow, T., & Levitt, M.D. (1987). Gaseous response to ingestion of a poorly absorbed fructo-oligosaccharide sweetener. *American Journal of Clinical Nutrition*, 46, 61–65.
- Stoneham, M., Goldacre, M., Seagroatt, V., & Gill, L. (2000). Olive oil, diet and colorectal cancer: An ecological study and a hypothesis. *Journal of Epidemiology and Community Health*, 54, 756–760.
- Suhonen, R., Kantola, I., & Bjorksten, F. (1983). Anaphylactic shock due to ingestion of psyllium laxative. *Allergy*, 38, 363–365.
- Tanaka, T., Makita, H., Ohnishi, M., Mori, H., Satoh, K., & Hara, A. (1995). Chemoprevention of rat oral carcinogenesis by naturally occurring xanthophylls, astaxanthin, and canthaxanthin. *Cancer Research*, 55, 4059–4064.
- Tanaka, T., Morishita, Y., Suzui, M., Kojima, T., Okumura, A., & Mori, H. (1994). Chemoprevention of mouse urinary bladder carcinogenesis by the naturally occurring carotenoid astaxanthin. *Carcinogenesis*, 15, 15–19.
- Taylor, J.R., & Wilt, V.M. (1999). Probable antagonism of warfarin by green tea. *Annals of Pharmacotherapy*, 33, 426–428.
- Trevisan, M., Krogh, V., Frudenheim, J., Blake, A., Muti, P., Panico, S., et al. (1990). Consumption of olive oil, butter, and vegetable oils and coronary heart disease risk factors. The Research Group ATS-RF2 of the Italian National Research Council. *JAMA*, 263, 688–692.
- Tsubono, Y., Nishino, Y., Komatsu, S., Hsieh, C.C., Kanemura, S., Tsuji, I., et al. (2001). Green tea and the risk of gastric cancer in Japan. *New England Journal of Medicine*, 344, 632–636.
- Tyler, V.E. (1993). *The honest herbal* (3rd ed.). Binghamton, NY: Pharmaceutical Products Press.
- Tyler, V.E. (1994). *Herbs of choice: The therapeutic use of phytochemicals*. Binghamton, NY: Pharmaceutical Products Press.
- Tyler, V.E., Brady, L.R., & Robbers, J.B. (1981). *Pharmacognosy*. Philadelphia: Lea and Febiger.
- Tzanakakis, G.N., Agarwal, K.C., & Vezeridis, M.P. (1990). Inhibition of hepatic metastasis from a human pancreatic adenocarcinoma (RWP-2) in the nude mouse by prostacyclin, forskolin, and ketoconazole. *Cancer*, 65, 446–451.
- Tzonou, A., Signorello, L.B., Lagiou, P., Wu, J., Trichopoulos, D., & Trichopoulos, A. (1999). Diet and cancer of the prostate: A case-control study in Greece. *International Journal of Cancer*, 80, 704–708.
- Vainio, H., & Rautalahti, M. (1998). An international evaluation of the cancer preventive potential of carotenoids. *Cancer Epidemiology, Biomarkers and Prevention*, 7, 725–728.
- Walsh, D.E., Yaghoobian, V., & Behforooz, A. (1984). Effect of glucomannan on obese patients: A clinical study. *International Journal of Obesity*, 8, 289–293.

- Watkins, T.R., Geller, M., Kooyenga, D.K., & Bierenbaum, M.L. (1999). Hypocholesterolemic and antioxidant effect of rice bran oil non-saponifiables in hypercholesterolemic subjects. *Environmental and Nutritional Interactions*, 3, 115–122.
- Weisburger, J.H., Reddy, B.S., Rose, D.P., Cohen, L.A., Kendall, M.E., & Wynder, E.L. (1993). Protective mechanisms of dietary fibers in nutritional carcinogenesis. *Basic Life Science*, 61, 45–63.
- White, J.D. (2002). Complementary and alternative medicine research: A National Cancer Institute perspective. *Seminars in Oncology*, 29, 546–551.
- Widschwendter, M., Berger, J., Hermann, M., Muller, H.M., Amberger, A., Zeschnigk, M., et al. (2000). Methylation and silencing of the retinoic acid receptor-beta2 gene in breast cancer. *Journal of the National Cancer Institute*, 82, 826–832.
- Wong, G.Y., Bradlow, L., Sepkovic, D., Mehl, S., Mailman, J., & Osborne, M.P. (1997). Dose-ranging study of indole-3-carbinol for breast cancer prevention. *Journal of Cellular Biochemistry Supplement*, 28–29, 111–116.
- Yates, A.A., Schlicker, S.A., & Suitor, C.W. (1998). Dietary reference intakes: The new basis for recommendations for calcium and related nutrients, B vitamins, and choline. *Journal of the American Dietetic Association*, 98, 699–706.
- Yen, C.L., Mar, M.H., & Zeisel, S.H. (1999). Choline deficiency-induced apoptosis in PC12 cells is associated with diminished membrane phosphatidylcholine and sphingomyelin, accumulation of ceramide and diacylglycerol, and activation of a caspase. *FASEB Journal*, 13, 135–142.
- Yu, X.Y. (1993). A prospective clinical study on reversion of 200 precancerous patients with hua-sheng-ping. *Zhongguo Zhong Xi Yi Jie He Za Zhi Zhongguo Zhongxiyi Jiehe Zazhi*, 13, 147–149.
- Yuan, F., Chen, D.Z., Liu, K., Sepkovic, D.W., Bradlow, H.L., & Auborn, K. (1999). Anti-estrogenic activities of indole-3-carbinol in cervical cells: Implication for prevention of cervical cancer. *Anticancer Research*, 19, 1673–1680.
- Zeisel, S.H. (1992). Choline: An important nutrient in brain development, liver function and carcinogenesis. *Journal of the American College of Nutrition*, 11, 473–481.
- Zhang, Y., Moriguchi, T., Saito, H., & Nishiyama, N. (1998). Functional relationship between age-related immunodeficiency and learning deterioration. *New European Journal of Neuroscience*, 10, 3869–3875. 

For more information . . .

- American Cancer Society: Complementary and Alternative Therapies
www.cancer.org/docroot/ETO/ETO_5.asp?sitearea=ETO

A link can be found at www.ons.org.
