How Foods Support Cancer Recovery

by Donald Yance, C.N., M.H., R.H. (AHG)

"You are what you eat."

This simple adage has been around since time immemorial. It is balanced by the complementary slogan "you are what you don't excrete" (but that's a different story). Perhaps more appropriately, "you are what you absorb." Overcoming illness and maintaining health through dietary therapy is central to holistic philosophy and practice.

People in the United States spend more per capita on junk food and fast food than any other country, are fatter than in any other country, and spend more in diet products and diet foods than any other country. The most widely advertised foods tend to be high in calories and low in nutrients, with little advertising for healthy foods like fruits, vegetables, whole grains, and beans.

It is difficult to change current lifestyle trends. Our corporate culture thrives on the inculcated work ethic, including a hectic work schedule that leaves little time to shop for fresh foods at the market and prepare healthy meals at home. Not only that, a bewildering variety of diets are popular today, making it hard to determine which dietary choices are best for one's individual needs. Most of these diets scapegoat a particular type of food as being responsible for ill health or weight gain. Carbohydrate-rich foods, high-fat foods, and low protein foods have all been targeted as culprits for the nation's high rates of obesity, cancer, and cardiovascular disease.

Know Your Ancestral Heritage

At any given point in time there are a number of factors that determine a person's unique nutritional requirements. One very significant and often overlooked factor is a person's ancestral heritage, which takes into account classic Darwinian principles of evolution and adaptation, natural selection, genetic mutation, and survival of the fittest. Over thousands of years of evolutionary history, people in different parts of the world developed very specific dietary needs as an adaptation mechanism, in response to many unique aspects of their habitats and lifestyles — including climate, geography, vegetation, and naturally occurring food supplies.

For example, people from cold northern regions of the world have historically relied heavily on animal protein, simply because that's the primary food source available in wintry climates. Thus, they have radically different nutritional needs than people from tropical regions, where the environment is rich in vegetative diversity year round.

In the early part of the 20th century, a brilliant scientist by the name of Weston Price, D.D.S., demonstrated this in no uncertain terms. He traveled all over the world and sought out the indigenous populations to study their diet and health. His discoveries were remarkable and extremely important. He wrote a brilliant and groundbreaking book, that was ignored by the medical establishment. Price found the diets of all the indigenous peoples to be tremendously varied, dependent on geography, climate, and edibles naturally available. Indigenous people from all parts who followed their ancestral diets were robust and healthy. He also found that those who moved away to cities or commercialized areas and strayed from their traditional diets developed degenerative diseases and very quickly developed dental problems. Eating more like our ancestral forbears is beneficial on all levels. The less processed your food the better. If you have Northern heritage then eat more fish and meat; if you have more Southern European, African, and Asian heritage eat more fruit and grains (Fallon, 2000).

Cancer Protective Eating Based on the Mediterranean Diet

1. Incorporate an abundance of food from plant sources, including fruits and vegetables, whole grains, whole-grain breads, beans, nuts, and seeds.

How Foods Support Cancer Recovery—CONTINUED

2. Eat minimally processed and mostly seasonally fresh and locally grown foods.
3. Use olive oil as the principal fat, replacing other fats and oils, and eat olives daily.
4. Drink a moderate amount of wine, normally with meals; about one to two glasses per day for men and one glass per day for women.
5. Eat fresh fruit as a typical daily dessert; limit sweets with a significant amount of sugar and saturated fat, and still only with whole grains and whole food sweetening agents.
6. Total dietary fat should range from 25–35%, with saturated fat between 7–10% of total calories.
7. Eat moderate amounts of high-quality cheese and yogurt daily.
8. Consume moderate amounts of fish and eggs, and if desired, poultry and/or wild meats from 0–3 servings per week.
9. Only eat red meat a few times or just one time per month, if desired, unless iron deficient, then it can be eaten a few times per week until iron levels reach normal.
10. Eat as much organically grown or wild foods as possible.

The Mediterranean diet includes locally grown wild vegetables, as well as other common vegetables, such as cabbage; leafy and root vegetables; bitter greens including arugula, radicchio, and endive; mushrooms; tomatoes and other fruiting vegetables; grapes and berries; fish; a moderate intake of hard cheeses; grains; and plenty of olive oil. People between the ages of 70–90 eating a Mediterranean diet have consistently lower rates of all cancers by 50%, but in particular, stomach cancer, colorectal cancer, breast and prostate cancer, and cancer of the esophagus, pancreas, and liver, than men in the wealthier industrial northeast. There is also a reduction in heart disease by 50% as well (Knoops et al., 2004).

Cancer Protective Compounds in Food Cancer Prevention

- Allicin — garlic
- Beta glucans — mushrooms, oats, onions
- Calcium D glucarate — apples, grapefruit, grapes, bean sprouts, cauliflower, cabbage
- Carotenoids — carrots, beets, kale, yams, sweet potatoes, red peppers
- Fiber — all fruits and vegetables, psyllium, slippery elm
- Ellagic acid — pomegranates, raspberries, strawberries, cranberries, loganberries, Marionberries
- Geraniol — from the volatile oil of rose geranium and lemon grass
- Indoles and isothiocyantes — wasabi, cabbage, broccoli (sprouts), kale, beet tops, turnip, Brussels sprouts, collards
- Isoflavones — fermented soy, clover and alfalfa sprouts
- Limonene — citrus juice and peel
- Lycopene — tomatoes and other red fruits and vegetables
- Omega-3 fatty acids — fish, flax oil, walnuts
- Polyphenols — black and freen tea, rooibos tea
- Selenium — Brazil nuts, salmon, garlic, shiitake, maitake mushrooms
- Sulfur garlic, onions, leeks, shallots, chives, eggs

Specific Cancer Protective Compounds in Common Spices and Teas

- Epigallocatechin gallate (EGCG) — black and green tea
  - Curcummoids — turmeric
  - Polyphenols — black and green tea, rooibos tea

How Foods Support Cancer Recovery—CONTINUED

Culinary Herbs to Add to Your Diet

Culinary herbs have antioxidant and anti-tumor activity. For example lemon grass and cumin contain farnesol, an isoprenoid that has been shown to inhibit tumor growth. Ginger, cayenne, oregano, and parsley all contain known anti-cancer agents. Herbs and spices also add wonderful flavor to food. Start with a pinch and then add until you have reached a level that is flavorful, but not overpowering. Some common spices with antioxidant health-promoting agents include:

- Allspice
- Basil
- Caraway seed
- Cardamom
- Celery
- Chili pepper
- Cinnamon
- Clove
- Ginger
- Lavender
- Lemon grass
- Marjoram
- Nutmeg
- Orange and lemon peel
- Oregano
- Paprika
- Parsley
- Rosemary
- Sage
- Turmeric
- Thyme

Common black pepper was historically used (as were many spices) to protect against rancidity of the food (mostly meat) and to cover up the taste if the food had already become semi-rancid. Black pepper exerts an anti-hepatotoxic effect by acting as a synergist for other nutrients to perform their functions more effectively. It prolongs the life of antioxidants, allowing them to work for longer periods of time. For instance, taking black pepper with turmeric allows the turmeric more time to do its detoxification work in the liver.

Little or No Red Meat Is Best for Cancer Inhibition

It's best to limit one's intake of red meat to four ounces or less per serving. Unless you are extremely blood deficient, eating meat predominant diet (particularly red meat) has drawbacks with regards to gene expression and cancer. Moderate intake of wild or organic meat isn't a problem as long as it is eaten with two or more servings of colorful vegetables. Dietary epidemiological studies indicate correlations between the consumption of conventionally raised red meat and nitrate containing cold cuts, and cancer of the colon, rectum, stomach, pancreas, bladder, endometrium and ovaries, prostate, breast, and lung, as well as an increase in heart disease, rheumatoid arthritis, type 2 diabetes, and Alzheimer's disease.

How Much Raw to Cooked Food Should One Eat?

There are a few basic guidelines to consider with regard to choosing a diet that is predominantly raw food. Eating food raw as opposed to properly cooked, fermented, or pickled, changes the energy of each ingredient, food, meal, and subsequent digestive and nutrient value. Some nutrients (folic acid, vitamin C, phenolic compounds) break down and are reduced or even lost when food is improperly cooked or overcooked. However, other food compounds and nutrients are made more absorbable cooking them with health fats. A notable example would be cooking tomatoes in olive oil which provides more absorbable form of lycopene. Fermented soy foods, such as tempeh and miso contain more bioavailable isoflavones and are easier to digest than soy grits, tofu, or roasted soy beans. Raw food in general is cooling, making it balancing for people that run hot, energetically speaking, or during the hot summer months. Raw food is often harder to digest for people who run cold and are deficient in HCl. In traditional Chinese Medicine, a person with this disposition would be identified as having a weak spleen (weak digestion, loose bowels, people undergoing chemotherapy). Cooked food warms the spleen and is often easier to digest. Most people do best with a blend of raw (cold), cooked (warm), and spicy

How Foods Support Cancer Recovery—CONTINUED

(hot) foods, herbs, and spices. A cleansing diet tends to emphasize raw foods, wherein a building diet emphasizes warming foods. A balancing diet would be about 50/50 with regards to raw and cooked foods.

Many books and theories on diet therapy for cancer emphasize the need to eat as much raw foods as possible. However, it is best not to generalize and to consider each person with cancer or any other condition, individually. A consultant needs to discuss with a client what is practical and plausible for them, what they like or crave, and the nature of any religious or dietary preferences or restrictions. Eating raw vs. cooked also depends on where one lives. Living in Florida or in a tropical country would be more conducive to eating a raw food diet. Living in Alaska or any other cold weather local would be more conducive to eating more warming cooked foods. Seasons, weather, and blood sugar stability are also most important is eating for health and recovery.

Fermented Foods Support Gut and Immune Health

Traditionally, people have used fermented foods like yogurt and sauerkraut both as a means to preserve food and to support intestinal, immunological, and overall health. As far back as Roman times, people consumed sauerkraut as a delicious food, and for health-related issues. In Indian, the consumption of a fermented dairy drink before meals called 'lassi' was and is commonly consumed. At the end of the meal, the people of India consumed a small serving of curd. These Indian traditions were based on the principle of using sour milk as a probiotic delivery system to your body. The Bulgarians are noted both for their longevity and their high consumption of fermented milk, as both yogurt and kefir. In Asian cultures, pickled fermentations of cabbage, turnips, eggplant, cucumbers, onions, squash, and carrots still exist today.

Eating Food Cooked at High Temperature Accelerates Aging

Eating foods cooked at high temperatures increase the rate at which we age, and contribute to chronic disease including cancer (Vlassara et al., 2002). The ingestion of high temperature cooked foods causes chronic inflammation and the formation of advanced glycation end products. As humans age, there is a systemic increase in inflammatory cytokines (destructive cell-signaling chemicals) that contribute to many degenerative diseases. Chronic inflammation disrupts the linings of arteries, mutates DNA, degrades brain cells, and is a major cause of cancer and cancer progression.

In aging people with multiple degenerative diseases, often there is typically an elevated blood level of C-reactive protein, indicating the presence of an inflammatory disorder, which usually means there are excess levels of one or more of the pro-inflammatory cytokines. The most common pro-inflammatory cytokines are tumor necrosis factor-alpha, interleukin-6, interleukin-1(b) and/or interleukin-8.

The other pathological aging mechanism exacerbated by eating high temperature cooked food is the formation of advanced *glycation end products* (AEs). Glycation can be described as the binding of a protein molecule to a glucose molecule resulting in the formation of damaged protein structures. Many age-related diseases such as arterial stiffening, cataracts, and neurological impairment are at least partially attributable to glycation.

Olive Oil: Cancer Inhibiting and Gene Normalizing

Olive oil is an integral ingredient of the "Mediterranean diet" and accumulating evidence suggests that it may have a potential role in lowering the risk of several types of cancers. A number of epidemiological studies have linked consumption of olive oil with a reduced risk of cancer and researchers are increasingly

How Foods Support Cancer Recovery—CONTINUED

investigating this association further in laboratory studies. The mechanisms by which the cancer-preventing effects of olive oil as having novel anti-cancer actions may relate to the ability of its *monounsaturated fatty acid* (MUFA) *oleic acid* (OA; 18:1n-9) to specifically regulate cancer-related oncogenes. Supporting the hypothesis, exogenous supplementation of cultured breast cancer cells with physiological concentrations of OA was found to suppress the overexpression of HER2 (Her-2/neu, erbB-2), a well-characterized oncogene playing a key role in the etiology, progression, and response to chemotherapy and endocrine therapy in approximately 20% of breast carcinomas. But while a recent report from the U.S. suggests that one of the oil's fats — oleic acid — could be responsible for protecting against breast cancer, the latest research suggests that the phenols in olive oil could protect against colon cancer. The *in vitro* study found that incubation of one cancer cell line with increasing concentrations of olive oil phenols for 24 hours protected the cells from DNA damage. The effect of olive oil phenols on another cell line after 48 hours of exposure suggested that they may exert an anti-promoter effect in the carcinogenesis pathway. The researchers say that the olive oil phenols also led to a significant reduction in the invasiveness of a colon cancer cell line *in vitro* (Gill et al., 2005).

Soy Foods and Cancer

No food has ever had as much publicity as soy — almost equally weighted for and against! Either you have been told it can cure cancer, on the one side, or it is a poison and contributes to or causes everything from birth defects, to mineral deficiencies, to pancreatic cancer, and dementia on the other. What almost nobody is talking about, though, is the form of the soy and the processing it has been subjected to. The fact is that most people are getting soy in all the wrong forms and do not even realize it. Soy protein isolate is in tofu, soy milk, power bars, fake cheeses, and so on. Soy oil in the form of the deadly hydrogenated oils is lurking in nearly every fast food or packaged product — from crackers, cookies, and other baked goods to canned foods, frozen French fries and TV dinners. Most people don't even know or seem to mind the fact that the food industry has slipped "invisible" soy into every supermarket food imaginable.

The truth of the matter is that commercially processed soy products, which include textured soy protein, soy oil, soy nuggets, soy margarine, soy ice cream, soy cheeses, soy protein isolate, and hydrolyzed vegetable protein products, are poorly digested and may even inhibit proper protein digestion and should not be eaten. These can be found as ingredients in everything from shake powders, energy bars and veggie burgers. Perhaps the worst of these are soy oil products including margarines and shortenings which are made from partially hydrogenated soybean oil containing dangerous trans fatty acids. Most of the liquid vegetable oils and salad dressings sold in supermarkets today also come from the soybean. To make these bland enough for public acceptance, the oils are subjected to heavy refining, deodorizing, and light hydrogenation. This is why it is so important to make you own salad dressing.

The other issue of concern when eating soy, or any bean for that matter, is the presence of protease inhibitors that decrease digestibility. The purpose of a bean's existence is to carry the genetic material for the next generation. It wants to get taken far from the parent plant so that there will be better opportunity for gene mixing when it flowers, and it wants to be in rich, well-fertilized soil. The bean packages itself in a juicy green pod and waits to be eaten by a deer or other passing animal. It is designed expressly to withstand the digestive juices of the animal and to be deposited later at a distant site along with a pile of fertilizer, ready to grow. When we allow the bean to ripen on the plant and then we dry it for food

How Foods Support Cancer Recovery—CONTINUED

use, we preserve all those digestion inhibition factors and they act on our endogenous proteolytic enzymes to decrease our capacity to adequately digest the bean. This reduces the nutritional value of the bean and also contributes to inflammatory bowel diseases and food allergies, through the presence of proteins too low down in the gut. Not until the bean is well soaked and is in a good position to sprout will its physiology change to switch off the protease inhibitors.

Thus for improved digestibility of all beans and grains, it is best to soak and then rinse them well to wash off the 'negative nutrients'. Fermenting the bean also neutralizes the protease inhibitors. In cultures of the Far East, where soy foods are commonly consumed, the traditional and time-honored way to prepare it is by fermentation. Tempeh, miso, tamari (soy sauce) and natto are all ancient ways of preparing the otherwise indigestible soy bean into a palatable and nutritious food. *Edamame* is the Japanese term for the young green beans in the pod. These are harvested before they are mature so they have minimal protease inhibitors. They are boiled in salt water and provide excellent nutrition without the protease inhibitors.

Eating *traditional soy foods* appears to pose no health threat and in fact there is an overwhelming amount of evidence pointing to the fact that it offers protection from many chronic diseases including cancer, heart disease, osteoporosis, and kidney disease. Other commonly found soy products including soymilk (unsweetened and free of any additives), soy yogurt, and tofu should be consumed moderately. These foods in moderation (i.e. occasional use) are acceptable but not nearly as health promoting as the fermented foods. Only fermented soy products should be used on a daily basis.

Soybean products, whole-grain cereal food, seeds, and berries all provide precursors of biologically active compounds after ingestion of these foods. Plant lignans and isoflavonoid glycosides are converted by intestinal bacteria to hormone-like compounds. The weakly estrogenic diphenols formed in this way influence sex-hormone production, metabolism, and biological activity as well as intracellular enzyme systems, protein synthesis, growth factor action, and malignant cell proliferation, differentiation, cell adhesion, and angiogenesis. Their effect on some of the most important steroid biosynthetic enzymes may result in beneficial modulation of hormone concentrations and action in the cells, preventing development of cancer as well as heart disease. Animal research suggests that both lignans and isoflavonoids may prevent the development of cancer as well as atherosclerosis (Adlercreutz & Mazur, 1997).

Soy and Breast Cancer

A variety of health benefits, including protection against breast cancer, have been attributed to soy food consumption, primarily because of the soybean isoflavones (genistein, daidzein, glycitein). Isoflavones are considered to be possible *selective estrogen receptor modulators* (SERMs) but possess non-hormonal properties that may also contribute to their effects. Concern has arisen over a possible detrimental effect of soy in breast cancer patients because of the estrogen-like effects of isoflavones. However, isoflavones apparently exhibit a balancing effect on the response of cells to estrogen. They augment the effects of weak estrogens but inhibit effects in times of estrogen plenty (Wei, Bowen, Cai, Barnes, & Wang, 1995). Soy isoflavones bind to *estrogen receptors* (ER) and may variably act as either estrogen agonists or antagonists depending on the estrogen environment.

Shao and Barsky at UCLA showed that in an *in vitro* study, in the absence of estrogen, genistein inhibited proliferation of ER-negative cell lines, but exerted only minimal inhibitory effects on an ER-positive cell line. In the presence of estrogen, genistein inhibited growth of both ER-positive

How Foods Support Cancer Recovery—CONTINUED

and ER-negative cell lines while inhibiting *protein tyrosine kinase* (PTK), which is normally upregulated by estrogen. Genistein inhibits the ER-dependent line by competing with estrogen for estrogen receptor site binding (Shao & Barsky, 1999). The clinical implication of this is that it may possibly be more effective to dose soy products for pre-menopausal women than for post menopausal women with their lower circulating estrogen load.

Although there have been some conflicting reports about the beneficial effects of soy isoflavones, there have been a couple of studies indicated that breast cancer cells in mice were stimulated by the isoflavones due to an excess dose and extended duration of use in animal studies, the over-whelming majority of studies have demonstrated a protective and inhibitory effect against breast cancer. Population studies have shown that women with a high-soy diet have the lowest rates of breast cancer. Mechanisms of action are still under consideration and controversy exists regarding the optimal timing and dosing of soy products.

Historically, Asian women have the lowest rates of breast cancer compared to women in the rest of the world, a fact that changes when they adopt modern-western eating habits (Shannon et al., 2005). Researchers are now trying to pinpoint which foods are most beneficial to health, and soy foods are at the top of the list. A recent study indicates women who drink miso daily dramatically reduced their risk for breast cancer. This prospective study of women in Japan reported that intake of miso soup and isoflavones, but not of total soy food intake, was inversely associated with breast cancer risk (Yamamoto, Sobue, Kobayashi, Sasaki, & Tsugane, 2003).

However, results from case-control studies of high soy consuming Chinese women in Singapore, in Shanghai and Tianjin, China have been inconsistent (Lee et al., 1992; Dai et al., 2001; Yuan, Wang, Ross, Henderson, & Yu, 1995). Currently researchers are considering the timing of soy exposure. Several studies have reported a significant inverse association between the intake of soy in adolescence and overall breast cancer risk, and the age at which soy is consumed (not in infancy, but during adolescence and adulthood) appears to be important (Shu et al., 2001; Wu et al., 2002; Messina & Flickinger, 2002).

A population-based, case-control study of breast cancer among over 1,000 Chinese, Japanese, and Filipino women in Los Angeles County was designed to investigate the role of soy and to quantify breast cancer risks associated with intake of soy during adolescence and adult life among Asian-American women. The risk of breast cancer was significantly inversely associated with soy intake during adolescence and adult life. After adjusting for age, ethnicity, education, migration history, and menstrual and reproductive factors, women who reported soy intake at least once per week during adolescence showed a statistically significant reduced risk of breast cancer. There was also a significant trend of decreasing risk with increasing soy intake during adult life. In this study risk did not appear to differ between those who were low consumers during adolescence and high consumers during adult life and the authors conclude that high soy intake in childhood in Asian-Americans is associated with reduced breast cancer risk and that risk may be further reduced by intake as an adult (Wu et al. 2002).

Two studies in premenopausal women suggested that soy exerts estrogenic-like effects on breast tissue. Other studies indicate that isoflavones did not affect breast tissue density in premenopausal women at an appropriate dose (<50 mg/day) and decreased density in postmenopausal women. These latter effects are opposite to those of *hormone replacement therapy* (HRT) (Messina & Loprinzi, 2001). We have to appreciate that women metabolize soy products differently,

How Foods Support Cancer Recovery—CONTINUED

which will determine whether they have a health enhancing or detrimental effect from eating soy products. Asians have been eating soy products for thousands of years, wherein soy is new and often genetically modified (GMO) and processed for the western market.

A review of research confirms miso and other fermented soy products offer exceptional breast cancer preventive benefits. (Oliviera & Osbourne, 1996; Head, 1998). Miso soup is a nourishing broth of fermented soybean paste and seaweed, often with bean curd and vegetables. Miso (the paste) can be found in natural food stores, Asian markets and some grocery stores. It will keep for months in the refrigerator and can be used as flavoring in soups and sauces or a salt substitute. Isoflavones have also demonstrated an ability to inhibit chemically-induced breast cancer cells by reducing *Epidermal Growth Factor* (EGF) signaling and *Vascular Epidermal Growth factor* (VEGF) R2, which renders breast cancer cells less proliferative and less susceptible to cancer. (Rowell, Carpenter, & Lamartiniere, 2005).

Tempeh, a traditional food, made from fermented whole soybeans, is particularly healthful. Tempeh can be cooked in several ways:

- Sliced and brushed with olive oil then broiled
- Cubed and threaded on skewers for kabobs
- Cubed and tossed in olive oil then baked in the oven until crisped like croutons
- Crumbled and used as stuffing for cabbage rolls, stuffed peppers, etc., or in a nut loaf
- Cubed, marinated in a Thai sauce made with coconut milk, minced fresh ginger, lemon grass, green curry paste, tossed with chopped fresh vegetables (carrots, summer squash, pepper, onions, green beans, sliced water chestnut, etc.) and baked like a stew

Research on Soy and Estrogen Modulation

In a study using monkeys on diets containing either a high or low dose of estrogen and one of four isoflavones levels: no isoflavones, 60 mg (comparable to a typical Asian diet), 120 mg, and 240 mg, the researchers reported that the highest isoflavone dose resulted in significantly lower breast proliferation and uterine size in the high-estrogen environment. Isoflavone levels for the low estrogen diet did not affect markers for breast cancer, such as breast cell proliferation. For the high estrogen diet, no and low-level isoflavone intake were actually linked to increase in breast cell proliferation. However, at higher levels of estrogen and higher intake of isoflavones, the effects of estrogen on breast tissue were blocked by the isoflavones.

Even at high doses, there was no evidence that the estrogen-like compounds in soy stimulate cell growth or other markers for cancer risk in breast tissue. The study suggests that women who have higher levels of estrogen may actually gain a protective effect from higher doses of soy isoflavones. The researchers suggested that soy isoflavones might induce an estrogen effect on estrogen-dependent cells, without promoting cellular growth or cell proliferation. These findings show that in the presence of estrogen, higher doses of dietary soy isoflavones may alter estrogen receptor (ER) signaling and induce selective antagonistic effects in the breast (Wood, Register, Franke, Anthony, & Cline, 2006). Overall, the data is suggestive, but *not* conclusive that the adult consumption of soy markedly reduces the risk of developing breast cancer or that soy consumption positively affects the survival of breast cancer patients. However, soy does appear to offer some modest protection. If breast cancer patients enjoy soy products, it seems reasonable for them to continue to purchase non-GMO soy products, focusing on whole soy food products such as miso, tempeh, and edamame as their first choice. Soy, like all foods, loses important constituents when it is processed and refined.

How Foods Support Cancer Recovery—CONTINUED

Fantastic Flax

A standard part of healthy cancer recovery programs is a blended smoothie with 1–2 Tbs of freshly ground flax. Flax seeds are a rich source of fiber and mucilage, which help clean the colon of waste products and toxins. Flax seeds, particularly ground flax seeds, are high in a substance called lignans. Lignans are known for their ability to ward off viral, bacterial, and fungal infections. They are also potent anti-cancer substances. Flax seeds are a rich source of alpha linolenic acid, which provides the body with essential Omega-3 fatty acids. Flax seed is excellent for people who suffer with bowel problems such as constipation or diarrhea. The flax seed moves through the digestive tract quickly and, because it is a fiber, results in normal, softer stools. It is important to drink water directly after consuming flax seed, since the substance can absorb about a dozen times its weight in liquid. Flax seeds are also rich in other minerals, vitamins, and protein, but the most important compound in flax is lignans.

Flax Lignans are Cancer Preventative

Flax seeds, which are the richest known source of plant lignans, have been shown to have chemoprotective effects in animal and cell studies. Flax seeds and lignan consumption in general have also been associated with reduced cancer risk in epidemiological studies. Some of its effects may be mediated through its influence on endogenous hormone production and metabolism. Two competing pathways in estrogen metabolism involve production of the 2-hydroxylated and 16 alpha-hydroxylated metabolites. Because of the proposed differences in biological activities of these metabolites, the balance of the two pathways has been used as a biomarker for breast cancer risk. One study looking at endogenous hormone concentrations, examined the effects of flax seed consumption on urinary estrogen metabolite excretion in postmenopausal women. Twenty-eight postmenopausal women were studied for three 7-week feeding periods in a randomized crossover design. During the feeding periods, subjects consumed their usual diets plus ground flax seed (0, 5, or 10 g/day). Urinary excretion of the estrogen metabolites 2-hydroxyestrogen (2OHEstrogen) and 16 alpha-hydroxyestrone (16 alpha-OHE1) as well as their ratio, 2/16 alpha-OHE1, was measured by enzyme immunoassay. Flax seed supplementation significantly increased urinary 2-OHEstrogen excretion ($p < 0.0005$) and the urinary 2/16 alpha-OHE1 ratio ($p < 0.05$) in a linear, dose-response fashion. There were no significant differences in urinary 16 alpha-OHE1 excretion. These results suggest that flax seed may have chemoprotective effects in postmenopausal women (Haggans et al., 1999; Tsakok, 2001).

Another randomized study on flax conducted consisted of three 7-week feeding periods during which 31 healthy postmenopausal women, ages 52–82 years, consumed their habitual diets plus 0, 5, or 10 grams of ground flax seed per day. Urine samples collected for 2 consecutive days during the last week of each feeding period were analyzed for lignan content (enterodiol, enterolactone, and matairesinol) by isotope dilution gas chromatography/mass spectrometry. Compared with the 0 g flax seed diet, consumption of 5 or 10 g of flax seed significantly increased excretion of enterodiol by 1,009 and 2,867 nmol/day, respectively; significantly increased excretion of enterolactone by 21,242 and 52,826 nmol/day, respectively; and significantly increased excretion of total lignans (enterodiol + enterolactone + matairesinol) by 24,333 and 60,640 nmol/day, respectively (Hutchins, Martini, Olson, Thomas, & Slavin, 2000).

Flax Inhibits Metastasis and Decreases Angiogenesis

Angiogenesis is important in tumor growth, progression, and metastatic dissemination. *Vascular endothelial growth factor* (VEGF) is one key factor in promotion of breast cancer angiogenesis. VEGFs are bioactive in the extracellular space where

How Foods Support Cancer Recovery—CONTINUED

they become available to the endothelial cells. Phytoestrogens such as lignans have been shown to alter breast cancer incidence and be cancer-protective in rats. This study demonstrated that supplementation of 10% flax seed to mice with established human breast tumors reduced tumor growth and metastasis. Flax seed also decreased extracellular levels of VEGF, which appears to be one mechanistic explanation to the decreased tumor growth and metastasis (Dabrosin, Chen, Wang, & Thompson, 2002).

Study Results: Flax Enhances Protective Effects of Tamoxifen

This study determined the effect of 10% dietary *flax seed* (FS) and *tamoxifen* (TAM), alone and in combination, on the growth of estrogen-dependent human breast cancer (MCF-7) in mice with or without 17beta-estradiol (E2) supplementation. At low E2 level, FS regressed the pretreatment tumor size by 74%. TAM regressed tumor initially but later induced an increase so that the tumor size was finally similar to the pretreatment size. A tumor regression >53% was induced by FS+TAM than by TAM alone. At high E2 level, FS, TAM, and FS+TAM inhibited the tumor growth by 22, 41, and 50%, respectively, compared with the positive control. Decreased tumor size was attributable to reduced tumor cell proliferation and increased apoptosis. Conclusions: FS inhibited the growth of human estrogen-dependent breast cancer and strengthened the tumor-inhibitory effect of TAM at both low and high E2 (estradiol) levels (Chen, Hui, Ip, & Thompson, 2004).

Super Ninja Phyto Fighters

Cruciferous Vegetables

Cabbage, broccoli, Brussels sprouts, cauliflower, kale, collards, turnips, and radishes are among the most commonly consumed vegetables. It is best to lightly cook them, rather than eating them raw because in their raw form they contain high amounts of goitrogens, thyroid suppressing agents that are degraded during the cooking process.

Since the 1980s, there has been much research showing the anti-cancer properties of cruciferous vegetables. Cabbage and its relatives contain a group of sulfated compounds called the glucosinolates. These are derived from a variety of amino acids and comprise a glucose residue, a sulfate group and a variable aglycone, with the molecule occurring as a potassium salt (Bruneton, 1999). They are metabolized to isothiocyanates either by the plant enzyme myrosinase, released when the cell wall is cut, bruised, or broken, or by gastrointestinal micro flora in the body. They are, in part, responsible for the sharp taste of mustard seeds, horseradish, wasabi, and the cruciferous vegetables.

A study among Polish immigrants in the United States found that those who ate a lot of cabbage during their early teen years (more than three servings a week) had almost 70% less breast cancer risk compared to those who ate little cabbage during their adolescence. (Pathak, 2005).

Many isothiocyanates such as *sulforaphane* (SFN), *phenethyl isothiocyanate* (PEITC) and *allyl isothiocyanate* (AITC) are highly effective in chemoprevention or reduction of the risk of cancer, and possess anti-tumor activities *in vitro* and *in vivo*. Isothiocyanates activate genes that regulate enzymes which detoxify certain cancer-causing substances. They promote phase II detoxification pathways in the liver including NADP(H), quinone reductase and glutathione-S-transferase, epoxide hydrolase, and glucuronosyltransferases (Higdon, 2008; Bruneton, 1999). Indole-3-carbinol (I3C) and PEITC are breakdown products of the glucosinolates glucobrassicin and gluconasturtiin, respectively, and are thought to reduce carcinogen activation by P450 enzymes.

Naturally occurring isothiocyanates derived from cruciferous vegetables and their N-acetylcysteine conjugates inhibited lung adenoma formation induced by tobacco carcinogens in mice. The

How Foods Support Cancer Recovery—CONTINUED

tumor-inhibitory activity by these compounds was linked with activation of activator protein (AP-1) and induction of apoptosis in lung tissues. In a study by Conaway et al. (2005) lung tumor incidences in groups treated with sulforaphane-N-acetylcysteine in the diet were significantly reduced. Furthermore, the malignant lung tumor multiplicity was significantly reduced from 1.0 tumor/mouse in the carcinogen-treated control group to 0.3 in the sulforaphane low-dose group, 0.3 and 0.4 in the two sulforaphane-N-acetylcysteine groups, and 0.4 in the phenethyl isothiocyanate high-dose group.

In animal experiments, isothiocyanates were added to the diets of mice before and during the administration of carcinogens (like those in cigarettes); the isothiocyanates stopped the growth of tumors developing in the stomach and lung (Morse, Amin, Hecht, & Chung, 1989). Isothiocyanates deactivate carcinogens or block them from damaging cells, acting at several different stages of carcinogenesis to stop both cancer promoters and initiators. Isothiocyanates buttress the enzyme systems responsible for metabolizing carcinogens, and, increase the antioxidant action of glutathione compounds. (Wattenberg, 1987).

Fahey, Zhang, & Talalay (1997) found that 3-day-old sprouts of certain crucifers including broccoli and cauliflower contain 10–100 times higher levels of glucoraphanin (the glucosinolate of sulforaphane) than did the corresponding mature plants. This study reported that extracts of 3-day-old broccoli sprouts (containing either glucoraphanin or sulforaphane as the principal enzyme inducer) were highly effective in reducing the incidence, multiplicity, and rate of development of mammary tumors in dimethylbenz(*a*) anthracene-treated rats. Because no net synthesis of phase 2 inducers occurs after sprouting, their concentration decreases as the plant grows. Small quantities of cruciferous sprouts may protect against the risk of cancer as effectively as much larger quantities of mature vegetables of the same variety and without risk (Nestle, 1997).

Isothiocyanates Reduce Chemotherapy Toxicity and Enhance Immune Response

Cyclophosphamide (CTX) is the most commonly used agent for antineoplastic chemotherapy. CTX-induced urotoxicity was reduced in animals by the treatment of natural ITC including *allyl isothiocyanate* (AITC) and *phenyl isothiocyanate* (PITC). In cancer therapy it has been shown that treatment with ITCs enhance the total WBC count, antibody producing cells, and circulating antibody titer; and act as effective immune modulators (Manesh & Kuttan, 2005).

Broccoli sprouts are the richest source of sulforaphane. They are available in some supermarkets and natural food stores, or you can sprout your own. Sprouting seeds are very nutritious, cost effective and provide a relatively easy way to acquire many vitamins, minerals, and important cancer inhibiting phytonutrients. Besides the popular alfalfa sprouts and broccoli sprouts, other seeds, which are easy to sprout, include red clover, mung bean, chick pea, radish, chia, and sunflower.

Foods That Boost Glutathione

Asparagus is a leading source of glutathione, the premier cancer protective intracellular enzyme. Foods like broccoli, avocado, cilantro, and spinach are also known to boost glutathione levels. Raw eggs, garlic, and fresh unprocessed meats contain high levels of sulfur-containing amino acids and help to maintain optimal glutathione levels. Undenatured whey protein isolate contains proteins like alpha-lactalbumin, which is rich in sulfur-containing amino acids. Heating or pasteurization destroys the delicate disulphide bonds that give these proteins their bioactivity. Undenatured whey protein is a non-heated product that preserves bioactive amino acids like cystine. Brazil nuts provide a rich natural source of selenium, which is a key nutrient for the production of glutathione. Consumption of 2 Brazil nuts daily is as effective for increasing selenium status (Thomson, Chisholm, McLachlan, & Campbell, 2008).

How Foods Support Cancer Recovery—CONTINUED

Bitter Greens

As a person matures, their taste for bitter fruits and vegetables increases — the taste buds for bitter actually outlast taste buds for sweets. According to Dr. Adam Drewnowski, an expert on taste and food preferences, obesity, and cancer prevention, the food industry has spent decades ridding foods of natural chemicals that taste bitter. Yet many bitter foods are healthful. The solution, Drewnowski says, is not food processing but good cooking. Olive-eating people around the Mediterranean appreciate bitter as a true flavor and dress it out with salt and pepper, lemon, vinegar, and olive oil. Or the cook takes a bitter ingredient — for example, rhubarb or citrus rind — and adds just enough sugar to leave a tangy edge (Dauchet, Amouyel, Hercberg, & Dallongeville, 2006).

Bitter greens, especially when eaten as a green salad starter 10 minutes before the main course, serves to stimulate the liver to make bile which promotes detoxification. Greens can be eaten everyday both raw and cooked. Try to eat wild greens like chickweed, watercress, mustard greens, and nettles. Use romaine lettuce, arugula, escarole, and chicory in salads. Eat cooked greens like kale, collard greens, and beet greens. One of the very best green agents for digestive health is dandelion. Instead of spending big bucks on containers of 'picked-last week-and-washed-in-antibacterial-soap' fancy mixed greens from the health food store, you can buy bunches of dandelion greens (or grow your own very easily in any patch of ground). Chop them into salads or put them into juice blends for a digestive stimulant and alterative, depurative effect. Dandelion possesses both cholagogue (promotes the flow of bile), and choleretic properties (stimulates bile secretion in the liver). This is the quintessential food for the liver. Dandelion root has been shown to have anti-tumor effects due to its macrophage activation effect. Both the root and the leaves have been used traditionally to support liver function for people with various types of cancer.

Garlic and Onion Protective

A new study has analyzed the odds of a person developing cancer based on the frequency of their ingestion of garlic and onions. The researchers used data from a network of Italian and Swiss case-controlled studies. Comparing patients to controls, they found that those with the highest intake of onions and garlic had the most protection from an assortment of cancers including: esophageal, colon, breast, ovarian, and prostate cancer (Galeone et al., 2006).

Fruits

All fruits have an abundance of healing properties. Berries of all types, especially wild berries such as raspberries, blackberries, elderberries, Marionberries, boysenberries, and loganberries, are all wonderful healing super foods. Berries are concentrated pure energy. They represent the germ or vital force of the plant in a way that other fruits where the seed is discarded don't. They are adaptogens with many healing properties. The flesh is rich in flavonoids and chewing on the tiny seeds releases Omega-3 fatty acids and other antioxidants. Eat all you can in season and freeze as much as possible, or buy them frozen. Aim to have at least a cup a day every day through the year. If you cannot manage that then consider a sugarless fruit concentrate such as elderberry, blueberry, cranberry, hawthorn, and the skin and seed of the red and/or purple grape. During the winter months use pomegranate or elderberry, during the spring hawthorn berry, during the summer bilberry, and in the early fall grape extract and late fall cranberry extract.

Berries are among the best fruits on the planet. Not only do they taste great, but they are densely packed with a variety of potent phytochemicals that can do wonders to normalize and improve health. They are also high in fiber and relatively low in sugar, so they won't stimulate severe insulin swings if eaten in moderation.

How Foods Support Cancer Recovery—CONTINUED

The best way to eat berries is in their raw, natural state, as heating and freezing can damage antioxidants. However, some antioxidants will remain even after heating or freezing. Strawberries came in second to blueberries in the USDAs analysis of antioxidant capacity of 40 fruits and vegetables. They are rich in dietary fiber and manganese, and contain more vitamin C than any other berry. Among strawberries' antioxidants are anthocyanins and ellagic acid, shown to fight carcinogens. Antioxidant compounds found in strawberries may also prevent the oxidation of LDL ("bad") cholesterol, and thereby help fight the development of heart disease. Strawberries are also high in folic acid, dietary fiber and potassium.

Cranberry Proanthocyanidins Inhibit Tumor Growth

The October 17, 2005 issue of the *Journal of Science and Food Agriculture* reported that compounds isolated from cranberries help prevent the growth of tumors when studied in cell cultures. Catherine C. Neto of the University of Massachusetts and colleagues tested a proanthocyanidin rich fraction of cranberry as well as separate proanthocyanidins on breast, prostate, cervical, lung, and colon cancer cell lines as well as a melanoma and leukemia cell line, and normal mouse cells. Antitumor activity was expressed as the concentrations of a sample that inhibits cell growth by 50% relative to untreated cells. High and low concentrations of whole cranberry extract and cranberry fractions were also tested for their ability to inhibit *matrix metalloproteinases* (MMPs) in prostate cancer cells. Matrix metalloproteinases are enzymes that can break down intercellular tissue, which can increase the tumor invasiveness and metastasis (Neto, et al., 2005).

The scientists found that proanthocyanidins were effective at inhibiting lung, cervical, and colon cancer as well as leukemia growth. Additionally, one of the subfractions was found to inhibit all but the cervical tumor line as efficiently as its parent compound. Other subfractions inhibited tumor growth at higher concentrations (Seeram, Adams, Hardy, & Heber, 2004).

Phenolic compounds in blueberries could inhibit HepG2 liver cancer cell population growth and induce apoptosis. "Dietary intakes of these fruits may have the potential to reduce liver cancer," wrote lead researcher Weiguang Yi from the University of Georgia. The new study analyzed the polyphenol content of three different blueberry cultivars from the state of Georgia; Briteblue, Tifblue, and Powderblue, and found that the total anthocyanidin content ranged from 89-98% of the anthocyanin fraction. The main anthocyanidins present were delphinidin, cyaniding, petunidin, peonidin, and malvidin (Yi, Fischer, Krewer, & Akoh, 2005).

Ellagic acid is another important phenolic constituent found in many berries and nuts. It inhibits cancer formation and is believed to inhibit cancer mutation by latching onto DNA, masking sensitive sites on the genetic material that might otherwise be occupied by harmful chemicals. Ellagic acid is particularly effective in the inhibition of lung cancer caused by cigarette smoking. Pomegranates, which are in season early winter are the richest source of ellagic acid and should be consumed regularly during when they are in season. A daily glass of pomegranate juice can hold back prostate cancer and could even prevent men dying of the disease, new research has shown (Pantuck et al., 2006). Just one 8oz glass of juice per day increased the stability period of prostate cancer 4-fold, scientists found. The effect was so pronounced it may allow older men to avoid dying from the cancer, experts believe. Simply by drinking pomegranate juice, a man of 65 to 70 with prostate cancer could complete his normal life span without having to undergo harsh medical treatments.

The new three-year pilot study from the University of California at Los Angeles involved 50 prostate cancer patients who had undergone surgery or radiotherapy. All the men had experienced a

How Foods Support Cancer Recovery—CONTINUED

post-treatment increase in blood levels of PSA (prostate-specific antigen), indicating that cancer was still present in their bodies. Over a period of three years, scientists measured the men's PSA levels to calculate how fast they were taking to double. Prostate cancer patients who have short doubling times are more likely to die from their illness. The average doubling time for the disease is about 15 months. But drinking pomegranate juice extended this period to 54 months — an almost 4-fold increase. The study showed that the speed at which PSA levels rose in the men fell by an average of 35% after they started drinking pomegranate juice. There was also evidence that pomegranate juice was actually killing prostate cancer cells (Pantuck et al., 2006).

Oranges, grapefruit, tangerines, limes, and lemons also contain abundant amounts of various flavonoids and terpenoids. These are potent activators of detoxifying enzyme systems. The flavonoids found in grapefruit include naringenin (the most abundant), quercetin, apigenin, hesperetin, and kaempferol. Naringenin slows the growth of cancer cells.

Grapefruit Boosts Cancer Fighting Liver Enzymes

Scientists at Hebrew University of Jerusalem found that oroblanco and grapefruit juice upped the activity of hepatic detoxification enzymes in rats, thought to cut the risk of chemically induced carcinogenesis. Investigating the impact of oroblanco (a pummelo-grapefruit hybrid) and grapefruit juice, Michal Hahn-Obercyger and colleagues observed that both juices

> *"significantly increased activity and expression of the hepatic phase I enzyme, cytochrome P450 CYP1A1."*

The human body has developed complex enzymatic mechanisms to detoxify xenobiotics, a chemical found in an organism but which is not normally produced or expected to be present in it. The detoxification systems are highly complex and can vary greatly between individuals, linked to a person's environment and genetic make-up as well as lifestyle.

> *"These results suggest that these citrus fruits are bifunctional inducers, modulating both phase I and phase II drug-metabolizing enzymes to enhance hepatic detoxification* (Hahn-Obercyger, Stark, & Madar, 2005)*."*

Researchers at Texas A&M University reported last year that freeze-dried *grapefruit* pulp, similar to whole grapefruit, reduced the incidence of early colon cancer lesions in an animal model of the disease (Girennavar, Jayaprakasha, & Patil, 2007).

Citrus Peels Protective

Don't throw away the peels of citrus fruit because they contain some of the most remarkable anti-cancer liver-protective substances called terpenes, (oranges contain D-limonene). D-limonene dissolves gallstones, lowers cholesterol, reduces mucous in the lungs, and relieves nausea. Mince the peel and sprinkle on fruit or vegetable salads, steamed greens or carrots, soups, etc. Store them in an airtight jar in a cool, dark place and add to tea or put them in a pepper grinder and use as a condiment. You can add aromatic seeds to the citrus peel if you wish — coriander, cumin, cardamom, celery, caraway, black pepper. Try some crumbled dulse or other seaweeds for a salty flavor. All this goes through the grinder and makes a delicious and healthful condiment for your meal. You can also crush them and sprinkle over baked goods and desserts.

Anti-cancer chemical compounds present in oranges and tangerines may potentially prevent prostate, lung cancers and melanoma. Phenolic acids and flavonoids, natural antioxidants contained in fresh apples, seem to combine to inhibit the proliferation of tumor cells *in vitro,* according to researchers from Cornell University. Apples

How Foods Support Cancer Recovery—CONTINUED

contain a variety of phytochemicals, including quercetin, catechin, phloridzin, and chlorogenic acid, all of which are strong inhibitors of oxidative stress. The phytochemical composition of apples varies greatly between different varieties of apples, and there are also small changes in phytochemicals during the maturation and ripening of the fruit. Storage has little to no effect on apple phytochemicals, but processing can greatly affect apple phytochemicals (Boyer & Liu, 2004).

Cancer and Sugar

"Cancer has only one prime cause. It is the replacement of normal oxygen respiration of the body's cells by an anaerobic [i.e., oxygen-deficient] cell respiration."
Dr. Otto Warburg

Natural health practitioners have believed for decades that dietary intake of sugar, particularly glucose, is a key driver in the development and progression of cancer. Although current medical practice has yet to give much credence to this theory, there is a wealth of research supporting the proposition and this is likely to be one area where practice standards will change soon. Controlling one's blood-glucose levels through diet, herbs, supplements, exercise, and meditation is one of the most crucial components to a cancer recovery program.

Aerobic glycolysis was first described by Otto Warburg in the early part of the last century. In 1931, Dr. Warburg received the Nobel Prize in medicine for his revelatory understanding of the physiology and metabolism of cells. He showed, among other things, that cancerous cells can live and develop even in the virtual absence of oxygen. The crux of his Nobel thesis was that malignant tumors frequently exhibit an increase in anaerobic glycolysis — a process whereby glucose is used as a fuel by cancer cells with lactic acid as an anaerobic byproduct — compared to normal tissues (Warburg, 1966).

Normalize Blood Sugar and Insulin to Inhibit and Slow Cancer Growth

There is a long-standing well-accepted link between elevated glucose and insulin levels and risk of cancer (Yam, 1992). The role of diabetes and insulin resistance as a cancer risk factor is becoming clearer, and with the rise in obesity and diabetes it is important to see these health diseases as causative factors for cancer development, especially for older individuals. To examine the relationship between fasting serum glucose, diabetes, the risk of all cancers, and specific cancers in men and women, a ten-year prospective cohort study was conducted of 1,298,385 Koreans (829,770 men and 468,615 women) aged 30 to 95 years who received health insurance from the National Health Insurance Corp and had a biennial medical evaluation in 1992–1995 (with follow-up for up to 10 years). During the 10 years of follow-up there were 20,566 cancer deaths in men and 5,907 cancer deaths in women. People with the highest fasting serum glucose had higher death rates from all cancers combined compared with the people with the lowest level. By cancer site, the association was strongest for pancreatic cancer.

Significant associations were also found for cancers of the esophagus, liver, and colon/rectum in men, and of the liver and cervix in women. There were significant trends with glucose level for cancers of the esophagus, colon/rectum, liver, pancreas, and bile duct in men, and of the liver and pancreas in women. Of the 26,473 total cancer deaths in men and women, 848 were estimated as attributable to having a fasting serum glucose level of less than 90 mg/dl. For cancer incidence, the general patterns reflected

How Foods Support Cancer Recovery—CONTINUED

those found for mortality. For persons with a diagnosis of diabetes or a fasting serum glucose level greater than 125 mg/dl (6.9 mmol/l), risks for cancer incidence and mortality were generally elevated compared with those without diabetes. Elevated fasting serum glucose levels and a diagnosis of diabetes are independent risk factors for several major cancers, and the risk tends to increase with an increased level of fasting serum glucose (Jee et al., 2005).

Cancer cells demonstrate a 3- to 5-fold increase in glucose uptake compared to healthy cells. Cancer thrives on glucose while also initiating gluconeogenesis and insulin resistance. Lipid based parenteral solutions for cancer patients slow cancer growth (Demetrakopoulos et al., 1982). Modest ingestion of glucose (75 g) caused a measurable decline in cell-mediated immunity in 7 healthy human volunteers. Mechanism of action is probably via elevated insulin, which competes with mitogens for binding sites on lymphocytes (Rossi-Fanelli as cited in Guthrie, 2007). Growing tumor cells can crowd out other cells and cut them off from oxygen-carrying blood vessels, necessary for their survival. When this happens, some cancer cells have developed the ability to bypass the need for oxygen and instead switch entirely to the glycolytic pathway, which they use even when oxygen is restored. In one study healthy human volunteers ingested 100 gram portions (average US daily intake) of simple carbohydrates from glucose, fructose, sucrose (white sugar), honey, and orange juice. While simple sugars significantly impaired the capacity of neutrophils to engulf bacteria, grains did not have this effect (Sanchez et al., 1973).

In a study comparing 50 colorectal cancer patients to healthy matched controls, the cancer patients ate considerably more sugar and fat than the healthy people (Bristol, Emmett, Heaton, & Williamson, 1985). An epidemiological study of 21 countries suggests that high sugar intake is a major risk factor toward breast cancer (Seely & Horrobin, 1983). Animals were fed isocaloric diets of carbohydrates. The group eating more sugar developed significantly more mammary tumors than the starch-fed group. (Hoehn & Carroll, 1979).

Dangers of Fructose

Fruit is such a powerhouse of nutrition and wholesome goodness, but, there can be too much of a good thing, especially if it is processed, refined, and not in its whole, fiber-rich form. Fruit sugar is called fructose and because it does not stimulate insulin secretion from pancreatic ß cells. The consumption of foods and beverages containing fructose produces smaller postprandial insulin excursions than does glucose-containing carbohydrates. Obtaining fructose from fresh fruits, along with water, fiber, minerals, and vitamins, limits the amount of fructose ingested at a time. However, in our modern world, fructose is no longer confined to fruits in the diet. Just like any other sugar, once fructose has been removed from the food in its natural environment and added to other foods and drinks (such as soda), most often as high fructose corn sweetener, it becomes a poison to our body.

In 2002 the American Journal of Clinical Nutrition reported that the per capita consumption of sucrose and high-fructose corn syrup had increased by 26%, from 64 g/day in 1970 to 81 g/day in 1997. This is clearly faster than the rate of evolution and our bodies are struggling to keep up. Because leptin production is regulated by insulin responses to meals, fructose consumption also reduces circulating leptin concentrations. In addition, fructose, compared with glucose, is preferentially metabolized to lipid in the liver. Eating a lot of fructose increases the likelihood of weight gain and its associated metabolic sequelae. Fructose consumption induces insulin resistance, impaired glucose tolerance, hyperinsulinemia, hypertriacylglycerolemia, and hypertension in animal models although this is less definitive in humans (Elliot, Keim, Stern, Teff, & Havel, 2002).

How Foods Support Cancer Recovery—CONTINUED

Managing the Warburg Effect in Clinical Practice

The Warburg effect is one reason why 40% of cancer patients die from malnutrition, or cachexia. Hence, cancer therapies should encompass measures to regulate blood-glucose levels via diet supplements, medication, exercise, stress reduction; and parenteral solutions for cachexic patients who lose their appetite. Professional guidance and patient self-discipline are crucial at this point in the cancer process. The quest is not to eliminate healthy sugars (fruits) or complex carbohydrates (whole-grains) from the diet, but rather to control blood glucose and insulin within a narrow range to help starve the cancer and bolster immune system health.

Diets, herbs, and mitochondrial enhancing supplements increase efficient energy transfer to correct dysregulation of the metabolic process. Mitochondrial, Krebs cycle, and oxidative phosphorylation enzymes need healthy balanced food to ensure efficient metabolic energy. This will help to shift energy away from the cancer growth and into the growth of healthy cells. Recently it has been shown that specific nutrients including CO Q10, Vitamin B-2, and niacin, correct ATP production in the normal host cell metabolism by enhancing the activities of mitochondrial enzymes and in turn suppress cancer.

What to Eat During Chemo

- Suggestion #1: Hydrate — drink tea or fluids with adaptogenic herbs as a warm or herbal ice tea
- Suggestion # 2: The day of chemotherapy and the day after eat lightly. Studies have shown that a modified fast for one or two days significantly enhances the effectiveness of chemotherapy (Raffaghello et al., 2008).
- Suggestion # 3: Enjoy fresh juices — fruit and/or vegetable
  - Cabbage, kale, celery, watercress, parsley, cilantro, chard, beet tops, beet roots, carrots, burdock root, jicama, apples, oranges, grapefruit, banana, etc
  - Leave the peel on the citrus and put the whole lot through the juicer; dilute as desired
- Suggestion # 4: Make smoothies with fresh fruit, organic goat or sheep yoghurt, soy / rice / oat / almond milk and green powder. Add whey or rice protein powder. For extra nutrients you can soak a handful of nuts overnight in water, whirl this up with everything else or put in a spoonful of almond butter.
- Suggestion #5: Purchase the young green or white coconuts and drink the liquid inside — one a day. Eat the pulpy flesh as well, and use it in smoothies and juices. This is great if the gut lining is damaged from chemo.
- Suggestion #6: Applesauce, soaked and poached dried fruits, mashed banana with soy / rice / oat / almond milk
- Suggestion # 7: Make broths and pureed soups. If you can get organic beef bones with plenty of marrow and cook them up to make stock. This will help build back the blood cells and give overall strength.
- Suggestion # 8: Eat poached or soft boiled eggs
- Suggestion # 9: Poached fish in a good broth/stock
- Suggestion #10: Enjoy a porridge of millet, congee (cream of rice), barley, or quinoa

How Foods Support Cancer Recovery—CONTINUED

Bone Marrow Soup Recipe

The best bones to get are organic, hormone-free, antibiotic-free beef or lamb bones. Here's a recipe for making a bone marrow soup that is great for nourishing the blood and bone marrow.

- Cover the bones with pure water, add the soup herbs (see below) and place over low medium heat. Slowly bring to a simmer and let it simmer for about 1 to 11/2 hours.
- Add vegetables like beets, celery, burdock root, carrots, kale, whatever else you'd like
- Optional: shiitake mushrooms, garlic, ginger, and herbs according to your taste (parsley, rosemary, thyme, etc.)

Water Recommendations

Drink water only in *glass* bottles like Mountain Valley Spring Water, San Pellegrino, or other pure mineral waters. If possible, purchase for the home and office a high quality water filtration system such as reverse osmosis. The need for clean, clear, chemically free water cannot be emphasized enough, as most people are dehydrated which blocks the body's ability to excrete toxins. We don't want to hold on to toxins, therefore *flush them out with water!* We all need to drink more clean water. Unfortunately, city water is not safe to drink because it is chemically treated with detrimental health substances like chlorine and fluoride.

Eliminate plastic — phthalates are used in plastic containers to make them flexible and durable. But these chemicals reduce spermatogenesis, creating infertility in men (Colborn, Dumanoski, & Myers, 2006). Do NOT drink water from a plastic bottle; *any* spring or filtered water in plastic. The plastic leaches into the water and becomes an estrogen mimetic which will wreak havoc on the hormonal system in the body. Estrogen also feeds fungal infections and many people have fungi because of the antibiotics in our food supply. Fungi feed cancer cells.

Exercise to Reduce Breast Cancer Risk

Epidemiologists have identified several risk factors for breast cancer, yet clinical advice to women to change these risk factors has been uncommon. Physical activity promises to be one modifiable risk factor through which women can reduce their risk for breast cancer. Clinicians can now advise women that reducing risk for breast cancer may be one additional reason to adopt an active lifestyle. There are still questions about the type and amount of exercise needed, the ages at which exercise should be done, and the interactions with other risk factors such as reproductive and menstrual history, diet, body mass, alcohol intake, genetics, and hormone therapy. Finding answers to these questions will require a research agenda focused on the biology of exercise and breast cancer (McTiernan, 2000).

Conclusion

When a person is ill, it can be challenging to eat enough nourishing food as taste, smell, and digestion can be disturbed. As a chef or nutrition consultant, if you observe this state in your client, rely on making pleasing smoothies, broths, juices, to which you can add booster foods, protein, and green powder. It is most important to maintain adequate calories, since cancer is a hyper-metabolic disease that robs the body of protein from the muscles and gut lining, and vitamin and minerals from many body organs and tissues. When an aggressive treatment is suspended or concluded, appetite and taste return along with the drive to nourish oneself. Quality and duration of life can only be maintained when a person is able to eat nourishing foods that they enjoy, in ample quantities, to enable them to recover their energy and repair damaged tissues. It is important that all involved recognize that cancer is a catabolic (breakdown) condition, as is surgery, radiation, and chemotherapy. Therefore, a durable recovery will have to be based upon an anabolic (building) diet with ample nutrients and calories — from quality fats and proteins rather than from predominently

How Foods Support Cancer Recovery—CONTINUED

carbohydrates. Yes, it is great to have lots of fresh vegetables and fruits, herbs and spices, but it is also essential to have quality proteins and fats at each meal to maintain a balance between degeneration and regeneration. We need to educate families and oncologists of the value of working with a skilled and sensitive Nutrition Consultant or Natural Chef to create meal plans, support the recovery, and enhance the quality while extending the duration of the life of a person living with cancer.

SOURCE

Donald Yance, C.N., M.H., R.H. (AHG) with editing and additional writing by Ed Bauman, Ph.D. and staff.

ABOUT THE AUTHOR

Donald Yance Jr. is a practicing Clinical Herbalist and Certified Nutritionist, specializing in the use of nutritional and herbal approaches to cancer, heart disease, and other chronic health conditions, as complementary and/or primary therapies, and in the prevention of these diseases. His mastery of the Eclectic Tradition, his specific use of nutrition, and vast knowledge of up-to-date scientific research, together has led him to develop his own wholistic model that focuses on an integrative approach to healing. Mr. Yance is a professional member of the *American Herbalists Guild* (AHG) and the *National Association of Nutritional Professionals* (NANP). Websites: mederifoundation.org or centrehealing.org

REFERENCES

Adlercreutz, H., & Mazur, W. (1997, Apr). Phyto-estrogens and Western diseases [Abstract]. *Ann Med,* 29(2):95–120. PMID:9187225

Boyer, J., & Liu, R.H. (2004, May 12). Apple phytochemicals and their health benefits [Abstract]. *Nutr J,* 3:5. PMID:15140261

Bristol, J.B., Emmett, P.M., Heaton, K.W., & Williamson, R.C.N. (1985, Nov 23). Sugar, fat, and the risk of colorectal cancer [PDF]. *Br Med J,* 29:1467–1470. Available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1418069/pdf/bmjcred00475-0027.pdf

Bruneton, J. (1999). *Pharamcognosy: Phytochemistry, Medicinal Plants.* Secaucus, NJ: Lavoisier

Chen, J., Hui, E., Ip, T., & Thompson, L.U. (2004 Nov 15). Dietary flaxseed enhances the inhibitory effect of tamoxifen on the growth of estrogen-dependent human breast cancer (mcf-7) in nude mice [Full text]. *Clin Cancer Res,* 10(22):7703–7711. DOI:10.1158/1078–0432.CCR-04-1130

Colborn, T., Dumanoski, D., & Myers, J.P. (2006, Nov 6). About phthalates. *Our Stolen Future.* Retrieved from http://www.ourstolenfuture.org/newscience/oncompounds/phthalates/phthalates.htm

Conaway, C.C., Wang, C-X., Pittman, B., Yang, Y-M., Schwartz, J.E., Tian, D., ... Chung, F-L. (2005, Sep 15). Phenethyl isothiocyanate and sulforaphane and their N-acetylcysteine conjugates inhibit malignant progression of lung adenomas induced by tobacco carcinogens in A/J mice [Full text]. *Cancer Res,* 65(18):8548–8557. DOI:10.1158/0008-5472.CAN-05-0237

Cummings, J.H., Antoine, J-M., Azpiroz, F., Bourdet-Sicard, R., Brandtzaeg, P., Calder, P.C., ... Watzl, B. (2004). Gut health and immunity [Abstract]. *Euro J Nutr,* 43(2 Suppl):ii118-ii173. DOI:10.1007/s00394-004-1205-4

Dabrosin, C., Chen, J., Wang, L., & Thompson, L.U. (2002, Nov 8). Flaxseed inhibits metastasis and decreases extracellular vascular endothelial growth factor in human breast cancer xenografts [Abstract]. *Cancer Lett,* 185(1):31–37. PMID:12142076

Dai, Q., Shu, X-O., Jin, F., Potter, J.D., Kushi, L.H., Teas, J., ... Zheng, W. (2001, Aug 3). Population-based case-control study of soyfood intake and breast cancer risk in Shanghai [Abstract]. *Br J Cancer,* 85(3):372–378. PMID:11487268

Daniells, S. (2008, Feb 28). Broccoli sprouts linked to bladder cancer protection. *Nutraingredients.com.* Retrieved from http://www.healthandwellness360.com/summaries/new-broccoli-anti-cancer-findings.html

Dauchet, L., Amouyel, P., Hercberg, S., & Dallongeville, J. (2006, Oct 1). Fruit and vegetable consumption and risk of coronary heart disease: A meta-analysis of cohort studies [Abstract]. *J Nutr,* 136(10):2588–2593. Retrieved from http://jn.nutrition.org/content/136/10/2588.abstract

Demetrakopoulos, G.E. (1982, Feb). *Cancer Research,* 42:756S. Retrieved from http://www.nutritioncancer.com/images/_Ch11_starve_sugar_BCN_2005.pdf

Elliott, S.S., Keim, N.L., Stern, J.S., Teff, K. & Havel, P.J. (2002, Nov). Fructose, weight gain, and the insulin resistance syndrome [Abstract]. *Am J Clin Nutr,* 76(5):911–922. PMID:12399260

Fahey, J.W., Zhang, Y., & Talalay, P. (1997, Sep 16). Broccoli sprouts: An exceptionally rich source of inducers of enzymes that protect against chemical carcinogens [Full text]. *Proc Natl Acad Sci U S A,* 94(19):10367–10372. Available at http://www.pnas.org/content/94/19/10367.full

Fallon, S. (Reviewer). (2000, Jan 1). *Nutrition and Physical Degeneration* (by Weston A. Price). The Weston A. Price Foundation. Retrieved from http://www.westonaprice.org/book-reviews/thumbs-up/394-nutrition-and-physical-degeneration

How Foods Support Cancer Recovery—CONTINUED

Galeone, C., Pelucchi, C., Levi, F., Negri, E., Franceschi, S., Talamini, R., ... La Vecchia, C. (2006, Nov). Onion and garlic use and human cancer [Full text]. *Am J Clin Nutr,* 84(5):1027–1032. Available at http://www.ajcn.org/content/84/5/1027.full

Gill, C., Boyd, A., McDermott, E., McCann, M., Servili, M., Selvaggini, R., ... Rowland, I. (2005, Oct 20). Potential anti-cancer effects of virgin olive oil phenols on colorectal carcinogenesis models in vitro [Abstract]. *Int J Cancer,* 117(1):1–7. PMID:15880398

Girennavar, B., Jayaprakasha, G.K., & Patil, B.S. (2007). Potent inhibition of human cytochrome P450 3A4, 2D6, and 2C9 isoenzymes by grapefruit juice and its furocoumarins [Abstract]. *J Food Sci,* 72(8):C417-421. DOI:10.1111/j.1750-3841.2007.00483.x

Guthrie, M. (2007, May 7). Nutrition and cancer. *Alternative cancer treatments.* Retrieved from http://www.alternative-cancer-treatments.com/diet.htm

Haggans, C.J., Hutchins, A.M., Olson, B.A., Thomas, W., Martini, M.C., & Slavin, J.L. (1999). Effect of flaxseed consumption on urinary estrogen metabolites in postmenopausal women [Abstract]. *Nutr Cancer,* 33(2):188–195. PMID:10368815

Hahn-Obercyger, M., Stark, A.H., & Madar, Z. (2005, Mar 9). Grapefruit and oroblanco enhance hepatic detoxification enzymes in rats: Possible role in protection against chemical carcinogenesis. *J Agric Food Chem,* 53(5):1828–1832, 2005. PMID:15740081

Head, K. (1998). Isoflavones and other soy constituents in human health and disease. *Alt Med Rev,* 3(1):433–450. Available at http://www.chiroonline.net/_fileCabinet/soyisoflavones.pdf

Hoehn, S.K. & Carroll, K.K. (1979). Effects of dietary carbohydrate on the incidence of mammary tumors induced in rats by 7,12- dimethylbenz(a)anthracene. *Nutr Cancer,* 1(3):27–30. Available at http://jn.nutrition.org/content/116/11_Suppl/S105.full.pdf

Higdon, J. (2008, Nov updated). Isothiocyanates. *Linus Pauling Institute, Oregon State University.* Retrieved from http://lpi.oregonstate.edu/infocenter/phytochemicals/isothio/

Hutchins, A.M., Martini, M.C., Olson, B.A., Thomas, W., & Slavin, J.L. (2000, Oct). Flaxseed influences urinary lignan excretion in a dose-dependent manner in postmenopausal women [Full text]. *Cancer Epidemiol Biomarkers Prev,* 9(10):1113–1118. Available at http://cebp.aacrjournals.org/content/9/10/1113.full

Jee, S.H., Ohrr, H., Sull, J.W., Yun, J.E., Ji, M., & Samet, J.M. (2005, Jan 12). Fasting serum glucose level and cancer risk in Korean men and women. *JAMA,* 293(2):235–6. DOI:10.1001/jama.293.2.194

Knoops, K.T., de Groot, L.C., Kromhout, D., Perrin, A-E., Moreiras-Varela, O., Menotti, A., van Staveren, W.A. (2004, Sep 22). Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women: the HALE project [Full text]. *JAMA,* 292(12):1433–1439. DOI:10.1001/jama.292.12.1433

Lee, H.P., Gourley, L., Duffy, S.W., Esteve, J., Lee, J., & Day, N.E. (1992, Jul). Risk factors for breast cancer by age and menopausal status: A case-control study in Singapore [Abstract]. *Cancer Causes Control,* 3(4):313–322. PMID:1617118

Manesh, C. & Kuttan, G. (2005, Jun). Effect of naturally occurring isothiocyanates in the inhibition cyclophosphamide-induced urotoxicity [Abstract]. *Phytomedicine,* 12(6–7):487–493. PMID:16008126

McTiernan, A. (2000, Sep-Oct). Physical activity and the prevention of breast cancer. *Medscape.* Retrieved from http://www.medscape.com/viewarticle/408931_1

Messina, M. & Flickinger, B. (2002). Hypothesized anticancer effects of soy: Evidence points to isoflavones as the primary anticarcinogens [Abstract]. *Pharmaceutical Biology,* 40(74 Suppl):6–23. Available at http://cat.inist.fr/?aModele=afficheN&cpsidt=13697449

Messina, M.J. & Loprinzi, C.L. (2001, Nov). Soy for breast cancer survivors: A critical review of the literature [Abstract]. *J Nutr,* 131(11 Suppl):3095S-3108S. PMID:11694655

Morse, M.A., Amin, S.G., Hecht, S.S., & Chung, F.L. (1989). Effects of aromatic isothiocyanates on tumorigenicity, 06-methylguanine formation, and metabolism of the tobacco-specific nitrosamine 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone in A/J mouse lung [Abstract]. *Cancer Res,* 49(11):2894–2897. PMID:2720649

Nestle, M. (1997, Oct 14). Broccoli sprouts as inducers of carcinogen-detoxifying enzyme systems: Clinical, dietary, and policy implications [Full text]. *Proc Natl Acad Sci U S A,* 94(21):11149–11151. Retrieved from http://www.pnas.org/content/94/21/11149.full

Neto, C.C., Krueger, C.G., Lamoureaux, T.L., Kondo, M., Vaisberg, A.J., Hurta, R.A.R., ... Reed, J.D. (2005, May). MALDI-TOF MS characterization of proanthocyanidins from cranberry fruit *(Vaccinium macrocarpon)* that inhibit tumor cell growth and matrix metalloproteinase expression *in vitro* [Abstract]. *J Sci Food Agri,* 86(1):18–25(8). DOI:10.1002/jsfa.2347

Oliveria, S.A. & Osborne, M.P. (1996, May 18). Diet, breast cancer and case-control studies [Abstract]. *Lancet,* 347(9012):1346. DOI:10.1016/S0140-6736(96)91003-X

Pantuck, A.J., Leppert, J.T., Zomorodian, N., Aronson, W., Hong, J., Barnard, R.J., ... Belldegrun, A. (2006, Jul 1). Phase II study of pomegranate juice for men with rising prostate-specific antigen following surgery or radiation for prostate cancer [Abstract]. *Clin Cancer Res,* 12(13):4018–4026. PMID:16818701

Pathak, D. (2005, Nov 2). Joint association of high cabbage/sauerkraut intake at 12–13 years of age and

How Foods Support Cancer Recovery—CONTINUED

adulthood with reduced breast cancer risk in Polish migrant women: Results from the US component of the Polish women's health study (PWHS) Abstract # 3697. *Poster Session C*, at the University of New Mexico, Albuquerque, NM.

Raffaghello, L., Lee, C., Safdie, F.M., Wei, M., Madia, F., Bianchi, G., & Longo, V.D. (2008, Feb 11). Starvation-dependent differential stress resistance protects normal but not cancer cells against high-dose chemotherapy [Abstract]. DOI:10.1073/pnas.0708100105

Rowell, C., Carpenter, D.M., & Lamartiniere, C.A. (2005, Dec). Chemoprevention of breast cancer, proteomic discovery of genistein action in the rat mammary gland [Full text]. *J Nutr,* 135(12):2953S-2959S. Available at http://jn.nutrition.org/content/135/12/2953S.full

Sanchez, A., Reeser, J.L., Lau, H.S., Yahiku, P.Y., Willard, R.E., McMillan, P.J., ... Register, U.D. (1973, Nov). Role of sugars in human neutrophilic phagocytosis [Full text]. *Am J Clin Nutr,* 26(11):1180–1184. Available at http://www.ajcn.org/content/26/11/1180.full.pdf+html

Seely, S. & Horrobin, D.F. (1983, Jul). Diet and breast cancer: The possible connection with sugar consumption [Abstract]. *Med Hypotheses,* 11(3):319–327. PMID:6645999

Seeram, N.P., Adams, L.S., Hardy, M.L., & Heber, D. (2004, May 5). Total cranberry extract versus its phytochemical constituents: Antiproliferative and synergistic effects against human tumor cell lines [Abstract]. *J Agric Food Chem,* 52(9):2512–2517. PMID:15113149

Shannon, J., Ray, R., Wu, C., Nelson, Z., Gao, D.L., Li, W., ... Thomas, D. (2005, Jan). Food and botanical groupings and risk of breast cancer: A case-control study in Shanghai, China [Abstract]. *Cancer Epidemiology Biomarkers Prev,* 14(1):81–90. PMID:15668480

Shao, Z.M. & Barsky, S.H. (1999, Dec 8–11). Genistein's suppressive actions on human breast carcinoma differ in ER-positive and ER-negative lines [Abstract 310]. *San Antonio Breast Cancer Symposium.* Program and abstracts of the 22nd Annual San Antonio Breast Cancer Symposium, San Antonio, Texas.

Shu, X.O., Jin, F., Dai, Q., Wen, W., Potter, J.D., Kushi, L.H., ... Zheng, W. (2001, May). Soyfood intake during adolescence and subsequent risk of breast cancer among Chinese women [Full text]. *Cancer Epidemiol Biomarkers Prev,* 10:483. Available at http://cebp.aacrjournals.org/content/10/5/483.full

Tappel, A. (2007). Heme of consumed red meat can act as a catalyst of oxidative damage and could initiate colon, breast and prostate cancers, heart disease and other diseases [Abstract]. *Med Hypotheses,* 68(3):562–564. PMID:17045417

Thomson, C.D., Chisholm, A., McLachlan, S.K., & Campbell, J.M. (2008, Feb). Brazil nuts: An effective way to improve selenium status [Full text]. *Am J Clin Nutr,* 87(2):379–384. Available at http://www.ajcn.org/content/87/2/379.full

Tsakok, A.D. (2001, May). Correspondence re: A. M. Hutchins et al., Flaxseed influences urinary lignan excretion in a dose-dependent manner in post-menopausal women, Cancer Epidemiol. Biomark. Prev. 9:1113–1118, 2000 [Full text]. *Cancer Epidemiol Biomarkers Prev,* 10:569. Available at http://cebp.aacrjournals.org/content/10/5/569.full

Vlassara, H., Cai, W., Crandall, J., Goldbrg, T., Oberstein, R., Dardaine, V., ... Rayfield, E.J. (2002, Nov 26). Inflammatory mediators are induced by dietary glycotoxins, a major risk factor for diabetic angiopathy [Abstract]. *Proc Natl Acad Sci U S A,* 99(24):15596–15601. PMID:12429856

Warburg, O. (1966, Jun 30). The prime cause and prevention of cancer. *StopCancer.com.* Retrieved from http://www.stopcancer.com/ottolecture2.htm

Wattenberg, L.W., (1987, Dec). Inhibitory effect of benzyl isothio-cyanates administered shortly before diethyl nitrosamine benzo(a)pyrene on pulmonary and forestomach neoplasia in A/J mice [Abstract]. *Carcinogenesis,* 8(12):1971–1973. PMID:3677323

Wei, H., Bowen, R., Cai, Q., Barnes, S., & Wang, Y. (1995, Jan). Antioxidant and antipromotional effects of the soybean isoflavone genistein [Abstract]. *Proc Soc Exp Biol Med,* 208(1):124–130. PMID:7892286

Wood, C.E., Register, T.C., Franke, A.A., Anthony, M.S., & Cline, J.M. (2006, Jan 15). Dietary soy isoflavones inhibit estrogen effects in the postmenopausal breast [Abstract]. *Cancer Res,* 66(2):1241–1249. PMID:16424064

Wu, A.H., Wan, P., Hankin, J., Tseng, C.C., Yu, M.C., & Pike, M.C. (2002, Sep). Adolescent and adult soy intake and risk of breast cancer in Asian-Americans [Abstract]. *Carcinogenesis,* 23(9):1491–1496. PMID:12189192

Yam, D. (1992, Jun). Insulin-cancer relationships: Possible dietary implication [Abstract]. *Med Hypothesis,* 38(2):111–117. DOI:10.1016/0306-9877(92)90082-N

Yamamoto, S., Sobue, T., Kobayashi, M., Sasaki, S., & Tsugane, S. (2003). Soy, isoflavones, and breast cancer risk in Japan [Abstract]. *J Natl Cancer Inst,* 95(12):906–913. DOI:10.1093/jnci/95.12.906

Yi, W., Fischer, J., Krewer, G., & Akoh, C.C. (2005, Sep 7). Phenolic compounds from blueberries can inhibit colon cancer cell proliferation and induce apoptosis [Abstract]. *J Agric Food Chem,* 53(18):7320–7329. PMID:16131149

Yuan, J-M., Wang, Q-S., Ross, R.K., Henderson, B.E., & Yu, M.C. (1995, Jun). Diet and breast cancer in Shanghai and Tianjin, China [Abstract]. *Br J Cancer,* 71(6):1353–1358. PMID:7779738