Integrative Oncology for Clinicians and Cancer Patients

Michael B. Schachter MD, CNS[1,2]

[1]Director & Owner of The Schachter Center for Complementary Medicine, 2 Executive Blvd, Suite 202, Suffern, NY 10901, Website: www.schachtercenter.com, Tel: 845-368-4700, email: office@mbschachter.com
[2]Permission has been granted to publish an abbreviated version of this article that originally appeared in: International Journal of Integrative Medicine, 2010;2(1):52-92.

Abstract *Worldwide medical literature supports the notion that environmental and nutritional factors play a role in the development of cancer. Nutritional recommendations to the public to help prevent cancer are available from the USA's National Cancer Institute, the American Cancer Society and other organizations. However, when it comes to treating patients who have been diagnosed with cancer, the vast majority of oncologists fail to deal with nutritional and lifestyle factors to help their patients manage their cancers. Evidence continues to mount that some of the same recommendations designed to prevent cancer should also be applied to patients who already have cancer. Implementing such a program of lifestyle modifications, improvement in diet, exercise, stress management, optimal exposure to sunlight, improving energy flow and nutritional supplements should improve cancer patients' survival statistics and the quality of life of these patients, including significantly reducing the side effects of conventional treatments. This article focuses on dietary changes and nutritional supplements to help clinicians educate cancer patients, so that they may better deal with their illness. Highlighted are principles involving an optimal diet, avoidance of harmful chemicals and use of nutritional supplements. Some of the controversies surrounding nutritional supplements are reviewed. Specific topics covered include a broad range supplement program, vitamin C, amygdalin, iodine, and fermented wheat germ extract. Finally, there is a discussion about paradigms in health care and the effects of politics and economics on how health care is practiced today.*

Conventional Cancer Treatment Alone Is Not Working

According to the Center for Disease Control in the USA, the age-adjusted mortality rate in the USA for cardiovascular disease and cerebrovascular diseases dropped dramatically between 1950 and 2005 while that for cancer dropped only slightly (See **Figure 1**, p.170). This implies that the treatment methods for cancer have not been very effective during this time. Worldwide, conventional cancer treatment methods include: surgery, radiation, chemotherapy, hormonal manipulation for certain cancers and the newer monoclonal antibody targeted therapies. The goal of cancer treatment appears to be to destroy cancer cells at all cost without much attention being paid to the health of the host, the patient. There is little emphasis on helping patients to make lifestyle changes or to improve their nutrition. Regarding nutritional supplements, oncologists often tell patients to avoid them, as they might interfere with conventional treatment, since radiation and chemotherapy are largely pro-oxidant treatments and many nutritional supplements have antioxidant properties. Oncologists often tell patients that it doesn't

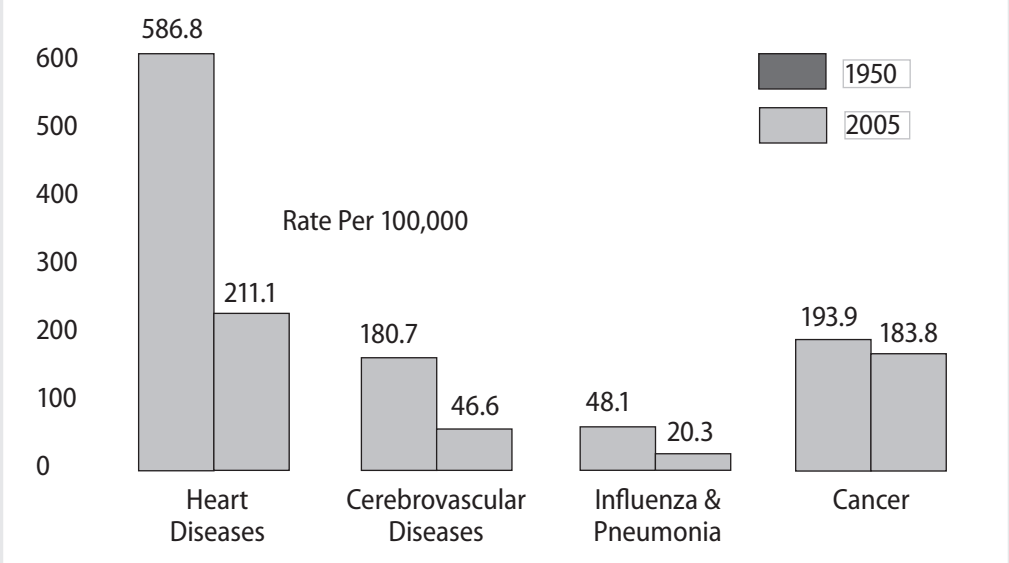
matter what you eat, as long as you consume enough calories to keep your weight up while you are undergoing conventional treatments that often cause a loss of appetite.

However, the adjusted mortality rates in Figure 1 show that this approach is not working very well. The purpose of this paper is to give a different perspective for treating cancer patients. Rather than just focusing on killing cancer cells, the treating physician should be able to considerably improve survival and the quality of life of cancer patients by taking a much broader view of the healing process. By utilizing a more integrative approach to cancer patients by educating and encouraging them to improve their nutrition, their sleep patterns, exercise as tolerated, exposure to sunlight (to encourage vitamin D formation, but not sunburn), improve sleep patterns and help them deal with stress, therapeutic results should be improved in terms of improved quality of life, prevention of recurrences and improved survival time in advanced cases.

Evidence for the Role of Diet in Helping to Prevent Cancer

A number of studies suggest that dietary factors can either prevent or encourage the development of cancer. In his book, *The China Study,*[1] T. Colin Campbell, outlines the findings of the most comprehensive study of nutrition ever conducted. Other research[2-5] supports the work of Campbell who asserts that a whole food, plant-based diet helps to prevent and treat cancer and other degenerative conditions. The elimination or marked reduction of animal-based foods will drastically cut cancer rates and improve results of cancer treatment. The elimination of refined plant-based foods containing sugar, white flour and various additives is also important. He further presents evidence that an optimal diet drastically reduces the negative effects of carcinogens and inhibits cancer promotion. Campbell is critical of the notion of "reductionism" research in nutrition (e.g. focus on fats or proteins or carbohydrates), rather than

Figure 1. Change in the U.S. Death Rates* by Cause: 1950 & 2005



*Age-adjusted to 2000 US standard population.
Sources: 1950 Mortality Data CDC/NCHS, NVSS, Mortality Revised.
2005 Mortality Data: US Mortality Data 2005, NCHS, Centers for Disease Control and Prevention, 2008.

looking at the effects of a whole food, plant-based diet. He claims that with reductionism research, you don't see the forest for the trees. He is also critical of the fact that health care education to the public and to professionals is largely controlled by dairy, meat and processed food and drug companies. A diet that is based largely on a whole plant-based food with a variety of colors is healthful and protective against cancer. Various organizations, such as the American Institute for Cancer Research, the American Cancer Society and the National Cancer Institute, support the notion that cancer is largely preventable with an optimal, predominantly plant-based diet.

Expanding on the idea of a whole food, plant-based diet, Gabriel Cousens, in his book *There is a Cure for Diabetes*,[6] suggests that when such a diet is mostly raw, the therapeutic benefits for preventing and reversing degenerative diseases, such as cancer, are enhanced. He points out that the therapeutic benefits of phytonutrients that are not damaged by heat are considerable because they may combine with transcription factors in the cell to up-regulate anti-cancer, anti-inflammatory and anti-diabetic genes, while down-regulating transcription factors that have the opposite effect. Phytonutrients can function as a master switch to turn many genes on or off. The tiny amounts of phytonutrients in food can have a large effect on phenotypic gene expression.

A highly refined processed food diet that emphasizes animal based foods has the opposite effect. There is no question that anyone adopting a healthy whole food, plant-based diet will drastically reduce his or her risk of developing cancer. We see that the Japanese people, when following a traditional Japanese diet, have a relatively low incidence of some of the most common cancers such as breast, prostate and colon cancer. However, when they migrate to the United States and adopt the standard American diet, the incidence of these cancers goes up dramatically.

Another excellent book written by a nutritionally oriented oncologist and radiotherapist Charles B. Simone, titled *Cancer & Nutrition*,[7] outlines an extensive program to help prevent cancer. This program involves a largely whole foods, plant-based diet, exercise program, dietary supplements and tips for stress management. It contains hundreds of references to the scientific literature that support his program.

Not everyone agrees that a completely plant-based diet is best for everyone. Famed dentist and researcher Weston A. Price spent many years in the 1930s researching the relationship between diet and the development of degenerative disease by interviewing and examining people in many cultures throughout the world. He noted the health of the people, including careful examinations of their teeth and mouths while they ate their traditional diets and then again after western, so-called civilized diets of refined processed foods were introduced. His observations were striking. People who ate a wide variety of whole food diets, both animal and plant based, were extremely healthy but, once refined foods were introduced, health deteriorated and all kinds of chronic degenerative diseases including cancer evolved.[8] Like Campbell and Cousens, the Price-Pottenger Foundation (http://www.ppnf.org/catalog/ppnf/) advocates eating whole foods and avoiding processed foods. However, they do advocate the use of certain types of animal foods. They advocate the use of raw dairy products and beef from grass fed animals. They emphasize using organic foods and foods that do not contain chemicals.

Another extremely valuable book entitled *Beating Cancer with Nutrition*[9] by nutritionist Patrick Quillin, offers very practical information to prevent cancer with nutrition, including nutritional supplements. Quillin is also not an advocate of extreme vegan diets. This book should be read and implemented by any clinician who is treating cancer patients.

Nutritional Recommendations and Other Suggestions for Patients Diagnosed with Cancer

Although many physicians would acknowledge that nutritional factors are important in preventing cancer, when it comes to treating patients who have been diagnosed

with cancer, the vast majority of oncologists fail to discuss nutritional and lifestyle factors to help their patients manage their cancers. Oncologists attempt to rid the body of cancer cells with surgery, radiation, chemotherapy, anti-hormonal therapies and/or the new monoclonal medications. Little attention is paid to lifestyle factors, nutritional recommendations or nutritional supplements. Oncologists often give patients dietary advice that is exactly opposite to the advice contained in cancer-preventive diets. Patients are frequently told to eat high calorie, high fat, high protein diets that also contain lots of sugar and other refined processed foods. They are sometimes told that it doesn't matter what you eat as long as you eat enough calories to sustain your weight during your conventional treatment.

There is considerable direct and indirect evidence that some of the same recommendations designed to prevent cancer should also be applied to patients who already have cancer. Implementing such a program should improve cancer patient survival statistics and the quality of life of these patients, including significantly reducing the side effects of conventional treatments. Both Simone and Quillin in their books cited previously have chapters showing the benefits of excellent nutrition for patients undergoing conventional cancer treatment with references to support their recommendations.

Common sense tells us that a patient's clinical outcome will be related to his nutritional intake. Food supplies the building blocks for all cellular structures in the body (cell membranes, DNA, proteins, etc). It supplies the calories or fuel that, when combined with oxygen in the body, supplies energy for all biochemical reactions. Finally, food supplies information to the genes of the body to help regulate all biological processes. This epigenetic information can help the genes to repair and heal the body or cause a deterioration of the healing process, depending upon what information from food is supplied.

One important area of concern for cancer patients and people in general has to do with exposure to toxins and how well the body is able to rid itself of these toxins. Toxins may be carcinogenic or toxic in other ways. We are what we eat, drink, breathe, touch, absorb and can't eliminate. We have many systems in our body to help protect us from toxins and to help our body eliminate them. First, we have the barrier function of our skin and our mucus membranes. We eliminate many toxins through bowel movements and it is important for all us to move our bowels at least once daily. One of the main functions of the liver is to eliminate toxins. This is generally done in two steps, with toxic organic molecules being converted to a more water-soluble form in phase one and conjugated to another organic molecule in phase two for easier elimination either through urine or feces via the bile. Many phytonutrients in fruits, vegetables and herbs are capable of influencing various detoxification pathways to help the body eliminate toxins. For example, sulforaphane derived from broccoli sprouts, up-regulates phase 2 of liver detoxification and shows many anti-cancer properties.[10,11]

It is difficult to find controlled studies comparing a group of cancer patients receiving only conventional treatment with another group that receives conventional treatment along with a dietary program that includes many of the principles of nutrition that I discuss in this article. One such study recorded the survival time from diagnosis of pancreatic cancer patients who ingested a macrobiotic diet, which consists primarily of whole, plant-based foods. In the first major scientific study of the macrobiotic approach to cancer, researchers at Tulane University reported that the 1-year survival rate among patients with pancreatic cancer was significantly higher among those who modified their diet than among those who did not (17 months versus six months). The one-year survival rate was 54.2 percent in the macrobiotic patients versus 10.0 percent in the controls. All comparisons were statistically significant.[12]

Also, reported in this paper was a study in which prostate cancer patients were prescribed a macrobiotic diet. For patients with metastatic prostate cancer, a case con-

trol study demonstrated that those who ate macrobiotically lived longer (177 months compared to 91 months) and enjoyed an improved quality of life. The researchers concluded that the macrobiotic approach may be an effective adjunctive treatment to conventional treatment or in primary management of cancers with a nutritional association. "This exploratory analysis suggests that a strict macrobiotic diet is more likely to be effective in the long-term management of cancer than are diets that provide a variety of other foods," the study concluded.

In spite of the limited number of published studies on this subject, many nutritionally oriented clinicians are convinced that an optimal nutritional program is essential for improving the results of cancer treatment and that such a program should be recommended for cancer patients and not reserved only for those without cancer who are looking to prevent it. It should also be used by patients who have undergone successful conventional treatment and are searching for ways to help prevent a recurrence.

Here is a list of recommendations that I give to my cancer patients concerning dietary recommendations. I suggest they avoid: sugar and white flour products; alcohol, caffeine, fluoridated and chlorinated water; foods containing bromine, hydrogenated fats and all trans fatty acids; artificial chemicals added to foods such as artificial sweeteners like aspartame (Nutrasweet or Equal) and sucralose (Splenda), artificial colors and flavors, preservatives; fish contaminated with mercury; and genetically modified food. Many people are sensitive to gluten (protein found in wheat, rye and barley) and should avoid these foods. Other food allergens should also be avoided.

Non-dietary items to be avoided include: tobacco; recreational drugs like marihuana and cocaine; mercury amalgam dental fillings; exposures to toxic chemicals; synthetic hair dyes; aluminum containing antiperspirants; harmful electromagnetic frequencies (such as cell phones as much as possible, microwave ovens); exposure to nuclear plants; and tight fitting clothing such as wired bras, which cut off lymphatic circulation from the breasts. A more complete list of items to avoid can be found at my website: www.schachtercenter.com (click on literature and articles and look for the "Avoid List").

My suggestions as to what to eat emphasize some of the points that have been previously made. I suggest that patients eat primarily whole foods, mostly plant-based, largely raw and preferably organic. I tell them to shop in the outer isles of the super market where most whole foods are kept and to avoid the inner isles, which largely have packaged processed foods. A wide variety of vegetables, fruits, nuts and seeds and legumes should be eaten and attempt should be made for the foods in the diet to be of many colors (a rainbow array), as this helps to ensure that a wide variety of phytonutrients are obtained in the diet. Fresh, raw, vegetable juices with a smaller amount of fruit are excellent. Animal foods, though somewhat limited, should generally be unprocessed, without chemical additives. Meat should be from grass fed animals and organic when possible. Dairy should be certified raw if it is available. Eggs should be from free range chickens and organic when possible. For most people, I do not recommend total elimination of animal products, as advocated by Campbell and Cousens. Food should not be overcooked or burned.

Additional suggestions I give to my patients include: (1) Eat slowly and chew your food well to improve digestion and prevent gastric upset; (2) Don't skip breakfast because studies have shown that people who eat breakfast generally have a lower intake of total calories for the day and have a better insulin sensitivity; (3) Meals should not be skipped as doing so causes an increase in insulin resistance; (4) Cooking method matters, as harsh cooking methods produces carcinogenic heterocyclic amines, oxidized cholesterol, lipid peroxides and advanced glycation end products, all of which are carcinogenic; (5) It is best to boil, poach or stew foods and avoid frying, broiling and roasting; and (6) Avoid the microwave, which tends to destroy nutrients and change blood chemistries.[13]

If physicians caring for cancer patients helped them to improve their diets, several positive effects could be expected. These include: (1) Avoidance of malnutrition (many patients die from malnutrition, rather than the cancer process itself); (2) Minimization of adverse effects from conventional treatment; (3) Optimization of cytotoxic effects on cancer cells; (4) Protection of healthy tissue; (5) Healthy cell proliferation; (6) Immune enhancement, helping to protect the patient against infections; (6) Beneficial hormone changes.

The Role of Hope, Attitude and Stress Management; Breathing and Energy Flow; Exercise, Sunlight and Vitamin D, Importance of Sleep and the Need for Healthy Social Relationships

1. The Role of Hope, Attitude and Stress Management for Cancer

Although this paper will not stress other aspects of lifestyle that are important for cancer patients, these need to be addressed. First and foremost, a patient needs to be given hope that the disease can be overcome or at least controlled. Unfortunately, under the guise of not giving patients false hope, oncologists frequently predict how long a patient will live. So, a patient may be told: "you have six months to live." Many people are extremely suggestible and when given this dictum, they somehow fulfill the prophecy. It is absolutely reasonable for a physician to tell a patient that he doesn't know how long the patient will live. The physician should emphasize that each person is an individual and that there is no way of telling how he will respond to many of the non-conventional treatments that are being implemented. The attitude of the patient is important in this equation and helping the patient believe that he can respond to treatment will be important for his prognosis. One can give a general prognosis for those with a similar situation who have received similar conventional treatments, but emphasize that this patient's response, especially with some of the integrative treatments, might be much better. Numerous books have been written about psychological aspects of dealing with cancer. Bernie Siegel's book, *Love, Medicine and Miracles: Lessons Learned about Self-Healing from a Surgeon's Experience with Exceptional Patients,* written many years ago, is still quite applicable.[14] Lawrence LeShan's book, *Cancer as a Turning Point: A Handbook for People with Cancer, Their Families, and Health Professionals,* is also worthwhile.[15] Other inspirational books by people who have overcome cancer using various nutritional and other lifestyle changes are highly recommended.[16,17]

2. Learning to Breathe Deeply and Energy Flow

The importance of learning how to breathe deeply (deep abdominal yoga-type breaths) and improving oxygenation is key to cancer patients and it should be emphasized that cancer cells generally are anaerobic and don't like oxygen. So, improving oxygenation should help the patient's own defenses overcome inflammation and slow down the cancer process. Improving energy flow is compatible with this notion and helping patients learn yoga, tai chi, Qi Gong or other energy disciplines are almost always helpful. Acupuncture, acupressure and massage can also be quite useful

3. Exercise

Patients should be encouraged to move and to exercise as tolerated. They must learn to listen to their bodies. If a person vigorously exercises and is out of commission for the next few days, he has done too much. But it is extremely important to begin to exercise, walking outside or on a treadmill or riding a stationary bike. This tones up the body, improves circulation and improves the defenses of the body. Stretching and limited strength training are also helpful.

4. Sunlight and Vitamin D

Another important factor that has been totally underestimated as important for healing is exposure to sunlight. John Ott introduced the concept in the 1970s, but like many other important insights, it has been ignored largely because of lack of financial incentives.

In his book, Health and Light, Ott describes a study involving cancer patients at New York University, in which very ill cancer patients were exposed to sunlight a few hours a day. This resulted in a marked improvement in their prognoses.[18] Jacob Liberman wrote a book in 1990 emphasizing the role of light in health and predicting its importance in the future, but the concept has not trickled down to conventional oncology.[19]

The importance of light has become somewhat more fashionable lately with the recent tremendous emphasis on the role of vitamin D in health and disease. Michael Holick has helped to fuel interest with his book *The UV Advantage*.[20] In this book, he attempts to counter the nonsense promulgated by the dermatology industry that the sun is bad for you and you should avoid it at all costs; when exposed to it, you must cover yourself with sunscreen to avoid the damage. This advice, according to dermatologists, prevents damage to the skin and prevents skin cancer. Butx= Holick points out that the risk of the most dangerous skin cancer, malignant melanoma, is increased with severely restricted sun exposure and vitamin D deficiency. The best way to get vitamin D is to have some exposure to the sun on bare skin not covered with sun screen. It is important to avoid burning the skin, but some limited exposure to sun is generally good for you. According to Ott, it is not just vitamin D, but other aspects of exposure to full spectrum sunlight that is therapeutic. I recommend that my patients try to expose themselves to some sunlight as much as possible without allowing sunburn to occur.

5. Quality Sleep

Another important factor that must be addressed relates to sleep. Good quality sleep is essential for any type of healing program. Unfortunately, conventional medicine usually addresses sleep problems with prescription drugs like benzodiazepines (Valium, Dalmane), SSRIs (Paxil), atypical antipsychotic agents (Seroquel, Zyprexa) or various sleep medications (Ambien). These usually wind up making the patient dependent upon the medication, but do not really offer sustained deep sleep that encourages the repair process of the body. Frequently, as a result of stress of all sorts, the patient has a hyperactive hypothalamo-pituitary-adrenal axis and elevated cortisol levels and/or epinephrine surges contribute to problems falling asleep or staying asleep. Often conventional medications prescribed for various conditions and exposures to chemicals contribute to the dysregulation of the hypothalamus and other areas of the brain associated with sleep. The process of detoxification, removing exposure to toxic substances, stress management techniques (such as deep breathing), regular exercise, the tapering of various psychotropic medications and the supply of herbs and nutrients (like amino acid precursors to serotonin, herbs that enhance the GABA receptors) and other strategies discussed in this paper can be extremely beneficial in helping a patient to regain healthy sleep patterns. An excellent recent book by James Harper, *How to Get Off Psychiatric Drugs Safely*,[21] and the website (www.theroadback.org), are excellent resources to help patients taper off psychiatric drugs safely. Sleep must be addressed very early in any treatment program and the treatment must be tailored to the patient.

6. Improving Relationships

Finally, it is important for cancer patients to enjoy healthy relationships. A patient's prognosis is affected by the quality of relationships and his desire to live. Frequently, brief or intermittent psychotherapy with an active psychotherapist who works on the person's strengths, rather than dwelling on weaknesses or problems, can do wonders. A practitioner needs to evaluate the social support system of the patient and attempt to build on positive relationships. An active support group may be helpful in this situation. However, many cancer support groups are in hospitals and are dominated by pure conventional oncology concepts, including ridiculing or criticizing integrative cancer approaches. It is important for cancer patients to avoid such groups and to find groups that will generally support what they are doing.

Use of Nutritional Supplements for Cancer Patients

1. Comparing Nutritional Supplements with Chemotherapeutic Cancer Agents

One of the most controversial areas surrounding the care of cancer patient relates to whether or not they should receive nutritional supplements while undergoing radiation and/or chemotherapy. Many oncologists advise cancer patients not to take any nutritional supplements because they contain anti-oxidants and since radiation and chemotherapy are pro-oxidant, the nutritional supplements will interfere with the activity of these pro-oxidant treatments. So, the important question is whether taking nutritional supplements while undergoing these treatments will help the treatment results, interfere with treatment results, or have no effect on the treatment. Also, might the answer to this question be affected by the nature of the conventional treatment, the kind and dosage of the supplements, the genetics and other factors within the patient and other environmental factors, such as the patient's diet?

Before trying to answer the question as to the value of nutritional supplements while undergoing conventional cancer treatment, it might be helpful to discuss the similarities and differences between conventional treatment and nutritional supplements. An ideal chemotherapeutic agent would be one that is highly selective in its action by promoting the destruction of cancer cells while not harming or even nurturing normal cells. Unfortunately, conventional therapy does not do this. Radiation, chemotherapy, antihormonal treatments and even the targeted monoclonal antibody treatments generally are harmful to normal cells; hence the adverse side effects observed during their administration.

2. How Nutritional Supplements May Affect Cancer Processes-John Boik's Work

Nutritional supplements, on the other hand, may be harmful overall to cancer cells while nurturing normal cells. In other words, nutritional supplements generally have different effects on cancer cells than normal cells. In his excellent, extremely well documented book, *Natural Compounds in Cancer Therapy: Promising Nontoxic Antitumor Agents from Plants & Other Natural Sources,*[22] John Boik outlines a series of pro-cancer events that occur during the development of cancer and shows how natural substances can interfere with these processes without harming normal cells. These events are: (1) Gene mutations and genetic instability; (2) Gene expression (switching genes on and off); (3) Abnormal signal transduction; (4) Abnormal cell to cell communication; (5) New blood vessel formation-angiogenesis; (6) Invasion into tissues; (7) Metastasis to other organs; and (8) Immune suppression and other forms of immune evasion.

With multiple references and citations, Boik explains how various natural substances that can be found in nutritional supplements can affect these processes. Many of these substances can affect several steps of the process. For example, Curcumin (derived from turmeric) inhibits PTK, PKC, NFkB and PGE_2 synthesis (all of which play a role in inflammation and cancer); inhibits invasive enzymes and stimulates or supports the immune system. EPA (from fish oil) inhibits PKC and PGE2 synthesis, stimulates or supports the immune system and inhibits invasive enzymes. The active form of Vitamin D (1,25 dihydroxycholecalciferol) is involved with 9 possible anti-cancer effects, melatonin with 15, vitamin A with 13 and Boswellic acid with 15.

Boik suggests that natural compounds are mild relative to chemotherapy drugs, being 30 times less potent *in vitro*, but about 21 times less toxic than most chemotherapy drugs. Each substance acts at several steps of the cancer process. They act synergistically and are used most effectively in combination. Boik's book contains hundreds of pages reviewing the studies showing these relationships, making it a very valuable resource for any clinician adding nutritional supplements to his cancer patient regimes.

3. Patrick Quillin's Work with Nutrition and Nutritional Supplements for Cancer Patients

Another book that summarizes many of the studies that have been done on the effects of nutritional supplements on the management of cancer patients is the previously mentioned book by Patrick Quillin (*Beating Cancer with Nutrition*).[9] This is a good place to start for clinicians who wish to incorporate nutritional recommendations, nutritional supplements and other integrative methods while working with cancer patients. They act synergistically and are used most effectively in combination.

4. Recent Reviews on Nutritional Supplements during Conventional Cancer Treatment: Keith Block, MD and Charles Simone, MD

Two recent review papers have looked at the question of whether nutritional supplements are beneficial for cancer patients. Block and others reviewed 845 peer-reviewed articles that discussed the use of nutritional supplements for patients undergoing conventional treatment. They identified 19 clinical trials, which met strict inclusion criteria. Most of the study participants had advanced or recurrent disease and received various supplements. The conclusion was that: "None of the trials reported evidence of significant decreases in efficacy from antioxidant supplementation during chemotherapy." Many studies showed that antioxidant supplementation was associated with "increased survival times, increased tumor responses, or both, as well as fewer toxicities than controls."[23]

Simone (an oncologist and radiotherapist who authored a book previously mentioned)[7] reviewed 280 peer-reviewed *in vitro* and *in vivo* studies that had been published since 1970. He said that 50 of these studies were human studies involving 8,521 patients, 5,081 of whom were given nutrients. These studies consistently showed that non-prescription antioxidants and other nutrients do not interfere with therapeutic modalities for cancer and actually enhance the killing of conventional cancer therapies and decreased their side effects, protecting normal tissue. In 15 human studies, 3,738 patients who took non-prescription antioxidants and other nutrients actually had increased survival.[24]

Studies Suggesting Efficacy of Nutritional Cancer Supplementation

1. Small Cell Lung Cancer Study by Jaakkola

There aren't many studies evaluating the efficacy of nutritional supplements in part because there just isn't the economic motivation to do these studies since supplements are not patentable and the vast majority of clinical research is carried out by pharmaceutical companies on patentable drugs. Nevertheless, there are a few suggestive studies, but most physicians aren't aware of them. Even fewer studies have been done on a combination of a variety of supplements. One non-randomized study carried out in Finland and published in 1992 involved 18 patients with small cell lung cancer where patients received a number of vitamins and minerals (several in relatively high doses), along with conventional treatment.[25] The vitamin supplements with dosages used in the study are found in **Table 1** (p.178) and a list of minerals used is found in **Table 2** (p.178).

The endpoint for the study was a simple one, namely the survival time of the patients from the time of diagnosis compared to the survival statistics of The United States' National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program for a similar group of patients. The survival statistics are shown in **Figure 2.** (p.179) From the time of diagnosis, at six months, the survival of the SEER group was 50% and the Nutrient group almost 95%; at 12 months, 20% of the SEER group and 85% of the Nutrient group was still alive; at 24 months, survival for the SEER group was only 10%, while 55% of the Nutrient group was still alive; at 30 months, only about 1% of the SEER group was still alive while 40% of the Nutrient group was still living and finally at six years or 72 months, all of the SEER

group had passed on, while 44% (eight of 18 patients) of the Nutrient group was still alive. Conclusions of the study were: (1) Antioxidants (AOX) and other nutrients given to small-cell lung cancer patients along with conventional treatment drastically improved long-term survival; (2) There were no side effects observed from the AOX and other nutrients; (3) Surviving patients started AOX treatment earlier than those who succumbed; and (4) AOX treatment should start as early as possible in combination with chemotherapy and/or radiation.

Granted this was a very small study, but the statistics are truly amazing. An unbiased observer would expect that this study would have at least provoked some interest and an attempt would have been made to replicate it, but I could find no evidence of this in the medical literature.

2. Studies by Abram Hoffer, MD on Advanced Cancer Patients Using High Doses of Nutritional Supplements Preceded by Studies of Cameron and Pauling Using High Doses of Vitamin C (Ascorbate); Conflicts with the Mayo Clinic Studies

Linus Pauling, two-time Nobel Prize winner was first introduced to the concept of high-dose vitamin C by biochemist, Irwin Stone in 1966. Being convinced of its worth and championing its use for the common cold, Pauling began to collaborate with Scottish cancer surgeon Ewan Cameron in 1971 on the use of intravenous and oral vitamin C as cancer therapy for terminal cancer patients. The reasoning was that cancer patients were generally depleted of ascorbate and ascorbate had numerous anticancer activities. They conducted a study involving

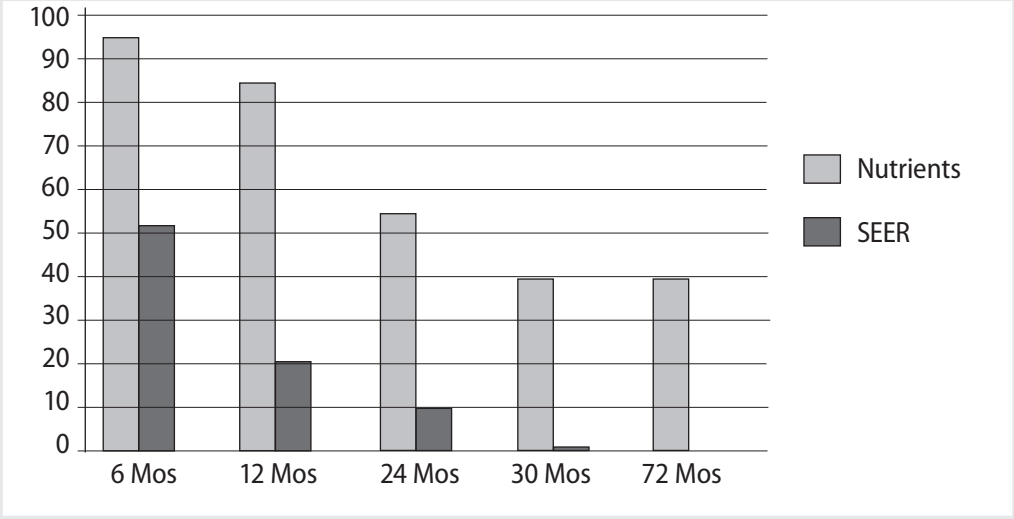
Table 1. Dosages of Vitamins, Minerals and Essential Fatty Acids-Jaakkola Study

Retinol Palmitate (Vitamin A)	15,000 to 40,000 IU
Beta Carotene	10,000 to 20,000 IU
Alpha Tocopherol Acetate (Vitamin E	300 to 800 IU
Thiamin Hydrochloride (Vitamin B_l)	150 to 750 mg
Pyridoxine HCl (Vitamin B_6)	200 to 1,140 mg
Cyanocobalamin (B_{12}	30 to 1,600 mcg
Nicotinamide (Vitamin B_3)	150 to 400 mg
Vitamin D	400-1,000 IU
Ascorbic Acid (Vitamin C)	2,000 to 5,000 mg
Calcium Pantothenate (Vitamin B_5)	50 to 300 mg
Biotin	300 to 1000 mcg
Essential Fatty Acids	5 to 65 Grams

Table 2. Minerals Used in the Jaakkola Study

Magnesium	Copper
Zinc	Chromium
Manganese	Vanadium
Selenium	

Figure 2. Small Cell Lung Cancer-Survival Statistics



100 terminal cancer patients in a Scottish Hospital. After 10 days of intravenous Vitamin C therapy, each patient was given 10 grams of vitamin C orally each day indefinitely. Their progress was compared to that of 1,000 similar patients treated identically, but who received no supplemental ascorbate. The mean survival time for the ascorbate group was 4.2 times more than the control subjects (more than 210 days compared to 50 days for the controls). An analysis of the survival-time curves indicated that deaths occurred for about 90% of the ascorbate-treated patients at one-third the rate for the controls and that the other 10% had a much greater survival time, averaging more than 20 times the controls.[26,27] Cameron and Pauling concluded that high doses of vitamin C should be given to all cancer patients.

The medical establishment rejected the conclusions of Cameron and Pauling after a series of papers from the Mayo Clinic failed to confirm their findings.[28,29] Pauling bitterly criticized these studies and claimed that they did not replicate his studies.[30] For one thing, in the first study, it turned out that the vast majority of cancer patients in the Scottish study were hospitalized and could be followed very closely and very few of them had previously received chemotherapy (only 4%, though the Moertel published study erroneously indicated that 50% had received chemotherapy), whereas virtually all of the cancer patients in the Mayo Clinic study had received previous chemotherapy.

In the second study, the Mayo Clinic patients (colon cancer patients with metastases for which there was no know effective conventional treatment) had not received any chemotherapy, but again Cameron and Pauling were critical of this Moertel study. First of all, very few of the control patients were checked to see if they were taking vitamin C on their own. This could be done by checking their urines. When the urine of a few patients in the control group were checked, it turned out that one or more of them were taking C on their own, making the control group invalid. Another major difference between the Moertel study and the original Cameron and Pauling study was that patients in the Cameron-Pauling study were given 10 grams of Vitamin C until they died, whereas the Mayo Clinic patients were given vitamin C until they showed progression of their disease (increase in size of the

tumor), at which point they were abruptly stopped from taking ascorbate and given other conventional treatments instead. Cameron and Pauling had not claimed that vitamin C cured cancer or even that it caused shrinkage of cancerous tumors. They claimed that it slowed the progression of the disease, increased survival time when taken consistently and improved quality of life. This was demonstrated by comparing survival times with 1,000 patients who were carefully matched as historical controls.

Moertel's experimental design did not address these issues. Instead, they treated ascorbate as a cytotoxic drug and measured its effectiveness by determining that it didn't shrink any tumors. It was then declared useless. After completion of the Mayo Clinic studies, conventional medicine concluded that vitamin C was useless for cancer patients, in spite of letters from Pauling and Cameron criticizing the experimental design and the conclusions. Vitamin C was relegated to use only by "alternative practitioners."

One recent study outlined the possible proposed mechanisms for ascorbic acid activity in the prevention and treatment of cancer.[31] They are: (1) Enhancement of the immune system by increased lymphocyte production and activity; (2) Stimulation of collagen formation, necessary for "walling off" tumors; (3) Inhibition of hyaluronidase by keeping the ground substance around the tumor intact and preventing metastasis; (4) Inhibition of oncogenic viruses; (5) Correction of ascorbate deficiency commonly seen in cancer patients; (6) Expedition of wound healing after cancer surgery; (7) Enhancement of the anti-carcinogenic effect of certain chemotherapy drugs; (8) Reduction of the toxicity of chemotherapeutic agents; (9) Prevention of cellular free radical damage; (10) Production of hydrogen peroxide; and (11) Neutralization of carcinogenic substances. Previously, Cameron and/or Pauling had published several papers, outlining some of these mechanisms.[32-34]

Recent studies from the National Institutes of Health (NIH) suggest high doses of vitamin C that can be achieved with intravenous doses of ascorbate are capable of inducing cancer cell death, without harming normal cells. While this has awakened some interest in vitamin C for cancer patients,[35] most cancer specialists today still regard vitamin C as either having no effect or being harmful to cancer patients.

In the early 1980s, Abram Hoffer MD, considered by many to be the father of orthomolecular psychiatry, evaluated a schizophrenic patient for treatment with high doses of niacin and vitamin C. This woman also had a lymphoma. Not only did the patient recover from schizophrenia, but much to the surprise of Hoffer, her lymphoma also went into remission. The word got out and soon Hoffer was bombarded with requests from cancer patients to be put on a nutritional regimen. At the urging of Pauling, Hoffer began to keep track of all of the cancer patients that he put on this nutritional program and reported on the survival time of these patients in a series of articles.

The patients followed by Hoffer had received conventional treatments and 90% of them were considered to be advanced. The endpoint of the study for each patient was either death or survival time at the time of the inquiry. Time was measured from the first visit with Hoffer. The control group consisted of patients who approached Hoffer, but did not remain on the program for at least two months. Excluded were all patients who died during the first two months, whether they planned to continue the program or had decided not to do so.[36]

The Hoffer protocol given to the treated patients included: (1) Improved diet with the elimination of so-called junk foods (refined, processed foods containing sugar, white flour and additives); low fat and elimination of allergic foods: (2) vitamin C 10 to 40 grams a day by mouth; (3) vitamin B_3 (niacin or niacinamide) 300 mg to 3,000 mg daily; (4) vitamin B_6 200 to 300 mg daily; (5) folic acid 1 to 30 mg daily; (6) vitamin E succinate 400 to 1,200 IU daily; (7) mixed carotenoids, as carrot juice; (7) multivitamin and mineral; (8) coenzyme Q_{10} 300 mg to 600 mg daily; selenium 200 to 1,000 mcg daily; (9) zinc 25

to 100 mg (with some copper); (10) calcium and magnesium in a 2:1 ratio. Most nutrients were given in divided dosages two to three times daily.

The survival statistics for Hoffer's first 131 patients treated between 1976 and 1988 are shown in **Table 3** (below). At the end of one year, only 28% of the controls were alive compared to 77% of the treated group. At three years, only 16% of the control group was alive compared to 56% of the treated group. By five years, only 5% of the control group and 46% of the treated group were alive, while at seven and nine years, there were no survivors in the control group, but 39% and 34% respectively in the treated group. The survival statistics for 769 patients through 1997 are shown in **Table 4** (below). Again, we see a marked difference in survival each year up until five years.

The conclusions from the Hoffer studies were: (1) Patients with a wide variety of advanced cancers have significantly improved survival when a nutritional program is added to their conventional treatment; (2) The nutritional program consisted of dietary suggestions and relatively high doses of vitamins, minerals and other nutritional supplements.

Intravenous (IV) Vitamin C for Cancer Patients

The first recommendations for IV vitamin C for cancer patients appeared in 1971.[37] In their book on cancer and vitamin C, Cameron and Pauling summarized their work with vitamin C for cancer patients both orally and by intravenous use.[38] In their study, IV vitamin C at 10 grams was administered daily for 10 days. In 1990, the late Hugh Riordan MD and his group in Wichita, Kansas reported a rather amazing case study of a patient with kidney cancer who had a long-term remission with IV treatments of Vitamin C in the range of

Table 3. Dr. Hoffer's First 131 Cancer Patients Treated From 1976 to 1988

Group	Treated	Untreated
Total Number	97	18
Alive at 1 year	77 %	28 %
Alive at 2 years	56 %	16 %
Alive at 3 years	46 %	5 %
Alive at 4 years	39 %	0 %
Alive at 5 years	34 %	0 %

Table 4. Dr. Hoffer's Cancer Patients Seen Before The End of 1997 (71 Excluded)

Group	Treated	Untreated
Total Number	769	75
Alive at 1 year	72 %	24 %
Alive at 2 years	48 %	12 %
Alive at 3 years	37 %	12 %
Alive at 4 years	30 %	8 %
Alive at 5 years	23 %	8 %

about 15 to 30 grams, a few times a week.[39] A paper in Medical Hypothesis in 1995 by Riordan's group described IV ascorbate as a tumor cytotoxic chemotherapeutic agent.[40] They reported that ascorbic acid and its salts are preferentially toxic to tumor cells *in vitro* and *in vivo* and that "given in high enough doses to maintain plasma concentrations above levels that have been shown to be toxic to tumor cells *in vitro,* ascorbic acid has the potential to selectively kill cancer cells in a manner similar to other tumor cytotoxic agents." A major point here is that at these concentrations, ascorbic acid is NOT toxic to normal cells.

Dr. Mark Levine at the NIH wrote a commentary in the *Journal of the American College of Nutrition* in 2000 pointing out that concentrations in the bloodstream of IV vitamin C was capable of killing cancer cells and not normal cells and that "ascorbate treatment of cancer should be reexamined by rigorous scientific scrutiny in the light of new evidence."[41] As mentioned previously, Levine and his group at the NIH published an extremely important paper in 2005, showing that high concentrations of ascorbate (achievable by IV infusions, but not by oral doses) was capable of killing a wide range of cancer cells without harming normal cells. Furthermore, he described the mechanism by which this occurs. Ascorbate in these high concentrations acted as a pro-drug, forming hydrogen peroxide in the extracellular spaces. It is the hydrogen peroxide that is capable of killing many cancer cells and not normal cells at these concentrations.[26] The reason for the discrepancy in ascorbate's ability to kill cancer cells and not normal cells may be that cancer cells have between 10 and 100 times less catalase than normal cells.[30,42] Catalase is the enzyme that breaks down hydrogen peroxide in the body and with less catalase, cancer cells might be expected to be more easily killed by hydrogen peroxide. More case studies were published in 2006.[43] In this paper, the authors describe: "three well-documented cases of advanced cancers, confirmed by histopathologic review, where patients had unexpectedly long survival times after receiving high-dose intravenous vitamin C therapy." They suggested that "the role of high-dose intravenous vitamin C therapy in cancer treatment should be reassessed. A nice review of ascorbic acid for cancer over the previous 25 years appeared in 2005.[44]

Recently, Dr. John Hoffer (son of the late Abram Hoffer), an internist and professor at McGill University (Montreal, Quebec) reported at the Orthomolecular Medicine Today Conference (2009) that a clinical trial that he had run on advanced cancer patients using high dose IV ascorbate over a six month period, failed to show any objective changes in the size of the tumor. The conclusion was that the IV ascorbate alone was not effective for the treatment of advanced cancers. However, J. Hoffer used the same methods that are used to evaluate toxic chemotherapeutic drugs and similar to the methods used by Moertel in his studies described previously. Measuring the size of a tumor does not necessarily correlate well with either survival time or quality of life. So, it is possible that a longer term study which looked at the issues of survival time and various lifestyle parameters might show a different story. But, it would undoubtedly be difficult to get funding for such a study. On the other hand, a study involving IV ascorbate along with a chemotherapeutic agent would be funded more easily. Currently, J. Hoffer is recruiting for a clinical trial using high dose vitamin C with chemotherapy. This is similar to a trial run at the University of Kansas by Drisko, which has not yet been published. It is not clear at this time if clinical trials of this sort using IV vitamin C along with chemotherapy will show vitamin C to be of benefit, but I suspect if parameters, such as survival and quality of life are measured, we should expect positive results. In my clinical experience, patients undergoing chemotherapy with another physician, but receiving high dose intravenous ascorbate at our office in between their chemotherapy treatments, invariably report that they appear to be doing better than other patients at the oncologist's office who are not receiving high dose vitamin C.

In our practice at the Schachter Center for Complementary Medicine in Suffern, NY (www.schachtercenter.com), we have been using high dose IV ascorbate (10 to 120 gram infusions) in cancer patients for more than 30 years. Each patient receives a comprehensive program involving dietary suggestions, a variety of nutritional supplements, an exercise program, stress management program and other life style enhancing suggestions. Our patients appear to do very well and we believe that the infusions play an important role in their treatment. We usually give about 60 grams of vitamin C, 10 cc of calcium gluconate and 4 cc of magnesium chloride in 500 cc of sterile water and administer this over about two hours.

Amygdalin (Also known as Laetrile and Vitamin B_{17})

1. Historical Background

Amygdalin has been one of the most controversial cancer treatments for the past 50 years. The story involves not only science, health care and treatment for cancer, but also politics and economics. In the USA, during the 1970s and 80s, a great debate waged between conventional medicine (with the support of the federal government) on the one hand and patients treated successfully with it, a small group of scientists and practitioners who believed in its value and a conservative political group that fostered the notion of freedom of choice in health care, on the other. As many as 20 states in the USA passed state legislation that decriminalized it, while some doctors who used it lost their medical licenses and some even wound up in prison. My first exposure to alternative cancer therapies was a narrated film strip titled *World Without Cancer,* which is available on the internet at: http://video.google.com/videoplay?docid=4312930190281243507#. It is also available as a book: World without Cancer By Edward Griffin.[45] The basic thesis of this book, based on the theory of Ernest Krebs Jr, is that cancer is largely a nutritional deficiency disease, much like pellagra (vitamin B_3), scurvy (vitamin C) or beri-beri (vitamin B_1) and that modern civilization ingests very little of this vitamin, which is contained in nitriloside-rich foods. A monograph with references on amygdalin is available at: http://www.worldwithoutcancer.org.uk/therapycomponents.html#14

During the late 1970s and early 1980s, I personally was involved in a legal struggle with New York State that involved amygdalin and other alternative cancer therapies. Fortunately for me, I was able to come out of this struggle without much damage to me or my practice. I have been recommending amygdalin as a nutritional supplement for cancer patients since the mid-1970s and believe that it does have value, along with many of the other suggestions and recommendations that we give to our patients.

2. Chemical Structure of Amygdalin and How it Works

Amygdalin is one of many nitriloside compounds, which are natural cyanide-containing substances found in many foods, including all of the seeds of the prunasin family (apricots, peaches, apples, pears and others), millet, buckwheat, cassava melons and many others. Amygdalin consists of two glucose molecules bound to a benzaldehyde, which in turn is bound to a cyanide radical (the benzaldehyde-cyanide radical is called mandelonitrile). Both benzaldehyde and the cyanide radical are potentially damaging to cells, but are quite harmless, while they are bound to the two glucose molecules. As a result of this lack of toxicity while the entire molecule is intact, large quantities of amygdalin (at least nine grams) can be given as a short intravenous infusion or even as an intravenous push with virtually no side effects or problems.

In the body, the two glucose molecules are split off by the enzyme beta glucosidase (probably by bacteria in the colon) and are replaced by a glucuronic acid molecule to form a compound consisting of glucuronic acid bound to mandelonitrile (the benzaldehyde-cyanide radical). This is actually the true Laetrile, according to Dr. Krebs, and it differs from the original amygdalin, which has two glucose molecules instead of the glucuronic acid. An enzyme known as beta glucuroni-

dase, which is found in high concentration in cancer cells (but is very scarce in normal cells) splits off the glucuronic acid, leaving benzaldehyde bound to cyanide (mandelonitrile). Once glucuronic acid is split off, the remaining benzaldehyde-cyanide radical spontaneously splits off cyanide, which is toxic to the cancer cell; cancer cells do not have sufficient quantities of any enzyme capable of breaking down or converting the cyanide to a less toxic compound whereas normal cells do. Hence, there is a selective toxicity to cancer cells.[46] Benzaldehyde, like formaldehyde, can also be toxic to cancer cells. So, both benzaldehyde and cyanide are released at the site of the cancer cells and can damage them.

An additional reason for amygdalin's selective toxicity to cancer cells, but not normal cells, involves the protective action of enzymes present in normal cells but lacking in cancer cells. An enzyme present in high concentration in normal cells but very low in cancer cells is the enzyme rhodanese or sulfur transferase. This enzyme transfers a sulfur atom onto the cyanide radical to create the relatively non-toxic thiocyanate. Cancer cells have trouble doing this because they lack this enzyme. So, the cancer cells get the toxic effects of cyanide while the small amount of cyanide released around normal cells is converted to thiocyanate. Blood thiocyanate levels may be used to help monitor the proper dose of amygdalin, helping to make sure that toxic levels of cyanide are not reached but that therapeutic levels are present. Of particular interest is that conventional medicine has used serum thiocyanate to help determine the dosage of their emergency anti-hypertensive drug nitroprusside, a medication that contains a cyanide radical. This drug is still used in emergency rooms for hypertensive crisis. I use the suggested therapeutic range of thiocyanate for nitroprusside to help me monitor appropriate doses of amygdalin.

Studies also indicate that benzaldehyde has anti-cancer activity, as it combines with cysteine in cancer cells, inactivating various proteins. Cancer cells do not have enzymes capable of converting benzaldehyde. Normal cells, on the other hand, have enzymes capable of oxidizing benzaldehyde to benzoic acid, rendering it harmless to normal cells. Hence, we have a selective toxicity to cancer cells and not normal cells. Incidentally, benzoic acid is converted in the body to hippuric acid, which is discharged in the urine and protects against urinary tract infections.

3. Clinical Studies and Critiques

Many epidemiological studies, animal studies and some clinical reports show evidence of amygdalin's efficacy. However, conventional medicine has taken the position that it is useless and/or harmful. It is generally regarded as the height of quackery. Most of the negative views of amygdalin emanate from a study by Moertel of the Mayo Clinic, whose article was published in the NEJM in 1982.[47] This is the same Moertel who carried out the studies on vitamin C for cancer that was previously discussed. He was a long time opponent of any so-called alternative cancer treatments. A number of criticisms of this study have been published. A summary of them can be found at: http://www.ispub.com/journal/the_internet_journal_of_alternative_medicine/volume_7_number_1_22/article/does_laetrile_work_another_look_at_the_mayo_clinic_study_moertel_et_al_1982.html.

The adult oral dosage is approximately 500 mg three times daily, but the dosage can be increased or decreased depending upon the patient's clinical response and the results of serum thiocyanate levels. For most adults, the IV dosage that we use is nine grams, dissolved in 100 mL of sterile saline. It is dripped over 10 to 20 minutes. In our Center, we usually administer an IV vitamin C drip and follow it with an IV drip of amygdalin.

Two cautions should be kept in mind when using amygdalin. First, it is necessary for patients using amygdalin to have a sufficient source of sulfur in the diet so that any excessive cyanide formed near normal cells can be converted to thiocyanate. A relatively inexpensive supplement source of sulfur is

methyl sulfonyl methane (MSM). Secondly, because thiocyanate tends to be suppressive to the thyroid gland, it is essential to have sufficient iodine to overcome any suppression of the thyroid gland by thiocyanate. Iodine as a nutrient with anti-cancer properties will be discussed below.

Iodine: The Most Misunderstood Nutrient

Iodine supplementation should be considered in all cancer patients. Dr. Max Gerson successfully treated many cancer patients with a variety of unconventional techniques including more than 10 glasses a day of raw vegetable juice, coffee enemas, a vegan diet, flaxseed oil, cod liver oil, thyroid hormone and Lugol's solution which contains relatively high concentrations of iodine.[48] Prior to World War II, Lugol's solution was used by numerous physicians worldwide to treat many different conditions. Since them, with the growth of pharmaceutical companies and the widespread use of patentable drugs, inorganic, non-radioactive iodine has not been used for cancer patients or for patients with other disorders who would have previously been treated with iodine.

1. Guy Abraham MD and the Iodine Project

Guy Abraham MD, former professor of obstetrics, gynecology and endocrinology at UCLA School of Medicine, has written a series of papers about iodine that has drastically changed my thinking about its role in health and the prevention and treatment of disease. He terms this series of papers "The Iodine Project".

I had been impressed by Abraham's previous work that showed that vitamin B_6 and magnesium could be helpful to women with premenstrual syndrome and I was anxious to learn what he had to say about iodine. Through a series of articles, (all of which are available for free download at: http://www.optimox.com/pics/Iodine/opt_Research_I.shtml), Abraham has proposed that the optimal daily dose of iodine for an adult is approximately 12.5 mg to 50 mg daily, which is close to 100 to 400 times the RDA of 0.150 mg daily. He believes that the current prevailing medical opinion, that more than 2 mg a day of iodine is toxic, is wrong.

2. How We Went Wrong: The "Wolf-Chaikoff Effect"

He traces the source of this mistaken notion about the toxicity of iodine to a scientific experiment on rats that was published in 1948 by Drs. Wolff and Chaikoff.[49] From this experiment, the authors erroneously concluded that iodine inhibits the thyroid gland and can cause goiter at doses of about 20 times the recommended daily allowance (RDA) for iodine. This conclusion was indeed surprising since they had not bothered to check the thyroid hormone levels in these rats and actually reported no evidence of an enlarged thyroid (goiter) in any of these rats. This conclusion was reiterated by Wolf in 1969[50] when he generalized his findings to humans. Subsequently, his conclusion was found in medical textbooks, including endocrinology and nutrition textbooks. For example, the Merck Manual online states: "Chronic toxicity may develop when intake is > 1.1 mg/day."[51] Even the Linus Pauling Institute on its website says: "The RDA for iodine is sufficient to ensure normal thyroid function. There is presently no evidence that iodine intakes higher than the RDA are beneficial. Most people in the U.S. consume more than sufficient iodine in their diets, making supplementation unnecessary."[52] The conclusion that more than two mg of iodine daily in humans can cause hypothyroidism and goiter is particularly more difficult to understand when as early as 1923, David Marine showed that nine mg per day of iodine was safe and actually prevented the development of goiter. In a controlled study used 9 mg of sodium iodide in 2,190 students for 2.5 years, Marine found that the incidence of goiter in the group receiving the nine mg of iodine daily was 0.2% with no evidence of adverse effects, while the control group that did not receive any iodine had an incidence of goiter of 22%.[53]

How did such an error occur in the original Wolf-Chaikoff experiment? The intent of

Wolf and Chaikoff was to determine the effects of inorganic non-radioactive iodine on the thyroid gland in rats. They gave gradually increasing doses of iodine and then used the radioactive iodine uptake test to see what effect these doses had on the thyroid. At that time, the interpretation of the test results was as follows: If the radioactive iodine uptake of the thyroid was suppressed, it was interpreted to mean that the non-radioactive iodine inhibited the thyroid and this phenomenon occurred at what would be about 2 mg of iodine in humans. Since at certain levels of iodine intake the radioactive iodine test showed virtually no iodine uptake, Wolf and Chaikoff decided that the treatment dose of iodine must have inhibited the thyroid gland and therefore iodine causes hypothyroidism and possibly goiter.

Abraham reinterpreted these findings and concluded that rather than showing that this amount of iodine inhibited the thyroid, it really showed that this level of iodine made the thyroid gland sufficient in iodine, and, therefore, it did not need to take up any more iodine. He asserted that the Wolf-Chaikoff interpretation, which became known as the "Wolf-Chaikoff Effect," was absolutely wrong, though it became the focus of attention for the entire health care industry. According to Abraham, this set back health care progress for decades.[54] Abraham defines and describes the term "medical iodophobia" as the "unwarranted fear of using and recommending inorganic, non-radioactive iodine/iodide within the range known from collective experience of three generations of clinicians to be the safest and most effective amounts for treating symptoms and signs of iodine/iodide deficiency (12.5 to 50 mg/day)."

3. Other Reasons that Physicians Believe Iodine is Toxic

There are other reasons for the belief among most health care practitioners that iodine is toxic and dangerous. Allergies to seafood are moderately frequent. A person who is allergic to seafood or specific seafood such as shrimp, will often say that he/she is allergic to iodine because seafood is not tolerated. The allergy, however, is to a protein or proteins within the seafood (that might or might not contain iodine) and not to iodine itself. The vast majority of patients with seafood allergy can tolerate inorganic, non-radioactive iodine.

Another common allergic reaction occurs when radiographic contrast medium containing iodine is given to a patient for an imaging study and there is an allergic response. The patient is told that he is allergic to iodine when in fact the person is reacting to the whole iodine containing compound and likely could tolerate non-radioactive, inorganic iodine. However, patients and their clinicians often think this means the person is allergic to iodine.

Another example involves the anti-arrhythmic drug, amiodarone. Although a reasonably effective medication, it is quite toxic and side effects may include death. Every 200 mg tablet of Amiodarone contains 70 mg of iodine and 9 mg of iodine is released daily from the tablet. Medicine has assumed the toxicity of amiodarone is due to its iodine content, but a study in 1993 suggests that iodine is the therapeutic component and the rest of the molecule causes the toxic effects.[55] **Table 5**, (p.187) summarizes the various forms of iodine/iodide used in clinical medicine.

4. Iodine Needed by All Cells and Organ Systems in the Body: Not Just the Thyroid

The commonly accepted medical opinion is that iodine's only role in the body is to help make thyroid hormones. Although this is an extremely important function, Abraham demonstrates that the role of iodine in the body goes far beyond its function of making thyroid hormones. In addition to the thyroid gland, every cell of the body uses iodine. The RDA for iodine of 150 micrograms daily (0.15 mg) is generally sufficient to prevent goiter and to prevent cretinism in infants when the pregnant mother ingests this dosage. However, this dosage is totally insufficient to supply all

of the needs of all cells in the body. For example, Finley reported that fibrocystic breast disease could be reversed with 5 mg or more of iodine daily.[56] Ghent using 5 mg of iodine daily for a year was able to reverse fibrocystic breast disease in more than 90% of the women in the study.[57] Flechas states that he is able to clear fibrocystic breast disease in women within 3 months of using 50 mg of iodine daily.[58]

Other possible functions of iodine include: helping to regulate mood; preventing cancer (especially in breast, ovarian, uterine, prostate and thyroid gland cancers); helping to regulate blood pressure; helping to regulate blood sugar and preventing and treating diabetes; and helping to prevent abnormal cardiac rhythms. With regard to cancer, in many areas of Japan, Japanese women (who have one of the lowest breast cancer rates in the world) ingest more than 13 mg of iodine daily from seaweed without suffering any adverse consequences and iodine may be an important factor in this low rate of breast cancer. Abraham further demonstrates that iodine tends to be antibacterial, antiviral, antiparasitic and antifungal and that it enhances immune function. No microorganism has ever been found to be resistant to iodine. Furthermore, he suggests that suboptimal iodine intake may contribute to various thyroid abnormalities commonly seen today, including hypothyroidism (underactive), hyperthyroidism (overactive) and autoimmune inflammation of the thyroid (Hashimoto's Disease).

5. Different Forms of Inorganic Iodine/Iodide in the Body and Organ Preferences

Abraham started this Iodine Project around 1998 when he became aware of the many benefits of treating patients with iodine using doses far beyond the 2 mg a day that most clinicians consider to be potentially toxic. He noted that starting in the 1820s, the French physician, Jean Lugol used these higher doses to treat a wide variety of conditions. Lugol combined elemental iodine (5%) and potassium iodide (10%) with 85% water. He found that combining the two resulted in elemental iodine being much soluble than when it was used alone. Since iodine kills infectious agents, Lugol successfully treated many infectious conditions with this solution, now known as Lugol's solution, which is still available today by prescription. Prior to World War II, many American and European physicians used Lugol's solution to treat thyroid conditions, using doses higher than 2 mg daily without apparent significant adverse effects.

Abraham notes that research has shown that the thyroid gland prefers to utilize the iodide form of iodine, while other organs, such as the breast and ovaries, prefer the elemental form of iodine.[59] Both of these forms are present in Lugol's solution. He points out in his preface to Dr. David Brownstein's book, *Iodine: Why You Need It, Why You Can't Live Without It,* that:

"Of all the elements known so far to be essential for human health, iodine is the most

Table 5. Various Forms of Iodine/Iodide Used in Clinical Medicine

Inorganic	**Organic**
-Non-Radioactive	-Naturally Occurring
Iodides (e.g. SSKI)	Thyroid hormones
Tincture of iodine	Thyroidal Iodolipids
Lugol's solution	-Manmade
-Radioactive Iodides for diagnostic and therapeutic purposes	Radiographic contrast media
	Iodine-containing drugs (e.g. Amiodarone)

misunderstood and the most feared. Yet, iodine is the safest of all the essential trace elements, being the only one that can be administered safely for long periods of time to large numbers of patients in daily amounts as high as 100,000 times the RDA. However, this safety record only applies to inorganic nonradioactive forms of iodine…Some organic iodine containing drugs are extremely toxic and prescribed by physicians. The severe side effects of these drugs are blamed on inorganic iodine although studies have clearly demonstrated that it is the whole molecule that is toxic, not the iodine released from it."[60]

6. Determining Total Body Iodine Sufficiency: The Iodine Loading Test

In his excellent short book on iodine, Brownstein summarizes his own clinical experience with hundreds of patients for whom he has prescribed iodine with excellent results and minimal side effects. To determine whether a patient is iodine sufficient, he uses the iodine-loading test described by Abraham and now in use at the Schachter Center. This was the test that Abraham used to determine if a person had an optimal amount of iodine in his/her body. Other research had shown that iodine is readily absorbed when ingested orally and readily excreted in the urine. The assumption was that if a person ingests a given amount of iodine and is iodine sufficient, most of the iodine should be found in the urine over a 24-hour period. On the other hand, if the person does not have an optimal amount of iodine in his body, when he ingests the iodine, his body will tend to hold onto it and a smaller amount will be found in the urine during the 24-hour collection period.[46]

To do this test, a patient first empties his bladder and then ingests 50 mg of iodine/iodide. The patient then collects his urine for the next 24 hours and sends a sample of it along with a note that includes the total volume collected to an appropriate laboratory. If the person excretes 90% or 45 mg of the iodine, he is considered iodine sufficient. If less is excreted, the patient is not optimally sufficient or is iodine insufficient and a therapeutic dosage of iodine may be administered for a period of time and then the test is repeated. Brownstein has found in using this test that more than 90% of his patients are iodine insufficient. Once a person is iodine sufficient, the maintenance dose for an adult is about 12.5 mg of iodine/iodide daily. The treatment dose when a person is iodine insufficient is generally between 12.5 mg and 50 mg daily. Preliminary research indicates that if a person is iodine insufficient, it takes about three months to become iodine sufficient while ingesting a dosage of 50 mg of iodine, and a year to become iodine sufficient while ingesting a dosage of 12.5 mg of iodine daily. However, the patient needs to be monitored closely with awareness of possible side effects and detoxification reactions. Cancer patients taking 50-100 mg of iodine daily may take more than a year to achieve iodine sufficiency as defined by this test.

The dosage of about 12.5 mg of iodine daily can be obtained with two drops of Lugol's solution or from an identical over-the-counter solution. This same dosage is also available in an over-the-counter tablet or capsule. Each capsule or tablet or two drops of the Lugol's solution contains 5 mg of the reduced elemental form of iodine (preferred by the breast, ovary and prostate) and 7.5 mg in the iodide form (preferred by the thyroid gland). Numerous testimonials indicate that many patients improve a variety of symptoms with optimal supplementation.

7. Detoxification Effects of Iodine and Protocol for Avoiding Adverse Effects

This dose of iodine may have other benefits as well. Abraham has shown in his work that iodine promotes the excretion of toxic minerals, such as lead, mercury and cadmium, as well as the toxic halogens fluoride and bromide. In the May 2005 edition of *Nutrition and Healing,* Jonathan V. Wright notes that his laboratory has also shown that iodine helps remove toxic elements, including bromide and fluoride, from the body. With this mobilization of toxic elements, patients may develop temporary side effects such as fatigue, irritability, palpitations or anxiety

that can be reduced by lowering the dosage of iodine and making sure that other aspects of nutrition and nutritional supplementation are in place.

Brownstein suggests a protocol that we are currently using when iodine is recommended. The protocol includes: drinking at least one-half your body weight (lbs) in ounces of pure water every day (juices, tea and other beverages do not count); 1-2 teaspoons of unrefined salt daily (1/4 teaspoonful of unrefined salt can be added to a quart of water and blood pressure should be monitored for the occasional person who is very salt-sensitive); daily doses 200-400 mcg of selenium, 3-6 g of vitamin C in divided dosage, and 300-1,200 mg of an absorbable form of magnesium (i.e., magnesium glycinate). Side effects or intolerances to the quantities of these supplements, such as diarrhea or frequent bowel movements to vitamin C or magnesium, need to be checked and dosages adjusted as necessary. All of these should be in divided dosage of about three times daily. This helps to reduce toxic side effects of bromine mobilization from tissues when iodine is supplemented. A clinician knowledgeable about iodine who can order appropriate tests when necessary should monitor this procedure.

8. The Possible Role of Iodine in Preventing and Treating Cancer: Counteracting Carcinogenic Agents (such as Bromine and Fluoride) while Promoting the Formation of Iodinated Lipids

Iodine's role in helping to prevent and treat cancer needs much more exploration and research but there is suggestive evidence that it plays a role in preventing and/or treating cancer (especially involving the thyroid gland, breasts, prostate, ovaries and uterus). Gerson, whose successful alternative therapy involved using fresh vegetable juices and intensive detoxification, recommended Lugol's solution for all of his cancer patients. Numerous rat studies by Eskin show a direct relationship between iodine deficiency and breast abnormalities including cystic mastopathy and breast cancer.[61-63] According to Brownstein, when Eskin applied to the NIH for grants to do studies on humans, he was refused funding because of the Wolf-Chaikoff Effect.

Iodine deficiency predisposes to breast cancer and a high fat diet predisposes to iodine deficiency.[64] Japan and Iceland have high iodine intake and low goiter and breast cancer rates; just the reverse occurs in Mexico and Thailand.[65] Iodine protects against estrogenic effects in breast cancer.[61,63] Thyroid hormone replacement therapy increased the incidence of breast cancer in iodine deficient women.[66] Female rats require 20 to 40 times the amount of iodine needed to control breast cancer and fibrocystic disease than to prevent goiter.[57,59] When iodine was used in dough during the 1960s, one slice of bread a day contained the RDA of 150 mcg. The average iodine intake was greater than 700 mcg daily and the breast cancer risk was 1:20. With the replacement of iodine in bread dough by the goitrogen bromine in the early 1980s, the average iodine intake was reduced below the RDA of 150 mcg and the rate of breast cancer increased to 1:8 (absorption of iodine from bread is much better than from iodized salt). This seems to me to be a totally unrecognized correlation that may be causal in nature. It wouldn't be the first time that a disastrous public health decision was made. As a result of exposure to goitrogens, including the addition of bromine to all baked goods, the amount of iodine needed to counteract the effects of these goitrogens has drastically increased. This is one of the main reasons that the average person needs so much iodine for optimal functioning. One researcher commented that to overcome the effects of goitrogens in the food chain such as bromine in dough, daily amounts of iodine ingested in Japan would be necessary (referring to the 13 mg daily in Japan).[67]

Brownstein, in his previously mentioned book, describes 3 cases of breast cancer that did remarkably well with an intake of iodine in the 50 mg range. A 60 year-old English teacher, diagnosed with breast cancer in 1989, refused conventional therapy and went on a nutritional program that included 2 mg daily of iodine. She did well over the next 10 years and continued to teach. She developed

breast metastases in 2005. Under medical supervision, she increased her iodine from 50 to 62.5 mg daily and improved. Six weeks after starting the higher dose of iodine, a PET scan showed all of the existing tumors to be disintegrating. A 73 year-old diagnosed in 2003, declined conventional treatment and took 50 mg of Iodoral daily. An ultrasound of the breast 18 months later showed reduction in size the tumor. Two years later, there was no evidence of cancer. A 52 year old woman with breast cancer and no conventional treatment was given 50 mg per day of iodine. Three years later, mammograms and ultrasound exams showed decreasing size of the tumor with no progression.

At higher doses of iodine in the range of 50 mg daily, iodine combines with lipids to form iodinated lipids such as Delta-Iodolactone that causes apoptosis in cancer cells. RDA levels of iodine do not do this. Recent work shows strong anticancer activity in breast cancer cells.[68] Research in this area is beginning to pick up worldwide.

A website with more information about the relationship between insufficient iodine and breast cancer is: http://www.breastcancerchoices.org/. Given all of this information about breast cancer and some epidemiologic evidence relating to higher incidence of prostate and thyroid cancer in iodine insufficient areas, it seems reasonable to consider that suboptimal iodine levels may play a role in many, if not all cancers, and that Gerson was correct in giving all of his cancer patients iodine. I think that the therapeutic use of iodine/iodide has the potential of drastically changing how medicine is practiced today, including the prevention and treatment of cancer. All of Abraham's research papers relating to the Iodine Project may be viewed and downloaded free from the Internet (www.optimox.com) and clicking on "Iodine Research."

Fermented Wheat Germ Extract for Cancer Patients

A nutritional supplement that has been well researched for cancer patients is a fermented wheat germ extract developed in Hungary by Mate Hidvegi, based on research initiated many years ago by Albert Szent-Gyorgyi, a recipient of the Nobel Prize in Medicine. Szent-Gyorgyi theorized that naturally occurring compounds called quinones would suppress anaerobic metabolism in cancer cells and enhance oxidative metabolism in normal cells. This is what the fermented wheat germ product, Avemar, does. However, it also appears to have several other mechanisms of action to help control the cancer process that include immune modulation, apoptosis induction, anti-angiogenesis activity, anti-metastatic activity, and inhibition of cancerous DNA synthesis.

Avemar is produced by a patented process involving a fermented wheat germ extract that yields a uniform, consistent, all-natural dietary supplement. More than 100 reports have been written for presentation or publication describing research conducted in the United States, Hungary, Russia, Austria, Israel and Italy. Its value has been validated by the publication of more than 18 peer-reviewed studies accessible on Medline. Clinical studies have shown that when Avemar is added to a program of conventional treatment for at least a year, long-term follow-up shows reduced progression of cancer, reduction of metastases and improved survival in a variety of cancers, including primary colorectal cancer,[69] malignant melanoma[70] and head and neck cancers.[71] It also significantly reduces side effects from conventional treatment and improves the quality of life of patients using it (these studies are available at www.avemar.com). It appears to be very safe and there are no reported significant side effects in any of the studies.

Other Nutritional Supplements

This paper has barely scratched the surface on the use of nutritional supplements to support cancer patients. I have chosen to emphasize certain supplements that have either been very controversial (most of the ones I discussed), not widely known among clinicians and ones that I thought could be implemented immediately to help patients.

This is not to say that there aren't many other nutritional supplements for which there is a great deal of evidence for benefits. Among the areas that really deserve much more attention are the systemic use of proteolytic enzymes (as utilized by the late Donald William Kelly and Nicholas Gonzalez and written about by Ralph Moss); the use of high doses of vitamin D_3 to produce optimal serum levels; the use of vitamin K to help with utilization of vitamin D; vitamin A; various phytonutrients like sulforaphane from broccoli extracts; resveratrol; curcumin; various pre and probiotics; and many others. The trick is to try to put all of this together in a comprehensive manageable program for the cancer patient.

Old vs. New Paradigms in Health Care and the Politics and Economics of Health Care Worldwide

Finally, it is necessary to touch on the difficulties of trying to practice integrative oncology and/or integrative medicine in general in the current international environment. Julian Whitaker, an integrative physician with his own newsletter and a great following, tries to explain the resistance to new ideas in health care and his explanation was an eye-opener to me since my own thoughts were that the problem is entirely related to economics. However, this does not explain it all. Whitaker points out that it is very hard to change a paradigm and the paradigm for health care is very rigid.

He uses as an example the case of Dr. Semmelweis, a Hungarian physician described as the "savior of mothers," who discovered by 1847 that the incidence of puerperal fever could be drastically cut by the use of hand disinfection (by means of hand washing with chlorinated lime solution) in obstetrical clinics. Puerperal fever, which was discovered later to be due to a bacterial infection caused by physicians moving from pathology laboratories where bodies were dissected to Obstetric wards, killed many women and their offspring (mortality estimated at between 10 and 35%). Rather than greeting him with awards, colleagues of Semmelweis belittled him and failed to follow his advice, which resulted in continued deaths. It was not until Pasteur explained Semmelweis' recommendations in terms of germ theory that Semmelweis' recommendations were implemented many years after his death. Semmelweis died a pauper in a hospital from a psychiatric or neurological disease at the age of 47 in 1865, 18 years after first offering his theory and recommendations. Whitaker points out that in Semmelweis' situation there was no money at stake, but only the difficulty changing the medical paradigm.

Today, the conventional medical paradigm involves a doctor, collecting signs and symptoms from a patient, possibly ordering some tests, coming up with a diagnosis and prescribing an approved patentable drug or recommending surgery or some other invasive procedure. Activity outside this paradigm is often ignored, ridiculed or attacked. There is not much emphasis on finding underlying causes such as environmental toxins, suboptimal diets, poor lifestyle and similar factors in interaction with the genotype of the person. Epigenetics is largely ignored.

Unlike the issue in the Semmelweis case more that 100 years ago, money is a major factor. The entire health care industry is supported by the pharmaceutical industry and virtually all medical school education and post graduate training is supported by the wealthy pharmaceutical industry. Its many lobbyists have profound effect on legislation in the United States and largely control the media, especially in the USA. In spite of all of this, the public is becoming wiser largely as a result of more information available via the Internet and more and more people taking charge of their health; making their own decisions rather than just relying on their doctors or the industry-supported media. It is essential that forward thinking physicians begin to understand the new paradigm relating to health care and begin to incorporate this new knowledge into their care of patients in order for us to make progress in health care and, indeed, for the survival of our planet.

References

1. Campbell TC, Campbell TM 2nd: *The China Study: The Most Comprehensive Study of Nutrition Ever Conducted and the Startling Implications for Diet, Weight Loss and Long-term Health.* Dallas, TX. BenBella Books. 2006.
2. Campbell TC: Influence of nutrition on metabolism of carcinogens (Martha Maso Honor's Thesis). *Adv Nutr Res,* 1979; 2: 29-55.
3. Doll R, Peto R: The causes of cancer: Quantitative estimates of avoidable risks of cancer in the United States today. *J Natl Cancer Inst,* 1981; 66: 1192-1265.
4. Wynder EL, Gori GB: Contribution of the environment to cancer Incidence: an epidemiologic exercise. *J Nat Cancer Inst,* 1977; 58: 825-832.
5. Bruce WR, Wolever TMS, Giacca A: Mechanisms linking diet and colorectal cancer: the possible role of insulin resistance. *Nutr Cancer,* 2000; 37: 19-26.
6. Cousens G: *There is a Cure for Diabetes.* Berkeley, CA. North Atlantic Books. 2008.
7. Simone, CB: *Cancer & Nutrition.* Princeton, NJ. Princeton Institute. 2004.
8. Price WA: *Nutrition and Physical Degeneration.* 6th edition. La Mesa, CA. Price-Pottenger Nutrition Foundation, Inc. 2000.
9. Quillin P: *Beating Cancer with Nutrition.* Revised edition. Tulsa, OK. The Nutrition Times Press, Inc. 2007.
10. Tanito M, Masutani H, Kim YC, et al: Sulforaphane induces thioredoxin through the antioxidant-responsive element and attenuates retinal light damage in mice. *Invest Ophthalmol Vis Sci,* 2005; 46: 979-987.
11. Kensler TW, Chen JG, Egner PA, et al: Effects of glucosinolate-rich broccoli sprouts on urinary levels of aflatoxin-DNA adducts and phenanthrene tetraols in a randomized clinical trial in He Zuo township, Qidong, People's Republic of China. *Cancer Epidemiol Biomarkers Prev,* 2005; 14(11 Pt 1): 2605-2613.
12. Carter JP, Saxe GP, Newbold V, et al: Hypothesis: dietary management may improve survival from nutritionally linked cancers based on analysis of representative cases. *J Am Coll Nutr,* 1993; 12: 209-226.
13. Cousens G: *There is a Cure for Diabetes.* Berkeley, CA. North Atlantic Books. 2008; 303-305.
14. Siegel BS: *Love, Medicine and Miracles: Lessons Learned about Self-Healing from a Surgeon's Experience with Exceptional Patients.* New York, NY. Harper & Row Publishers. 1986.
15. LeShan L: *Cancer as a Turning Point: A Handbook for People with Cancer, Their Families, and Health Professionals.* Revised Edition. New York, NY. Penguin Book. 1994.
16. Kraus P: *Surviving Mesothelioma and Other Cancers: A Patient's Guide.* Raleigh, NC. Cancer Monthly LLC. 2005.
17. Thomson PAJ: After Shock: *From Cancer Diagnosis to Healing: A step-by-step Guide to Help You Navigate Your Way.* New Paltz, NY. Roots & Wings publishing. 2007.
18. Ott J: *Health and Light.* New York, NY. Simon and Schuster. 1976.
19. Liberman J: *Light: Medicine of the Future: How We Can Use It to Heal Ourselves Now.* Santa Fe, NM. Bear & Company Publishing. 1990.
20. Holick MF, Jenkins M: *The UV Advantage.* New York, NY. Ibooks, Inc. 2004.
21. Harper J: *How to Get Off Psychiatric Drugs Safely.* 2010 Edition. Texas. The Road Back. 2010.
22. Boik J: *Natural Compounds in Cancer Therapy: Promising Nontoxic Antitumor Agents from Plants & Other Natural Sources.* Princeton, MN. Oregon Medical Press, LLC. 2001.
23. Block KI, Koch AC, Mead MN, et al: Impact of antioxidant supplementation on chemotherapeutic efficacy: A systematic review of the evidence from randomized controlled trials. *Cancer Treat Rev,* 2007; 33: 407-418.
24. Simone CB 2nd, Simone NL, Simone V, et al: Antioxidants and other nutrients do not interfere with chemotherapy or radiation therapy and can increase kill and increase survival, Part 1. *Altern Ther Health Med,* 2007; 13: 22-28; Simone SB 2nd, Simone NL, Simone CB, et al: Antioxidants and other nutrients do not interfere with chemotherapy or radiation therapy and can increase kill and increase survival, Part 2. *Altern Ther Health Med,* 2007; 13: 40-47.
25. Jaakkola K, Lähteenmäki P, Laakso J, et al: Treatment with antioxidant and other nutrients in combination with chemotherapy and irradiation in patients with small-cell lung cancer. *Anticancer Res,* 1992; 12: 599-606.
26. Cameron E, Pauling L: Supplemental ascorbate in the supportive treatment of cancer: Prolongation of survival times in terminal human cancer. *Proc Natl Acad Sci,* 1976; 73: 3685-3689.
27. Cameron E, Pauling L: Supplemental ascorbate in the supportive treatment of cancer: reevaluation of prolongation of survival times in terminal human cancer. *Proc Natl Acad Sci,* 1978; 75: 4538-4542.
28. Creagan ET, Moertel CG, O'Fallon Jr, et al: Failure of high-dose vitamin C (ascorbic acid) therapy to benefit patients with advanced cancer. A controlled trial. *N Engl J Med,* 1979; 301: 687-690.
29. Moertel CG, Fleming TR, Creagan ET, et al: High-dose vitamin C versus placebo in the treatment of patients with advanced cancer who have had no prior chemotherapy. A randomized double-blind comparison. *N Engl J Med,* 1985; 312: 137-141.
30. Pauling L: Vitamin C therapy and advanced cancer (letter). *N Engl J Med,* 1980; 302: 694.
31. Gonzalez MJ, Rosario-Perez G, Guzman AM, et al: Mitochondria, energy and cancer: The rela-

tionship with ascorbic acid. *J Orthomol Med,* 2010: 25: 29-38.
32. Cameron E, Pauling L: The orthomolecular treatment of cancer. I. The role of ascorbate in host resistance. *Chem Biol Interact,* 1974; 9: 273-283.
33. Cameron E., Campbell A: The orthomolecular treatment of cancer. II. Clinical trial of high dose ascorbic acid supplements in advanced human cancer. *Chem Biol Interact,* 1974; 9: 285-315.
34. Cameron E, Campbell A, Jack T: The orthomolecular treatment of cancer. III. Reticulum cell sarcoma: double complete regression induced by high dose ascorbic acid therapy. *Chem Biol Interact,* 1975; 11: 387-393.
35. Chen Q, Espey MG, Krishna MC, et al: Pharmacologic ascorbic acid concentrations selectively kill cancer cells: Action as a pro-drug to deliver hydrogen peroxide to tissues. *Proc Natl Acad Sci USA,* 2005: 102: 13604-13609.
36. Hoffer A: Antioxidant nutrients and cancer. *J Orthomol Med,* 2000; 15: 193-200.
37. Klenner F R: Observations on the dose and administration of ascorbic acid when employed beyond the range of a vitamin in human pathology. *J Appl Nutr,* 1971; 23: 61-88.
38. Cameron E, Pauling L: *Cancer and Vitamin C.* Philadelphia, PA. Camino Books, Inc. 1993.
39. Riordan H, Jackson J, Schultz M: Case study: high-dose intravenous vitamin C in the treatment of a patient with adenocarcinoma of the kidney. *J Orthomol Med,* 1990; 5: 5-7.
40. Riordan NH, Riordan HD, Meng X, et al: Intravenous ascorbate as a tumor cytotoxic chemotherapeutic agent. *Med Hypotheses,* 1995; 44: 207-213.
41. Levine M: Commentary: reevaluation of ascorbate in cancer treatment: emerging evidence, open minds and serendipity. *J Amer Coll Nutr,* 2000; 19: 423-425.
42. Benade L, Howard T, Burk D: Synergistic killing of Ehrlich ascites carcinoma cells by ascorbate and 3-amino-1,2,4-triazole. *Oncology,* 1969; 23: 33-43.
43. Paayatt SJ, Riordan HD, Hewitt SM, et al: Intravenously administered vitamin C as cancer therapy: three cases. *CMAJ,* 2006; 174: 937-942.
44. Gonzalez MJ, Miranda-Massari JR, Mora EM, et al: Orthomolecular oncology review: ascorbic acid and cancer 25 years later. *Integr Cancer Ther,* 2005; 4: 32-44.
45. Griffin GE: *World Without Cancer: The Story of Vitamin B_{17}.* Revised new edition. Westlake Village, CA. American Media. 1997.
46. Bradford RW, Culbert ML: T*he Metabolic Management of Cancer: A Physician's Protocol and Reference Book.* Los Altos, CA. The Robert W. Bradford Foundation. 1979.
47. Moertel C, Fleming T, Rubin J, et al: A clinical trial of amygdalin (Laetrile) in the treatment of human cancer. *N Engl J Med,* 1982: 306: 201-206.
48. Gerson MA: A Cancer Therapy: Results of Fifty Cases. Bonita, CA. The Gerson Institute. 1990.
49. Wolff J, Chaikoff IL: Plasma inorganic iodide as a homeostatic regulator of thyroid function. *J Biol Chem,* 1948; 174: 555-564.
50. Wolff J: Iodide, goiter and the pharmacologic effects of excess iodide. *Am J Med,* 1969; 47: 101-124.
51. The Merck Manuals Online Medical Library. Iodine. Retrieved from: [*www.merck.com/mmpe/sec01/ch005/ch005e.html*].
52. Linus Pauling Institute. Micronutrient Information Center. Iodine. Retrieved from: [*http: //lpi.oregonstate.edu/infocenter/minerals/iodine/*].
53. Marine D: Prevention and treatment of simple goiter. *Atl Med J,* 1923; 26: 437-442.
54. Abraham GE: The safe and effective implementation of orthoiodosupplementation in medical practice. *The Original Internist,* 2004; 11: 17-36.
55. Phillippou G, Koutras DA, Piperingos G, et al: The effect of iodide on serum thyroid hormone levels in normal persons, hyperthyroid patients, and in hypothyroid patients on thyroxine replacement. *Clin Endocr,* 1992; 37: 573-578.
56. Finley JW, Bogardus GM: Breast cancer and thyroid disease. *Quart Rev Surg Obstet Gynec,* 1960; 17: 139-147.
57. Ghent W, Eskin B, Low D, et al: Iodine replacement in fibrocystic disease of the breast. *Can J Surg,* 1993; 36: 453-460.
58. Flechas JD: Orthoiodosupplementation in a primary care practice. *The Original Internist,* 2005; 12: 89-96.
59. Eskin BA, Grotkowski CE, Connolly CP, et al: Different tissue responses for iodine and iodide in rat thyroid and mammary glands. *Biol Trace Elem Res,* 1995; 49: 9-19.
60. Brownstein D: *Iodine: Why You Need It and Can't Live Without It.* West Bloomfield, MI. Alternative Press. 2009.
61. Eskin BA, Bartuska DG, Dunn MR, et al: Mammary gland dysplasia in iodine deficiency. Studies in rats. *JAMA,* 1967; 200: 691-695.
62. Eskin BA: Iodine metabolism and breast cancer. *Trans N Y Acad Sci,* 1970; 32: 911-947.
63. Eskin BA: Iodine and mammary cancer. *Adv Exp Med Biol,* 1977; 91: 293-304.
64. Wiseman RA: Breast cancer hypothesis: a single cause for the majority of cases. *J Epidemiol Community Health,* 2000: 54: 851-858.
65. Finley JW, Bogardus GM: Breast cancer and thyroid disease. *Quart Rev Surg Obstet Gynec,* 1960 ; 17: 139-147.
66. Kapdi CC, Wolfe JN: Breast cancer. Relationship to thyroid supplements for hypothyroidism. *JAMA,* 1976; 236: 1124-1127.
67. Lakshmy R, Rao PS, Sesikeran B, et al: Iodine metabolism in response to goitrogen induced altered thyroid status under conditions of moderate and high intake of iodine. *Horm Metab Res,* 1995; 27: 450-454.

68. Nuñez-Anita RE, Arroyo-Helguera O, Cajero-Juárez M, et al: A complex between 6-iodolactone and the peroxisome proliferator-activated receptor type gamma may mediate the antineoplastic effect of iodine in mammary cancer. *Prostaglandins Other Lipid Mediat,* 2009; 89(1-2): 34-42.
69. Jakab F, Shoenfeld Y, Balogh A, et al: A medical nutriment has supportive value in the treatment of colorectal cancer. *Br J Cancer,* 2003; 89: 465-459.
70. Demidov LV, Manziuk LV, Kharkevitch GY, et al: Adjuvant fermented wheat germ extract (Avemar) nutraceutical improves survival of high-risk skin melanoma patients: a randomized, pilot, phase II clinical study with a 7-year follow-up. *Cancer Biother Radiopharm,* 2008; 23: 477-482.
71. Sukkar SG, Cella F, Rovera GM, et al: A multicentric prospective open trial on the quality of life and oxidative stress in patients affected by advanced head and neck cancer treated with a new benzoquinone-rich product derived from fermented wheat germ (Avemar). *Mediterr J Nutr Metab,* 2008; 1: 37–42.