Scientific Phytonutrition for Life-Long Wellness

A Scientific White Paper

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INTRODUCTION

By now most of us have heard that diets high in fruits and vegetables can help us lose weight, reduce our risk of heart disease, cancer, diabetes, high blood pressure, cataracts, macular degeneration, osteoporosis, arthritis and even wrinkles. This "common" knowledge has filtered down from research sponsored by such organizations as the National Cancer Institute and the National Institutes of Health starting back in the 1980's. A review of the scientific literature from 1999 to 2001 by Diane Hyson, Ph.D., M.S., R.D., states "the current evidence collectively demonstrates that fruit and vegetable intake is associated with improved health, reduced risk of major diseases, and possibly delayed onset of age-related factors." No wonder the latest 2005 USDA dietary guidelines call for five to thirteen servings of fruits and vegetables a day, depending on one's caloric intake. For a person who needs 2,000 calories a day to maintain weight and health, this translates into nine servings, or 4½ cups per day.

Needless to say, current adherence to the USDA guidelines is low in the US. Indeed these new USDA 2005 guidelines recommend a 50 % increase in vegetable intake, a 150% increase in fruits, a 250% increase in orange colored fruits and vegetables, and a 350% increase in dark greens!

In the last quarter of the 20th century, food science gradually came to realize that there is much more to micronutrient nutrition than just vitamins and minerals. Indeed, there may be well over 1,000 different plant chemicals, known as phytochemicals, which may have metabolic activity in humans! These include classes such as the terpenes, polyphenols, organosulfurs, polysaccharides, organic acids, amines, and lipids. Some serve as antioxidants fighting free radicals, some assist the liver in detoxification, others modulate the immune system and hormone metabolism, while yet other mediate hemodynamics.

Further study has shown that the fruits and vegetables that come in rich vibrant colors, like tomatoes, carrots, spinach, broccoli, blueberries and raspberries, are generally much more potent and beneficial than the pastel colored produce like iceberg lettuce, bananas, celery, corn and potatoes. Thus such "colorful" dietary recommendations as the color code diet and rainbow diet have evolved.

Furthermore, certain foods may contain greater density per calorie of antioxidants, fibers, probiotics, and even specific medicinal substances, the latter being especially true of many edible herbs and spices.

Factoid:

The current evidence collectively demonstrates that fruit and vegetable intake is associated with improved health, reduced risk of major diseases, and possibly delayed onset of age-related factors.

The Super Foods and the Standard American Diet

As we have become more aware of the amazing and broad spectrum of health, anti-aging, and disease preventing benefits of foods especially high in this "new" array of such micronutrients, a new popular name for them has arisen, the "Super Foods". Food scientist, nutritionists and registered dieticians prefer the technical term "functional foods"

The "S.A.D." fact remains, in spite of all the support from mainstream medicine organizations like the American Heart Association and American Diabetes Association, and governmental health organizations like the National Institutes of Health, the National Institute on Aging, the USDA, and even the U.S. Surgeon General, few of us even eat the recommended very minimum of two fruits and three vegetables daily. Even counting the "pale" plant foods like French fries, green-gassed bananas and iceberg lettuce, few achieve this daily *minimum*. Only a small percentage of the population enjoys daily the more optimal nine servings that emphasize fresh and organic phytochemical-dense deep green and brightly colored fruits and vegetables!

The reasons for this lack are many and varied, and deeply ingrained in our American culture and lifestyle, though it can no longer be accounted to ignorance. What is obviously needed are an educational initiative, *as well as new ways* for people to enjoy the benefits of fruits and vegetables. This paper is an introduction, and for some a review, of the power and importance of many of the super foods available to us today. Our S.A.D. choices in food must change. Education and the new advances in food technologies facilitating the formulation of high compliance "functional foods", also known as "super foods", are the keys.

"*If these findings are borne out in further research, young and middle-aged people may be able to reduce risk of diseases of aging—including senility—simply by adding high-ORAC foods to their diets*," Floyd P. Horn, administrator, Agricultural Research Service's Human Nutrition Research Center on Aging at Tufts University in Boston.

ORAC, short for **Oxygen Radical Absorbance Capacity**, is a test tube analysis that measures the total antioxidant power of foods and other chemical substances. Antioxidant power is the ability to neutralize oxygen free radicals. *Therefore ORAC testing is a way to measure how many oxygen radicals a specific food can absorb. The more oxygen radicals a food can absorb, the higher its ORAC score*. Foods that score high in ORAC testing may protect cells and their components from oxidative damage. So suggests the latest studies of animals and human blood at the ARS, the chief scientific agency of the U.S. Department of Agriculture. In other words *the higher a food's ORAC score, the better it is at helping our bodies fight diseases like cancer and heart disease*.

Factoid:

"Men and women whose diets are high in fruits and vegetables were shown to have lower rates of angina, arthritis, asthma, bronchitis, cirrhosis, gallstones, heart attack, kidney stones and peptic ulcers."

-Epidemiology, March 1998, Vol. 9, No 2, p 208.

Oxygen radicals are chemicals that are naturally formed inside our bodies by the process of **oxidation**. They are normal byproducts of everyday functions like digestion and physical activity. We are also exposed daily to polluted air; ingest oxidized or partially rancid foods, and oxidizing radiations from the sun and various electrical appliances which all add additional oxygen radicals to our systems.

Free radicals destroy our health in many ways. A good illustration of the harmful effects of oxidation is rusting. When metal rusts it becomes weak and flaky, it starts to degenerate or decay until it no longer performs its functions well. Eventually the metal "fatigues" and "fails". *This exact same process happens in your body!* Just like in rusting, the cells, organs, and other parts of our body can be made weak by oxidation. This can lead to diseases like cancer, heart disease, cataracts and macular degeneration, osteoarthritis, chronic obstructive pulmonary disease (COPD), senile dementia and other neurodegenerative diseases, and perhaps even skin aging and wrinkling!

The **Free Radical Theory of Aging** is the thesis that oxidative damage culminates in many of the above maladies of aging is now well accepted in the health community. Therefore, *if our bodies can quench these oxygen radicals before they do damage, then they won't hurt us*. Chemicals that neutralize oxidation from free radicals are called antioxidants. The antioxidant evidence has spurred skyrocketing sales of antioxidant vitamins. *But several large trials have had mixed results on vitamin pills as far as achieving the desired benefits.* This may be because there are hundreds, maybe even thousands, of antioxidant **phytonutrients** (plant chemical nutrients) in natural plant foods and herbs that play a major role in health and wellness. Some of these phytonutrients we have identified, many more as yet remain to be identified. *What we do know is that most of these powerfully beneficial plant compounds are not found in vitamin pills*. Therefore, it is not surprising that science has found *those who eat 7 to 13 servings of fruits and vegetables a day suffer from a much lower incidence of the common chronic degenerative diseases of aging as compared to those who eat only 2 or 3 servings a day.*

By the year 2050, nearly one-third of the U.S. population is expected to be over age 65. If further research supports these early findings, *millions of aging people may be able to guard against many of the worst and most common diseases simply by adding high-ORAC foods to their diets!* This could save much suffering, as well as reduce the staggering cost of treating and caring for the elderly.

Dr. Guohua Cao, a physician and chemist, developed the ORAC test while he was a visiting scientist at the National Institute on Aging in Baltimore, Maryland. According to Dr. Cao, "The ORAC value covers all the antioxidants in foods… You cannot easily measure each antioxidant separately, but you can use the ORAC assay to identify which phytonutrients are the important antioxidants. *It may be that combinations of nutrients found in foods have greater protective effects than each nutrient taken alone*."

New, natural plant chemicals are being discovered every day. We don't know as yet which ones, in what amounts, best fight cancer and other diseases. But we do know that, as our knowledge is so limited, it is best to get these plant chemicals from plant foods, not just supplements, to fully enjoy the disease-fighting benefits. One of the things science has proven is that *dark greens and brightly colored plant foods are the ones with the highest ORAC* scores such as spinach, kale, broccoli, blueberries, wild tart cherries, raspberries, elderberries, prunes, tomatoes, carrots and the like.

It is important to understand that the ORAC values of fruits and vegetables cover a broad range. Dr. Cao instructs us that, "you can pick seven with low values and get only about 3,000 ORAC units. Or, you can eat

seven with high values and reach 8,000 ORAC units or more. One cup of blueberries alone supplies 3,200 ORAC units." Generally the minimum recommended "5-a-day" vegetables and fruits program is considered to be supplying about 3,000-4,000 ORAC units daily. In studies, eating plenty of *high-ORAC foods raised the antioxidant power of human blood 10 to 25 percent*. Based on the evidence so far, some experts suggest that *daily intake be increased to approximately 8,000 or more ORAC units to have a significant impact on plasma and tissue antioxidant capacity.*

The Super Greens: Algae and Grasses!

Super Greens are those pigment rich dark green plants and friendly photosynthetic algae that make up most of the very foundation of complex life on earth. By this statement we mean that such green foods make life possible, for they serve at the beginning of the food chain upon which other plants, and the more complex animals, all depend, directly or indirectly. As such these dark green foods contain all the essential building block nutrients or precursors upon which all other life eventually depends. In the oceans and great lakes these super foods are one-celled organisms called spirulina and chlorella. They are some of the oldest, most successful and most resistant organisms and provide most of the oxygen dissolved in water. On land, these foods are the young spring time sprouts or shoots of the seed producing green grasses and the green herbs, a most excellent example of which is young barley green shoots.

Factoid:

Studies published in the UC Davis Health Journal state that, "Spirulina increased antibody responses and the activity of natural killer cells, which destroy infected and cancerous cells in the body."

Spirulina is a primordial aquatic micro-blue green algae. Spirulina takes its energy directly from the sun and the minerals in waters that are naturally highly alkaline, or commercial aqua-farms where purity can be monitored. It grows so fast that Spirulina accounts for up to one half of the oxygen on our planet!

Spirulina contains over 100 vitamins, minerals, amino acids, enzymes and phytonutrients! Spirulina contains high levels of easily absorbed natural cell protectors (antioxidants) including chlorophyll, alpha and beta carotene and phycocyanin, the latter found exclusively in Spirulina.

Spirulina is approximately 65 - 70% amino acid proteins, which is greater then beef steak by far! Spirulina is a natural treasure trove of organic vitamin B12, iron, chromium, selenium and essential fatty acids (GLA). Indeed, Spirulina contains 50 times more blood building iron than spinach and 10 times more bone building calcium than milk. Spirulina is the highest natural plant source of stamina building Vitamin B12, has more good fats (GLA /EFA) than evening primrose oil, and more Vitamin E than raw wheat germ! Spirulina also contains growth factors that support and promote the growth of friendly intestinal flora. Such a food is properly called a pre-biotic. "People have used foods like yogurt (containing pro-biotics) and Spirulina throughout history…these foods improve immune system function and…are a beneficial addition to our diet." *(Judy van de Water, associate professor of rheumatology, allergy and clinical immunology, UC Davis).*

Spirulina, like all edible dark green plants, is also highly alkalizing, meaning that it helps restore the acid–base balance. In other words, Spirulina helps neutralize the acidity caused by eating excess meats, starches, sugars, soft drinks and preserved foods, as well as by excess stress, excess exercise, environmental pollutants, drugs, alcohol, coffee and tobacco.

Spirulina is also rich in photosynthetic pigment chlorophyll that makes it a great heavy metal detoxifier. Doctors Sklar and Schwartz of Harvard School of Dental Medicine showed an extract of Spirulina's antioxidants prevented cancer in animals. "Spirulina increased antibody responses and the activity of natural killer cells, which destroy infected and cancerous cells in the body." - UC Davis Health System, Weekly Update, Dec, 2000, pp. 1-2

Dunaliella Salina algae is a unique spirulina species harvested from the Dead Sea containing rich concentrations of carotenoids, most especially beta-carotene, along with some alpha-carotene, cryptoxanthin, zeaxanthin, lutein and lycopene. Research has proven that consumption of the Dunaliella Salina algae is effective in inhibition of some forms of cancer. (PubMed, PMID: 3129701). This and other studies suggest that natural forms of mixed carotenes are more effective than synthetic beta-carotene in reducing risk of cancer and heart disease.

Factoid:

"Chlorella is by far the best and most powerful of the super foods that provide your body with the proper nutrition to heal itself."

Chlorella is the number one selling health food supplement sold in Japan. Chlorella, an unique single-celled fresh water green algae, contains high concentrations of chlorophyll, nucleic acids, amino acids, enzymes, antioxidant carotenes, and vitamins and minerals, especially zinc. (The latter is often deficient in athletes and vegetarians.) Chlorella actually contains twice as much chlorophyll as Spirulina. Chlorophyll, the phytonutrient that makes plants green, deodorizes, detoxifies and promotes the body's natural healing.

Chlorophyll has also been studied for its potential in stimulating tissue growth, and in stimulating red blood cell production. Perhaps most remarkable is the similarity between chlorophyll and the red pigment in blood. Indeed, chlorophyll is just a hemoglobin molecule with magnesium in the middle instead of iron! According to an article in the *Journal of the National Cancer Institute, 1995, Vol 87, No 11, p. 7*, chlorophyll fed to laboratory animals reduces absorption of three dietary carcinogens: heterocyclic amines (found in cooked muscle meats), polycyclic hydrocarbons (found in smoked and barbecued foods), and aflatoxin (a toxin produced commonly by mold that infects grains and peanuts). The chlorophyll forms complex compounds with the chemical carcinogens while they are still in the digestive tract, limiting their absorption and distribution. Chlorophyll has also been found useful to treat some disorders of the pancreas and reduce fecal, urinary, and body odor in geriatric patients.

Chlorella is the most researched "green product" resulting in proof of numerous health benefits including improved immune system function, heavy metal and pesticide detoxification, "anti-tumor activity", and, because of chlorella growth factor (CGF), enhanced white blood cell activity and quicker wound and ulcer healing! *(Drug Chemical Toxicology, Vol 7, No 1, pp. 51-71 and Immunotoxicology, 1999, Vol 21, No 3, pp.609-619.)*

Please note that as Chlorella, unlike Spirulina, has a cellulose wall that humans cannot digest, it is important that "cracked cell wall" Chlorella be used. Michael Rosenbaum, MD, MSC, Director of Orthomolecular Health Medical Society, writing in the *M.D.'s Nutritional Bulletin, Special Addition, Spring 2001, p.1*, states that chlorella is, *"by far the best and most powerful of the nutraceuticals, foods that provide your body with the proper nutrition to heal itself…There is nothing better for finally helping you feel the way you want to feel!"*

Barley grass is considered the most nutritional of the green grasses. When the great herds of the plains have survived the dry season or winter, nature provides them with the most nutritious of foods for themselves and their soon to be born, young, green sprouting grasses. Indeed green grasses are the only vegetation many herbivores eat and as such supply their sole nutritional support from birth to old age! But before green grasses undergo the reproductive cycle that creates the grains, they are in the grass stage, and the grasses contain about the same vitamins and minerals as dark green vegetables!

When these grasses are harvested at a young age, they have a different chemical makeup from their adult counterparts. For example, wheat grass has 32 g of protein per 100 g, whereas wheat flour has only 13 g per 100 g. Wheat grass has about 23,000 International Units (IUs) of vitamin A per 100 g, whereas wheat flour has none. We can see then that the young grasses offer us much greater nutrition.

Factoid:

"It is clear that the leaves of the cereal grasses provide the nearest thing this planet offers to the perfect food. For reasons of palatability, higher nutrient content, and favorable harvesting features, green barley stands out as the best among these," according to Dr. Hagiwara, Professor of Toxicology at UC Davis.

Factoid:

"The young barley juice powder contains 13 times as much carotene as that of carrots, 55 times as much Vitamin C as that of apples and 5 times as much iron as that of spinach."

The young barley juice powder contains 13 times as much carotene as that of carrots, 55 times as much Vitamin C as that of apples, and 5 times as much iron as that of spinach. Its potassium content works to balance the sodium in salt and so many other processed foods. Many people note a diuretic effect like the "water pills", frequently followed by lowering of an elevated blood pressure!

Barley grass powder is a green powerhouse that brings you a wide spectrum of natural nutrients in natural proportion, as well as chlorophyll, live enzymes, and a unique and powerful antioxidant: 2"-0-glycosylisovitexin, reported to have antioxidant activity equal to or superior to vitamin E.

Green barley leaves contain a multitude of the body's spark plugs, enzymes. Enzymes are the catalysts for the body's essential chemical reactions and are responsible for our digestive processes, for providing cellular energy, and for antioxidant effects. Despite their importance, most people do not get the enzymes they need. This is because heat destroys enzymes, and most of our foods, whether cooked at home or processed, are heated and the enzymes destroyed.

The world's greatest expert on green barely is Yoshihide Hagiwara, M.D., an associate professor at the Department of Environmental Toxicology at UC Davis. Dr. Hagiwara believes that there may be thousands of active enzymes in green barley, especially super oxide dismutase (SOD), a major detoxifying enzyme sometimes recommended in combating arthritis.

Recently, research has unveiled many other possible benefits of green barley leaves. Extracted compounds may have cholesterol lowering effects, anti-inflammatory benefits, and anti-ulcer properties. Dr. Hagiwara says, *"It was clear to me, then, that the leaves of the cereal grasses provide the nearest thing this planet offers to the perfect food. For reasons of palatability, higher nutrient content, and favorable harvesting features, green barley stands out as the best among these."*

Quinoa, a protein powerhouse from the Andes, was originally grown in the high plains of the Andes Mountains in South America. Quinoa (pronounced "keen-wa") was considered the "mother grain" that kept the Incan armies strong and robust. However, like buckwheat and amaranth, it is not really a grain. Quinoa is the seed of a leafy plant distantly related to spinach.

Of course no single food can supply all of life's essential nutrients, but quinoa comes close, especially as a "grass" seed sprout! It is extraordinarily rich in nutrients, notably the B vitamins, magnesium, iron, zinc, copper, manganese, essential fatty acids, saponins, beta glucans and enzymes. Quinoa contains up to 50% more protein than the true grains barley and wheat, and unlike them is rich in the essential amino acid lysine. Indeed, the World Health Organization has rated the quality of protein in quinoa at least equivalent to that in milk!

Factoid:

The International Journal of Cancer reported that high consumption of green leafy vegetables containing lutein and zeaxanthin, cancer protective agents, accounted for the low incidence of lung cancer in Fiji where 80% of the men are smokers!

The More Familiar Super Greens: Spinach, Parsley and Kale

The dark green "leafies"–**spinach, kale and parsley**–are also super abundant in vitamins, minerals, carotenes and chlorophyll, the great detoxifier. (That is why parsley and chlorophyll are used in natural breath fresheners!) Of particular note are folic acid (vitamin B9), vitamin K, calcium, iron , and potassium, and the antioxidant *phytonutrients lutein and zeaxanthin*.

Green leafy vegetables are well known as being high in bone building calcium. But did you know that Vitamin K is needed for strong bones, too? The Framingham Health Study showed that those with the highest vitamin K intake had three times less hip fracture from osteoporosis! *(Analyst, 1988:113:393-7).* In Japan vitamin K is approved as a drug to treat osteoporosis! Fewer yet realize that a recent analysis of published research on vitamin K concluded, *"A substantial part of the population is mildly deficient in vitamin K, and at the later stages this deficiency may contribute to (not only) increased bone fracture risk, (but) arterial calcification and cardiovascular disease, (too)." – Hematology Oncology Clinical North America 2000, Vol 14, No 2, pp. 339-53.*

Popeye sang, *"I'm strong to the finish 'cause I eats me spinach"*. This was mostly thought related to its rich iron content, which is also true of kale and parsley. Today, with our high sodium, high protein, high processed food diets, we are even more in need of the alkaline ash minerals, especially potassium, found so predominately in the super greens. These minerals act as a buffer to neutralize excess acid. If not present in sufficient quantities, the body "steals" these much mineral needed buffers from our bones, and thus such deficiencies are thought to be a leading cause of osteoporosis. -*American Journal of Clinical Nutrition 2000, Vol 73, pp. 118-122.*

The discovery that there is a whole class of micro-nutrients, called *phytonutrients*, that are not vitamins, minerals or fiber, but had dynamic health enhancing effect, is a big part of the reason the major health agencies recommend a *minimum* of 5 different fruits and vegetables daily. One such class of phytochemicals are the antioxidant carotenes, of which the pro vitamin A beta carotene is the most familiar. However, though the dark green "leafies" are a rich sources of beta carotenes, there are numerous non-vitamin A carotenes found in these foods as well. Two of the most researched are *lutein and zeaxanthin*. According to *Health Sense, August 2000, Vol. VI, issue 8*, numerous studies show that maintaining sufficient levels of lutein and zeaxanthin, the only carotene antioxidants active in the retina of the eye, can prevent macular degeneration and cataracts, two leading causes of age related blindness, and preserve youthful visual sensitivity!

High consumption of green leafy vegetables containing lutein and zeaxanthin were determined to be the protective agents that explained the low incidence of lung cancer in Fiji where 80% of the men smoke! *International. Journal of. Cancer: 1995, Vol 64 No 63, pp. 18-23*. The February 2000 edition of the *American Journal of Clinical Nutrition* linked lutein to a 17% reduction in colon cancer risk.

Factoid:

According to the International Journal of Cancer, food items most strongly related to decreased risk for ovarian cancer are raw carrots and tomato sauce. Consumption of fruits, vegetables, food items and supplements high in carotene and lycopene reduce the risk of ovarian cancer.

The Non Green Super Carotenoids: Carrots, Sweet Potatoes and Tomatoes

Having seen how carotenoid rich the greens are, it may surprise you that the carotenes are responsible for much of the yellow, orange and red of fruits and vegetables. It is the large amounts of chlorophyll that "mask" the carotenoid colors. This is why in the fall when the green chlorophyll leaves the leaves of deciduous tress, the carotenoid rich leaves transform into their "true" colors. These carotenoids act as powerful antioxidants that protect the leaves that need the sunlight to make energy, but must simultaneously resist the ionizing radiation of UV light. There are three carotenoid rich super foods we will mention here, namely carrots, sweet potatoes and tomatoes

Carrots are well known for their pro-vitamin A *beta-carotene* content, the abundance of which is responsible for their bright orange color. *"There was an evident increase in the risk of breast cancer for decreasing amounts of beta-carotene...the risk of breast cancer approximately doubled among the subjects with blood levels of beta-carotene at the lowest quartile" (American Journal of Epidemiology 2001, Vol 12, No 153, pp. 1142-7).*

According to the International Journal of Cancer, food items most strongly related to decreased risk for ovarian cancer were raw carrots and tomato sauce. Consumption of fruits, vegetables, food items and supplements high in *carotene and lycopene* were cited for reducing the risk of ovarian cancer.

Sweet Potatoes qualify as an excellent source of the pre-vitamin A beta-carotene. Sweet potatoes are also a very good source of other carotenoids, vitamin C and manganese, and a good source of copper, dietary fiber, vitamin B6, potassium and iron. They even provide some vitamin E. Remember, the 2005 USAD guidelines say that the average American should increase consumption of orange fruits and vegetables by 250%!

Tomatoes turn bright red because of the pigment called *lycopene*. Lycopene has drawn attention because of its link in lowering the risk of lung and prostate cancer *(Journal National Cancer Institute, December 6. 1995)*. Food items most strongly related to decreased risk for ovarian cancer were raw carrots and tomato sauce. According to the International Journal of Cancer, 2000, Vol 94, Issue 1, pp. 128-134 consumption of fruits, vegetables, food items and supplements high in *carotene and lycopene* may also reduce the risk of ovarian cancer.

The Cruciferous Vegetables

When it comes to cancer fighting, the real champs may be the cruciferous vegetables. **Cruciferous vegetables** contain detoxifying phytonutrients with rather unfamiliar names like *isothiocyanate, sulforaphane and indole –3 carbinol*, or IC-3 for short. These plant micronutrients work by speeding up the production of enzymes, especially in the liver, with which our bodies convert toxic, mutagenic, cancer causing substances into less harmful, even beneficial substances. -*Medical Committee for Aging Research and Education, Year 2001, Issue 2, Abstracts, p.5.*

The 2000 January 5th issue of the *Journal of the National Cancer Institute* proclaims that the cruciferous vegetables, such as broccoli, cauliflower, cabbage and Brussels Sprouts, substantially lower the risk of prostate cancer in men. Numerous tudies also suggest a protective role in uterine, cervical and breast cancer in women as well *(Cancer Chemotherapy and Pharmacology, 1991, No 28, pp.255-8.*

Factoid:

According to the Journal of the National Cancer Institute, cruciferous vegetables, such as broccoli, cauliflower, cabbage and Brussels sprouts, substantially lower the risk of prostate cancer in men. Numerous studies also suggest a protective role in uterine, cervical and breast cancer in women as well.

The Japanese have developed a **fermented cabbage extract**. Fermentation "predigests" foods making nutrients easier to assimilate. As no heat is used, fermentation retains enzymes, vitamins, and other nutrients that are usually destroyed by food processing. As a matter of fact, the active cultures that pre-digest the food as part of the fermentation process actually generate nutrients! So there are more vitamins, especially B-vitamins. Furthermore minerals are released from the chemical bonds that otherwise prevent them from being assimilated.

Compounds in fermented cabbage have been shown in test tube and animal studies to prevent the growth of cancer cells, especially of the breast, colon, lung and liver, according to a Finnish study reported in the Journal of Agricultural and Food Chemistry. Raw cabbage is rich in glucosinolate, which fermentation breaks down into the active form, the isothiocyanates and other cancer-fighting compounds.

Of great interest in Japan is the increase of the major antioxidant enzyme *Super Oxide Dismutase* (S.O.D.) in fermented cabbage. Here in the West, William G. Helferich of the University of Illinois believes that fermenting cabbage may create new anticancer agents! In the University's studies low-concentration extracts of the samples--typically 5 to 25 parts per billion--not only slowed the growth of estrogen-fed cells but also blocked estrogen's ability to turn on a particular cancer causing gene. Scientists had thought that any anticancer benefits from brassicas must be traced to sulforaphane (SN: 9/20/97, p. 183) and indole-3 carbinol (SN: 3/6/99, p. 157). The findings by Helferich's team suggest that fermented cabbage might offer even more "potentially important" agents.

The **thiosulfonates** are predominant in the *allium family* where garlic, onion, leek, asparagus, shallots, chive and scallion are most representative. They are known for their ability to promote a more favorable HDL- LDL ratio, lowering blood pressure, and stimulating non-specific immunity.

Like their cruciferous cousins, when thiosulfonates are cut or smashed the sulfur compounds release bio-transformation products including: allicin, ajoene, allylic sulfides, vinyl dithin, and D-allyl mercaptocysteine. Some of these are considered anti-atherosclerotic, some antioxidant, some anti-cancer agents, while others are antibacterial, antiviral and antifungal. The Commission E Monograph in Europe declares garlic antibacterial, anti-mycotic, lipid-lowering, an inhibitor of platelet aggregation (thus prolonging bleeding and clotting time) with concomitant enhancement of fibrinolytic activity.

Factoid:

Super rich in the anthocyanin bioflavonoid group of phytonutrients, these elements are found abundantly in beets and berries, and some of the richest sources are grape seed and pine bark extracts. These are powerful antioxidants that are significantly more active than Vitamins C and E. Grape skin extracts inhibit the initiation and promotion of tumors, and cause pre-cancerous cells to return to normal, according to the Journal of Clinical *Oncology.*

Fruit: Berry, Berry Good For You!

As a recent Newsweek article said *"The day when doctors say—'Take 10 cherries and call me in the morning'*—may not be far off." Most known phytonutrients are strongly related to pigment. Just as phytonutrient antioxidant *carotenoids* tend to dominate in the dark green greens and bright red and orange fruits and vegetables, the richly red/blue pigmented *flavonoids*, with names like *isoflavones, anthocyanins, flavinols, catechins and phenols,* tend to be dominant in the fruits and herbs, but we must mention beets as well.

The richest source of pigment and antioxidants in the fruit group are generally found in **blueberries, raspberries, tart dark cherries, cranberries, and deep purple plums/prunes**. Indeed, these fruits are the most potent source of antiaging antioxidants of any commonly eaten foods!

Antioxidants have been shown to increase immune function and decrease the risk of infection and cancer. Antioxidants help by preventing or repairing damage done to the body's cells by free radicals. Simply put, a free radical is a molecule with a free electron. Electrons like to be in pairs.

Factoid:

Studies conducted at the Hollings Cancer Institute found that cranberries, raspberries and tart cherries are the richest fruit source of ellagic acid, a naturally occurring plant phenolic flavonoid phytonutrient. This chemical is a potent anti-carcinogenic and may be the most potent way to prevent cancer!

An antioxidant, such as vitamin C, vitamin E or *beta-carotene*, may donate one of its electrons to the free radical. If no antioxidants are present, a free radical takes an electron from vital cell structures, damaging the cell and eventually leading to disease.

Just like so many Pac-Men, the *flavonoid antioxidants* in berries, cherries and plums "eat up" free radicals in the bloodstream helping prevent the development of cancer. These flavonoids have even been called, "*Mother Nature's all-natural chemotherapy agents"*.

Fruit *phytonutrient flavonoids* also play a role in preventing the development of heart disease by discouraging fatty deposits in the arteries. Flavonoids even slow wrinkling, protect the eyes from cataracts and macular degeneration, and protect the aging brain. Indeed, they are a main reason why fruits and vegetables have been called *"Natures Anti-Aging Wonders!"*

Is it any wonder then that most scientists believe it is far better to get a daily healthy dose of dozens of different *phytonutrients* from micro-nutrient dense "super foods" than it is to take a mega dose of a few *synthetic* antioxidant vitamins and minerals?

For example, the 17 identified compounds in tart cherries that have antioxidant properties are considered, in total, to be superior to the activity of vitamins E and C. In addition, they contain compounds that help relieve the pain of arthritis, gout and even headaches with daily consumption!

Blueberries are by far the greatest common whole food source of eye/vision and brain/mind protecting antioxidant *flavonoids*, being full of blue *anthocyanins*. Cranberries, raspberries and tart cherries are the richest fruit source of *ellagic acid*, a naturally occurring plant *phenolic flavonoid* phytonutrient that is known as a potent anti-carcinogenic compound. Clinical tests conducted at the *Hollings Cancer Institute at the Medical University of South Carolina (MUSC)* show that ellagic acid may be the most potent way to prevent cancer! In addition, you should know that all the berries, not just cranberries, help prevent recurrent urinary tract-bladder infections (UTI's).

Acerola cherries are best known for their high vitamin C and bioflavonoid content.

Factoid:

The benefits of green tea flavonoid catechins for the heart are greater than that of red wine, without the alcohol! There is a 10% increase in breast cancer for every alcoholic beverage consumed on a daily basis, according to an article in JAMA.

Four Famous Phenols: OPCs, Quercitin, Catechin, and Resveratrol

Oligomeric proanthocyanidins (OPCs) are super rich in the *anthocyanin bioflavonoid* group of phytonutrients. Found abundantly in berries, the very richest sources are grape seed and pine bark extracts. These have been shown to be powerful antioxidants that are significantly more active than vitamins C and E, and are thought to protect against carcinogenic changes *(Journal of Clinical Oncology 2000, No 18, pp. 668-83).*

Quercetin is the major representative of the antioxidant flavinol group, which group is particularly known for preventing the oxidation of low density lipoproteins (bad cholesterol). Quercitin is found in fruits and vegetables, most notably onions and green apple skins. That is the major reason why onions and green apples help prevent hardening of the arteries and the heart attacks and strokes that arteriosclerosis causes *(Biomedical Pharmacotherapy 1997, No 51, pp 305-310).* Quercetin has also consistently demonstrated a potent anti-tumor effect. *(Cancer Chemotherapy and Pharmacology,1991, No 8, pp. 255-8).* Like all polyphenols, quercetin is hard to absorb. Fortunately, food scientists *(Hollman et al, BJN 2004, 91-841-847)* have substantiated that the **isoquercetin** form, quercetin 3-glucoside, is much more bioavailable.

Green tea is rich in antioxidant *polyphenols* that are thought to be the most active ingredient as pertains to green tea's much purported benefits of preventing cancer, heart disease, osteoarthritis, gum disease and even tooth decay. The benefits of these green tea *flavonoid catechins polyphenols* for the heart are greater than that of red wine, without the alcohol! (There is a 10% increase in breast cancer for every alcoholic beverage consumed on a daily basis according to authors Smith, Warner SA, et al in *Alcohol and Breast Cancer in Women: A Pooled Analysis of Cohort Studies, JAMA, 1998, Vol 7, pp. 535-40*. Of interest **white tea** has twice the polyphenols of green tea!

Red wines are more protective of heart disease than white wines because of the phytonutrient, resveratrol, which gives dark grapes their deep red/blue color. *"Resveratrol (a stilbene polyphenol found in grape skin extracts and the herb polygonum cuspidatum) is able to inhibit the initiation and promotion of tumors, and cause pre-cancerous cells to return to normal." (Science, 1997, Vol 275, No5297, pp. 218-220)*. By extracting the resveratrol as a phytonutrient supplement, one can get the antioxidant immune enhancing and heart protecting benefits of red wine, dark grapes and grape juice without all the alcohol and sugar.

In August of 2003 researchers at Harvard Medical School shocked the scientific community when they announced the results of their work on polyphenols. Mice, rats, worms, flies, and yeast all live longer on a low-calorie diet. For the first time scientists have found a way to duplicate the benefits of restricted calories in yeast with a group of compounds found in red wine and vegetables. These polyphenol compounds extended yeast life span by up to 80 percent! The most potent molecule in the study was resveratrol.

Factoid:

Fruit and vegetable extracts, especially from dense varieties, are highly concentrated phytonutrient super food supplements. Findings reported in the 38th annual meeting of the American Society of Cell Biology indicate that these supplements enhance "multiple immune functions... especially for people whose immune functions have been diminished."

Factoid:

"Inflammatory bowel disease, urinary tract infections, diarrhea and even heart disease and colon cancer risk are favorably effected by these symbiotic bacteria we host in our alimentary tract," according to Dr. Lukaczar as reported in the Nutritional Science News.

Fruit and Vegetable Extract Facts

In order to approximate the phytonutrition of eating 7 to 13 serving of dark green, red, orange, blue and purple fruit and vegetables daily, food scientists have created fruit and vegetable *extracts* from the most nutrient dense organic varieties. These *extracts* become highly concentrated phytonutrient super food supplements. Findings reported in the 38th annual meeting of the American Society of Cell Biology show us that these supplements enhanced *"multiple immune functions…especially for people whose immune functions have been diminished"*. Dr O'Neill , Ph.D., of BYU's Dept. of Microbiology was quoted as saying, *"Fruit and vegetable extracts may be protective against cancer."*

Numerous peer reviewed reports by J. Wise, et al., demonstrate fruit and vegetable juice powder extracts can enhance plasma antioxidant levels, lower total peroxides, enhance immune function, decrease DNA damage, and even enhance body composition during weight loss.

Probiotics: Friendly Microorganisms?

Evidence for **probiotics**, "friendly" microorganisms (like *L. acidophilus*,) is impressive according to Dan Lukaczer, N.D., writing in the *Sept. 2001, Vol.6, No, 9 edition of the Nutritional Science News*. Inflammatory bowel disease, urinary tract infections, diarrhea and even heart disease and colon cancer risk are favorably affected by these symbiotic bacteria we host in our alimentary tract. No wonder we call them "friendly"! Probiotics are so effective in inhibiting virally induced gastrointestinal infections in children that hospitals, infamous as vectors for drug resistant pathogens, are studying their prophylactic use when admitting children.

Of note, one of the ways we get "inoculated" with probiotics is through soil organisms on plants. But our highly washed, even irradiated, vegetables may not contain near as many as we might get "eating from the garden". And our frequent ingestion of chlorinated water, antibiotics, and other medications, along with low fiber, high sugar diets do not favor the growth of symbiotic microorganisms in our intestines. Fermented plants foods like sauerkraut or tempeh, natto, and milk products like yogurt, are important *probiotic* sources as well. As diary sensitivity is so common, especially in those with chronic bowel problems, when supplementing dairy-free probiotics are to be generally preferred. *"Friendly bacteria can… prevent cancerous tumors; inactivate viruses; produce natural antibodies and vitamins; reduce cholesterol… and even more wonders."* – Dr David Williams, editor of *Alternatives For The Health Conscious Individual.*

Organic Food More Nutritious!

The *Journal of Alternative and Complementary Medicine 2001, Vol 7, No 2, pp. 161,* reported the results of part of the doctoral dissertation of Virginia Worthington, Ph.D., of John Hopkins University, Baltimore. Dr. Worthington found that the composition of conventionally grown American food has declined dramatically in the past 60 years. For example, iron is lower by 32 percent, calcium by 29 percent, magnesium by 21 percent.

She also found that **organically grown produce** was higher in most vitamins and minerals and lower in potentially harmful nitrates. Organic foods were 29 percent higher in magnesium, 27 percent higher in vitamin C, and 21 percent higher in iron. Using the USDA minimum recommendation of at least five servings of fruits and vegetables a day, *Dr Worthington concluded that consuming organic produce could make the difference between a deficient and adequate diet!*

Plant Enzymes: Digestive Dynamos!

Natural **plant enzymes**, like **amylase, lipase, cellulase, lactase, protease, bromelain and papain** (from pineapple and papaya) help us to digest starches, fats, cellulose, milk sugar and proteins, respectively. Raw foods, or foods processed below 108 degrees Fahrenheit, maintain their enzyme activity. Of course, only man cooks his food. In contrast, animals eat a "raw" and therefore a relatively more or less enzyme rich diet. The proposed advantages of a diet rich in raw and low temperature processed plant foods, or supplementing these natural plant enzymes, are well stated in the following quote by I. V. Jimenez-Velasquez, Vice-Chair of the Department Of Medicine, University of Puerto Rico School of Medicine, *"As we age, our natural digestive enzymes are depleted, allowing food to ferment (rot) in the digestive tract. Many experts believe that this undigested matter becomes quite toxic, causing many of the health problems associated with aging, such as joint distress, ulcers, bloating and constipation."*

Factoid:

"We recommend trying lecithin for reducing risk of coronary heart disease, fatty liver, and to improve mild memor impairment."
D.W. Johnson, Ph.D., D.J. Mokler, Ph.D., Dept. of Physiology and Pharmacology, College of Osteopathic Medicine, University of England.

Lecithin: A Nutrient to Remember

Lecithin is found in almost every tissue of the human body. But lecithin is present in greater concentrations in the brain as a component of the myelin sheets that cover nerve cells and other nerve cell membranes. Oral lecithin, a major source of *phosphatidylcholine*, is being studied in relation to dementia and Alzheimer's disease and other disorders of the nervous system in which memory is affected. It has been shown to mildly decrease total cholesterol while raising HDL, the "good " cholesterol, and lower homocysteine, thus perhaps lowering the risk for heart attack, stroke, and hardening of the arteries. Further more, lecithin promotes healthy liver function, including bile flow, fat breakdown and medication detoxification. It may help prevent gall stones.

Lecithin is a major source of the B vitamin choline. Though rarely deficient with a good diet, current lecithin and choline consumption rates may be lower than optimal, especially in certain "at risk" populations, because foods with the highest lecithin concentrations, like egg yolks and beef liver, are still considered by many to be too high in fat and cholesterol. Granulated lecithin is extracted from soy beans, its highest natural plant source. (Soy lecithin does not contain significant soy protein or protein isolates.) *"We recommend trying lecithin for reducing risk of coronary heart disease, fatty liver, and to improve mild memory impairment."- D. W. Johnson, Ph.D., D.J. Mokler, Ph.D., Department. of Physiology and Pharmacology, College of Osteopathic Medicine, University of England.*

Factoid:

Insoluble fibers are the most responsible for lowering cholesterol, and the most effective cholesterol lowering soluble fiber is oat beta-glucan. The FDA has recently approved claims for oat betaglucan stating that this is the primary component responsible for the total and LDL blood cholesterol lowering effects.

Natural Plant Polysaccharides

Polysaccharides are long chain molecules made of simple sugars. Four of the "healthiest" *polysaccharide fiber* combinations are found in the **bran of grains**, the **husks of seeds**, the **pectin of fruits**, and the **hydrocolloid gums**, of which **guar gum** is perhaps the most familiar. These natural plant foods contain high amounts of beneficial *soluble and/or insoluble polysaccharides fibers* and a wide variety of vitamins, minerals, and phytonutrients. For example pectin rich lemon peel also contains *bioflavonoids* and *limonoids*.

Insoluble fibers are responsible for increased bulk that reduces the risk of cancer, promotes healthy digestion, reduces the absorption of sugars in diabetic patients, and the risks of recurrent urinary stone disease in people with kidney disease.

Soluble polysaccharides, known popularly as *"soluble fibers"*, are known as "prebiotics" because the act as food for probiotic organisms, thereby promoting their growth and maintenance. Soluble fibers are the main polysaccharide responsible for lowering cholesterol and lipids thus reducing incidence of heart disease. They do this by binding to toxins and excess bile and cholesterol in the gut. Soluble fibers also slows the absorption of sugars in diabetic patients.

Guar gum is a polysaccharide made of the sugars galactose and mannose. Guar gum, a soluble fiber, comes from the endosperm of the seed of the legume plant *Cyamopsis tetragonolobus*. *Cyamopsis tetragonolobus* is an annual plant, grown in arid regions of India as a food crop for animals. Rice bran is a significant source of vitamins, minerals, protein, fiber, and antioxidants. Enzymatic stabilization technologies have eliminated one of the historic difficulties with using rice bran, namely rancidity due to the presence of nascent lipase and lipoxygenase. Stabilized flax seed is a patent-pending flax flour that, like rice bran, needs to be stabilized to prevent rapid rancidification. Flax seed is rich in soluble and insoluble fiber and protein. Stabilized flax seed is an excellent source of omega-3 fatty acids, lignans, vitamins, and minerals, while low in carbohydrates.

Medicinal Plants, Herbs and Spices

Medicinal plants have a long tradition in every culture. Many are safe to be eaten regularly in small amounts with few contraindications, even with concomitant prescription medicines.

Milk thistle is the popular name of a plant of the daisy family native to the Mediterranean region, and later introduced to most areas of Europe, North and

Factoid:

Curcuma longa (turmeric) extract was given to patients with previously elevated levels of fibrinogen, a bio-marker important to cardiovascular risk. After only 15 days, fibrinogen dropped like a rock in all subjects, according to the research of Ward Dean, M.D., Fibrinogen: Biomarker of Aging and Important Cardiovascular Risk.

South America. Its scientific name is *Silybum marianum*. The stalk and leaves of this herb have been eaten as an every day salad vegetable and used medicinally for more than 2000 years! The main uses for milk thistle are stimulating, regeneration, and promoting proper function of the liver and gallbladder. A phytonutrient extract of the seed has been prepared and investigated in both the laboratory and the clinic as a liver protectant and antioxidant. This extract is known to contain silymarin, rich in a mixture of phytochemicals known as *flavolignans*. Milk thistle has been used by medical doctors to treat hepatitis, to protect against the toxic effects of poisons and to detoxify the body after the exposure to chemical pollutants such as solvents, paints and glues. *"Milk thistle regenerates healthy liver cells and has an excellent safety profile at therapeutic dosages. American Journal of Health System Pharmacist,1999, Vol 56,pp 1195-97." It also "supports proper liver functioning through a number of mechanisms." Hepatology, Year 2001 Vol 34, No 3, pp. 595-603.*

Artichoke. The Natural Pharmacist website reports a double-blind, placebo-controlled study of 143 people with high cholesterol wherein artichoke leaf extract significantly improved cholesterol readings. In Jan., 1999, the *Nutrition Science News* states, "Artichoke (Cynara scolymus) leaves are another liver remedy. Recent animal tests show supplementation with artichoke prevented a liver toxin from causing oxidation, thus preventing glutathione destruction. The active compound, cynarin, is found in highest concentrations in the leaves. Chlorogenic acid and other antioxidants are also present"

Cinnamon bark powder is a plant originally from Sri Lanka and Southeast India still used extensively as a condiment and to treat gastrointestinal disorders. Its scientific names are *Cinnamomum zeylanicum, verum* and *cassia*. Cinnamon alcohol and aldehydes, present in the volatile oil that gives cinnamon its characteristic odor, kill many unfriendly bacteria and fungi that would like to inhabit our intestines. Cinnamon extracts also enhance the effects of the hormone insulin. *(Dr. Richard Anderson, Vitamin and Nutrition Laboratory, Beltsville MD, Human Nutrition Research Center USDA). This is good news for diabetes since it lowers blood sugar in a moderate way. According to Dr. Doss: "It is a spice that helps equalize (high) blood sugar levels without making them dip too low." – Larry Doss MD, peer reviewed medical author and lecturer.* Just recently, the active "insulin mimetic' ingredient, called Type-A Polymers, has been identified registered as Cinnulin PF.

Aloe leaf powder was called the "Plant of Immortality" by the ancient Egyptians. A plant originally from Africa, aloe is either identified as *Aloe vera* or *Aloe barbadensis* by botanists. Aloe gel and latex have found multiple applications in cosmetics and as medicine. Aloe gel is better known for its wound healing properties, as well as a "general tonic" or even as a "cure-all". Aloe gel has been variously described as a cleanser, antiseptic, nutrient, and moisturizer. Aloe has been hailed as benefiting the immune system (by fighting viruses), supporting tissue healing, ameliorating certain inflammatory disorders, improving digestion and gastric ulcers, and even reported as useful in asthma relief. *Pennies NS. Inhibition of arachidonic acid oxidation in vitro by vehicle components. Acta Derm Venerol Stockh 1981; 62:59-61.*

A controlled clinical trial has been published on the traditional use of the aloe gel in treating diabetes. In this study carried out in India a significant reduction in blood sugar and triglycerides was observed in the treatment group. *S Yongchaiyudha and co-workers published in the Journal, Phytomedicine Vol 3, No 3, pp. 241-243, 1997.* Modern food technology allows the preparation of 100:1 extracts!

Bioavailability of Phytonutrients

Maximizing bioavailability of phytonutrients is of vital importance today. To quote Jean Mayer of the USDA Human Nutrition Research Center on Aging, Tufts University, Boston, MA "…the effort to understand the health benefits of plant foods… is the characterization of their physiologically active constituents, the phytochemicals...As our knowledge grows…we will learn how best to create new products through altering their concentrations, combinations *and/or their bioavailability*. (italics Dr. John Maher)" (12

The importance of delivery systems when formulating nutraceuticals is further underlined in the Journal of Drug Targeting, "…antioxidants, which are found in many phytochemicals,… are biologically unstable, poorly soluble in water, and poorly distributed to target sites... we strongly advocate serious consideration of the bioavailability of dietary supplements… to improve their bioavailability using delivery systems such as liposomal formulations."

Today patented nanotechnologies have optimized the engineering of a new generation of liposomes. Compared to previous liposomal technologies, new materials allow spontaneous liposomal encapsulation, minimizing nutrient degradation, while optimizing stability and effectiveness. Liposome encapsulation mimics the strategy utilized in our small intestines to encapsulate poorly absorbed nutrients and nutraceuticals for uptake by enterocytes in the small intestine, maximizing bioavailability!

Summary

The Standard American Diet (S.A.D.) has given rise to an epidemic of obesity, cardio-vascular disease, premature aging and cancer. The message of "5-A-Day" has largely gone unheeded. This is not to say that the "5-A-Day for Better Health" program has not made some progress, but changing the eating habits of a nation comes very slowly. Now in 2005 the American public is being urged by the USDA to eat 7 to 13 a day!

Gourmet juices, wheat grass and salad bars, and the "smoothie" craze are steps in the right direction. Nonetheless, new forms of highly convenient, highly palatable, yet scientifically formulated phytonutrient dense foods, now referred to as *functional foods*, need to become readily available mainstays in the majority of our "convenience food" diets.

Factoid:

"…antioxidants, which are found in many phytochemicals,… are biologically unstable, poorly soluble in water, and poorly distributed to target sites... we strongly advocate serious consideration of the bioavailability of dietary supplements… to improve their bioavailability using delivery systems such as liposomal formulations."

-Journal of Drug Targeting

The ADA on the Value of a Varied Functional Food Rich Diet

In its 1995 report on functional foods the American Dietetic Association conclusion included the following:

The weight of scientific evidence indicates that the optimal approach for achieving a health benefit from the intake of nutrients and other physiologically active constituents is through the consumption of a varied diet that is rich in plant foods... Nutrients and other bioactive food components that occur naturally in foods act synergistically with other dietary elements...In addition...functional food products can be developed that further enhance the health benefits of food... *a combined functional food and food supplement approach may afford the greatest protection (italics mine)....*

The Super Food Solution?

Parallel with the scientific evidence for and professional interest in functional foods, consumer interest in and awareness of functional foods and the associated health benefits is steadily increasing. *Unfortunately such interest does not necessarily readily translate into compliance.* Therefore perhaps the greatest current potential for enhanced compliance is in "dietary supplementation" via good tasting meal replacement shakes, bars, snack and drink mixes requiring no or minimal preparation, formulated from whole functional foods. The "designer functional food" ingredients would consist of a base of very nutrient dense whole foods, fortified with micronutrients and phytonutrients, offered in bioavailable formats. For the public, such nutrient dense functional food snacks, meals and drinks might be rightly crowned "Super Foods".

BioPharma Scientific is dedicated to the development of "functional foods" of *proven purity, potency, bioavailability, and efficacy* that can be readily included in the dietary fabric of the busy, modern world. Most people with liberal food choices will only eat on a daily basis what they enjoy. Our mission at BioPharma Scientific is to create great tasting, highly convenient, all natural, nutrient dense, bioavailable functional foods that can quickly help bridge the gap between a S.A.D. and an optimal whole food, plant based diet now recommended by the USDA.

These statements have no been evaluated by the Food and Drug Administration. This document is not intended to diagnose, treat, cure, or prevent any disease.

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