Antioxidant Digest

DOCTOR PARRIS KIDD /

Antioxidants, Our Natural Protectants: Metabolic Regulators, Antitoxins and Anti-inflammatories

Antioxidants protect us. They are the sub-stances that naturally regulate the fires within our bodies.

The fires are sparked by metabolic errors in our cells—errors that are unavoidable as our cells make and use energy for the business of life. The fires can be managed when we are young and very healthy but become harder to control as we get older. Aging is not so much bad genes as it is a slow, inexorable, cumulative consequence of tissue damage from internal fires, sparked by these unavoidable errors of metabolism.

The sparks of metabolism come from living with oxygen. Our life forms breathe in oxygen and use it to do controlled “burns” that extract energy from our foods. Oxygen-based energy allows us to become more sophisticated than amoebas, but comes with a big price. Oxygen is so reactive that it draws single electrons to it, generating oxygen-free radicals within our cells. These “oxyrads” are our unavoidable “sparks of metabolism.” Antioxidants keep them from destroying our cells.

Our tiny metabolic sparks are generated at a steady rate, the oxyrads having single electrons which cause them to attack biological molecules. Molecules with single electrons are aggressive oxidants: they steal single electrons to become paired up. Antioxidants block this process by donating their own electrons.

The antioxidant defenses dare not fail. When they do, important bio-molecules lose single electrons, themselves become unstable, and initiate spreading chain reactions. A chain reaction that escapes control becomes inflammation, with cell and tissue death and progressive loss of functional capacity. Inflammatory events are our internal fires, opposed by antioxidant enzymes backed up by our dietary antioxidant intakes. Our antioxidant defenses give us power to head off degenerative disease and achieve long life.

By quenching the metabolic sparks, antioxidants are also our natural antitoxins. But if the oxygen-free-radical toxins were the only problem, we'd likely all live 120 years or more. Think about cigarette smoke—100 trillion free radicals per puff. A total 4,000-plus synthetic chemicals in everyday use; even drugs we buy over the counter set small fires. Not to mention the illicit "recreational drugs." Even emotional stress can overheat our metabolism. In this crazy world it's not good to leave home without your antioxidants.

Infectious agents are consistently linked to inflammation. In 1990 I documented inflammatory depletion of antioxidants by HIV-1. Then there's Hepatitis C virus in the livers of four million Americans. The bacterium *Helicobacter pylori* accounts for the majority of inflammatory stomach and intestinal ulcers. About half of the chronically ill American veterans of the Gulf War have mycoplasmal infections. We also can't forget *Chlamydia pneumoniae*, the fungus *Candida albicans* and *Giardia* and amebic protozoal parasites.

Our own host immune system may trigger inflammation from over-reaction to resistant pathogens. The immune cells produce huge quantities of free radicals when on the attack. When pathogens are not easily eliminated, the immune oxidant production can get out of control, resulting in local exhaustion of antioxidant defenses and another inflammatory focus.

Almost every toxic substance steals electrons and therefore can deplete the body's antioxidants. Thus, the body's own efforts to process some substances can actually make them worse toxins. The P450 detoxification system, located mostly in the liver, combines oxygen with water-insoluble substances such as cholesterol, estrogens, pollutants, pharmaceuticals, even herbal constituents. They are made into free radicals, to be later combined with antioxidants and made water-soluble for clearance with the urine or bile. But things don't always go as planned.

The P450 system wasn't designed to deal with the huge mass of toxins that enter the body. Let's talk about acetaminophen. This legal, over-the-counter drug (Tylenol®) is made highly reactive by the liver P450 enzymes. Then it burns away glutathione, the major liver antioxidant, and begins to kill liver cells. Liver failure can result. Organochlorine pollutants, indoor pesticides, mercury and other heavy metals (and let's not forget alcohol and cigarette smoke derivatives) all deplete glutathione and threaten all the tissues.

I recently did a series of in-depth reviews of degenerative diseases. The major pattern I see with atherosclerosis, coronary heart disease, bowel diseases, liver diseases, Alzheimer's disease, multiple sclerosis, Parkinson's, cataract, arthritis, osteoporosis, macular degeneration, prostate diseases, many cancers—is inflammation. By combating inflammation, antioxidants are our essential natural defense against premature suffering and death.

The body relies on foods to replenish its internal antioxidant stores. From our whole, unprocessed foods come the antioxidant vitamins A, C and E; the antioxidant essential minerals, selenium and zinc and copper and manganese; the semi-essential antioxidants coenzyme Q10 (COQ) and alpha lipoic acid (ALA); lutein, lycopene and other carotenoids; the polyphenolic flavonoids and various substances from traditional herbs. These circulate in our blood and contribute integratively to the blocking of free radicals. But a growing body of research indicates we aren't getting enough from our foods for optimal protection against disease.

The healthy body tries to conserve the nutritional antioxidants through metabolic recycling. But still there is a “burn” on our reserves. Dr. Robert Cathcart, the foremost authority on vitamin C , speaks of a “hundred-gram cold,” an influenza so severe it can burn away 100 grams (not milligrams) of vitamin C in just a day or two. A flu attack can be held to just a few days instead of a few weeks by taking lots of C and other antioxidants.

Integrative medical practitioners report that just about all their patients benefit from supplemental antioxidants. Vitamin E has been known for decades to be lifesaving against heart disease.Most of the health food community thinks of vitamin E as tocopherols. But tocotrienols are legitimate members of the vitamin E family and are excellent antioxidants. They are under clinical investigation for benefit against atherosclerotic blood vessel disease and experimentally for the slowing of cancer cell growth and proliferation.

Stephen Sinatra, M.D., a cardiologist and leader in the practice of integrative medicine, has long been a booster for COQ. I can relate to this because I also see COQ's fantastic promise. As I read about health care costs soaring through the roof, I wonder why COQ is not being fortified in our foods to lower gum disease, to improve heart and blood vessel health, to boost immunity and fight cancer development, even (yes!) to lengthen everyone's productive lifespan.

Coenzyme Q10 is unique as a potent antioxidant and indispensable energy catalyst (only ALA has a similar double role). Many of Dr. Sinatra's patients are very deficient in COQ. People taking statin drugs, beta-blockers or certain of the anti-depressants may have their internal COQ synthesis blocked. For them and probably for many of the sick and elderly, COQ is practically a vitamin. Any insufficiency of COQ can endanger the heart through impairing its energetic capacity.

Dr. Sinatra has linked much of the heart disease he sees in women to COQ deficiency. More than 100 clinical studies document that COQ improves congestive heart failure, angina, high blood pressure. About 15 percent of Dr. Sinatra's patients do not improve satisfactorily on COQ alone; these he gives carnitine and then improvement usually occurs. He also sees in the clinical evidence a potential link between poor COQ status and cancers, especially in women.

Selenium is an essential trace mineral, required through the diet though only in small quantities. Selenium has importance for human health that belies its plain mineral status. It is specific for the active sites of the antioxidant enzyme glutathione peroxidase (GP). GP is a central player in control over free radicals.

In 1996 a major paper appeared in the prestigious (and conservative) *New England Journal of Medicine*, making an almost unbelievable claim. It described a double-blind, randomized, placebo-controlled trial in which more than 1,300 subjects were followed for up to 10 years. Dietary supplementation with selenium produced a 50 percent reduction in total cancer mortality. The incidence of cancer was reduced by one-third. Lung, colorectal and prostate cancer incidence were markedly reduced. The material used was SelenoExcell™, an organic selenium concentrate that resembles the selenium found in food.

The carotenoids are, like vitamin E, fat-soluble antioxidants. One of them—lycopene—has been linked to exciting early results against prostate cancer. A small but controlled, clinical trial focused on male subjects undergoing surgery for prostate cancer. Half were offered a dietary supplement of LYC-O-MATO®, a standardized natural tomato extract with four times the typical lycopene content. PSA (Prostate Specific Antigen) levels and prostate tumor size were significantly reduced, compared with the control subjects.

More recently, in a placebo-controlled, crossover trial, LYC-O-MATO® also showed good results in lowering high blood pressure. Its natural combination of lycopene with other plant nutrients may offer a unique synergy for the protection of our health against free radical and other toxic damage.

Lutein is the only carotenoid found in high concentrations in the retina, a thin cell layer at the back of the eye which constantly takes a high dose of light radiation. Macular degeneration destroys the retina and afflicts one out of four Americans over age 65. Lutein is being researched for its capacity to protect the retina and the lens of the eye and it also has anticancer potential.

Grape seed extracts are concentrates of flavonoid polymers. When the great scientist Albert Szent-Gyorgyi received the Nobel Prize for discovering vitamin C, he commented that he had expected to get it for discovering the flavonoids. The small polymers (oligomeric procyanidins) and polyphenols in grapes work synergistically with vitamin C to conserve the functions of the blood vessel linings and walls. Some of these flavonoids also have antiviral and possible anticancer actions.

As scientists continue with their dedicated investigations of food constituents, the latest phytonutrient star is rosmarinic acid (RA). This substance is extracted from a naturally high-yielding strain of oregano and also occurs in thyme and rosemary. All three of these plants have been revered for their medicinal properties literally for centuries. RA appears to have anti-inflammatory and anti-allergic properties, while its high antioxidant potency has proved useful for stabilizing vegetable oils against frying. It has been prepared as a powder without solvents or other processing chemicals. Antibacterial, antifungal and antiviral effects are also being investigated.

Antioxidants are, together with phospholipids, nutrients with profound nutraceutical potential. Whether supplementation with these nutrients will extend the maximum lifespan remains to be proven. Certainly the clinical and experimental studies suggest that functional deficiencies of these nutrients result in cell-level dysfunctions with the potential to spark inflammation that progresses to life-shortening degenerative disease.

We need to keep the fires within us at a very low ebb lest they develop into the raging infernos of uncontrolled inflammation. Consumption of a variety of functional foods and supplements enriched with these nutrients will help keep that doctor away.

Phospholipids, Functional Partners of Antioxidants

by Parris M. Kidd, Ph.D.

Within the cells, circulating lipoproteins, digestive fluids and elsewhere in the body, phospholipids co-occur and co-function with antioxidants. The phospholipids (pronounced fos-fo-lip-ids) self-assemble into membranes and other multidimensional structures, together with antioxidants to protect them against oxidative destruction. This partnership between nutrient classes profoundly influences the health of the whole being.

The cell membranes are dynamic molecular assemblies that house life's plethora of biochemical processes. Our 100 trillion cells all rely on membranes to carry out their functions. Cell membrane organization is shown on the left of the illustration. Catalytic proteins are housed within a flexible bilayer (two molecular sheets), the phospholipid matrix. The matrix also houses antioxidants, including tocopherols and tocotrienols of the vitamin E family; lycopene, lutein and other carotenoids and ubiquinone (coenzyme Q10 or COQ). Also present is the antioxidant enzyme glutathione peroxidase, using selenium as its mineral co-factor.

Phospholipids (PL) are the most biochemically-suited building blocks for membranes. The right side of the illustration shows the molecular plan of a common membrane PL such as PS (PhosphatidylSerine)or PC (PhosphatidylCholine).

The fatty acid tails often are highly unsaturated and therefore susceptible to oxyradical or other oxidant attack. The more unsaturated the membrane, the more antioxidant protection is required. The PL head groups each bring special properties to the membrane. In PS the head group has serine, in PC it has choline. The “prophospholipid” GPC (GlyceroPhosphoCholine) has the choline head group but lacks fatty acid tails, and is absent from the membrane proper.

PS is most concentrated in nerve cell membranes. Its head group associates with membrane proteins particularly crucial to nerve cell functions. These include:

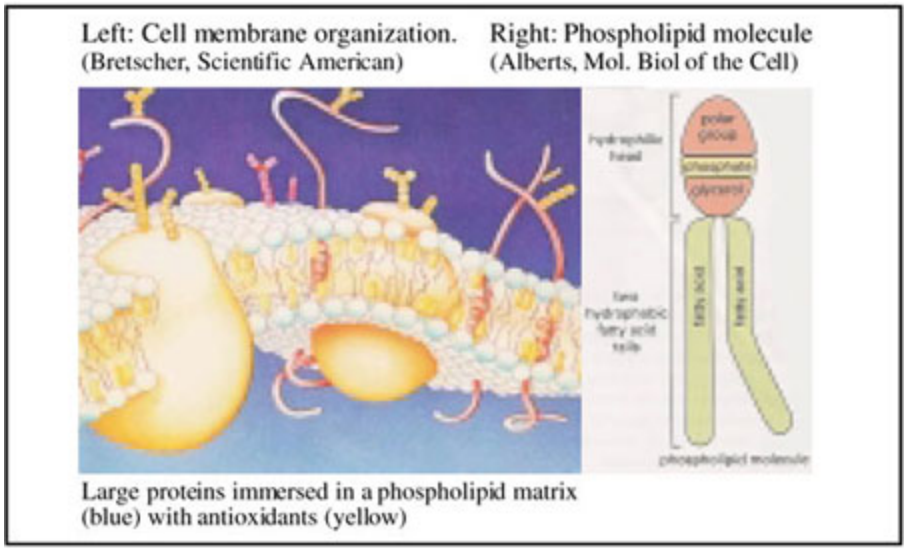
- The sodium-potassium AND calcium-magnesium transporters that use up to 70 percent of all the cell's energy;
- Enzymes for signal transduction—protein kinases and adenylyl cyclases;
- Receptors, sensors for chemical transmitters (acetylcholine, adrenaline, noradrenaline, serotonin, others), also for nerve growth factors;
- Proteins of the mitochondrial membranes, central to energetics. Here PS also is a backup for other phospholipids.

These membrane-level functions of PS translate to health for the whole being. Double-blind trials (20 of them) show PS a superior nutrient for memory support, for partial restoration of declining cognitive function, for coping with stress in the healthy young. Preliminary research suggests PS can improve attention, learning and behavior in children.

The energy for life is generated in cell membranes. In the process oxygen radicals (“oxyrads”) are generated which are highly reactive. However good the antioxidant defenses are, some oxyrads escape control and attack membranes. Thus the brain, with its intense energy generation (up to 60 percent of the body's total), must continually renew its cell membranes. Antioxidants such as

vitamins C and E, the minerals selenium, zinc and manganese, the energizers COQ and alpha-lipoic acid, the carotenoids lutein and lycopene, standardized polyphenolic flavonoids and other food borne antioxidants, all synergize with PS to help optimize brain functions.

The liver is our workhorse organ; its cells contain a total eight football fields worth of membrane area, to perform 500 different functions. In its efforts to detoxify foreign substances it generates a further oxidative load on top of its usual oxyrad burden. Oxidants from foods, viruses, pollutants and drugs challenge the liver's antioxidant capacity. Though the healthy liver is well endowed with antioxidants, oxidant overload can kill cell membranes. Enter PC (PhosphatidylCholine), the most common phospholipid of membranes.



Dietary supplementation with PC has clinically important, sometimes lifesaving benefits for the liver. In eight double-blind clinical trials, PC protected the human liver against alcoholic inflammation, viral infection and toxic prescription rugs, markedly improving the speed and extent of patient recovery.

The liver also carries a substantial reserve of GPC, which is readily converted into PC to make membrane. It is the most bioavailable source of choline to help the liver cells regenerate and perhaps for similar reasons is highly concentrated in mother's milk.

Taken by mouth, GPC quickly clears the blood-brain barrier to reach the brain. Working through various mechanisms, it sharpens attention and immediate recall in young, healthy subjects. In the middle-aged it benefits information processing and general mental focus. In the elderly it improves declining cognitive functions linked to circulatory damage. GPC's support for nerve cell functions, including a protective role as osmotic buffer, make a convenient biochemical fit with the antioxidant defenses operative in the brain.

Functional partnership between phospholipids and the antioxidants is not limited to membranes. The circulating lipoproteins produced in the liver (HDL, LDL and others) are made mostly from PL building blocks. Dietary PL facilitate normal, pro-homeostatic lipoprotein status, probably through their support of the liver.

The LDL are the main vehicles for delivery of fat-soluble antioxidants—E, COQ, alpha-lipoic, carotenoids, others—to the tissues. In all of 12 double-blind trials, phospholipid mixtures lowered abnormally high total- and LDL- cholesterol without harming the HDL levels. In another double-blind trial, PL significantly improved blood flow to the brain and improved abnormal platelet aggregation. These marked circulatory benefits of the PL clearly complement antioxidants' benefits for the circulating lipoproteins and blood vessel walls.

Phospholipids combine with antioxidants in facilitating digestion. The bile fluid is essential for fat digestion and absorption. Bile has a large content of PL, functioning with the antioxidant taurine as micellizing agents to fully disperse the fat molecules. Fatty acids of the omega-3 or omega-6 class make up many of the phospholipid "tails." These are held in position by their parent PL molecules while enzymes break away prostaglandins (PG) and other messenger molecules. Membrane antioxidants help regulate the PG formed, to support a favorable balance.

The natural co-functioning of phospholipids with antioxidants in our cells and tissues suggests combination supplements for synergistic benefits. In particular, a new technology (NutriVail™) employs custom phospholipids to make monomolecular dispersions of antioxidants, with the aim of substantially enhanced bio-availability and unique clinical benefit.

Peer-reviewed publications available on request. Dr. Kidd is scientific consultant to Lipoid USA.

Lutein For Eye Health

Recent scientific studies showing a clear association between lutein intake and a decreased risk of age-related macular degeneration (AMD) and cataracts are capturing the attention of both consumers and their eye doctors. The need is growing clearer:

- One out of four people aged 65 or older has early signs of AMD.
- One out of two people aged 65 or older has a cataract or cloudiness in the eye's lens.
- As the largest population group in the United States ages, many people are facing the likelihood of what some simply accept as part of aging, vision loss.

A Food and Nutrition Board report found that lutein is the nutrient most strongly associated with decreased risk of AMD and cataracts.

Lutein and Age-Related Macular Degeneration

Prevent Blindness America estimates that 13 million people in this country have evidence of AMD, a condition that gradually destroys central vision. While the exact cause of this debilitating condition is still unknown, family history and age are known factors.

Lutein is found in the macula's "yellow spot," a tiny region at the center of the retina. This tiny yellow spot filters blue light for the color vision cells within the retina. The researchers found that lutein is deposited in the retina and macula, increasing its density and protecting the tissue from oxidation by filtering blue light and quenching free radicals.

Experts say that by the time a person exhibits symptoms of AMD the disease has been developing for decades. Baby Boomers are showing concern about their aging eyesight and stocking up on supplement products formulated with lutein to reduce risk of age-related macular degeneration.

Lutein and Cataracts

While cataracts generally occur in people over the age of 65, they are occasionally found in younger people as well. A cataract is a clouding that develops in the normally clear lens of the eye. This process prevents the lens from properly focusing light on the retina at the back of the eye, resulting in a loss of vision.

Lutein's link to cataracts is recent but well documented. Studies published in *The American Journal of Clinical Nutrition* found that women with the highest intake of lutein and its fellow carotenoid antioxidant, zeaxanthin, had a 22 percent reduced risk for cataracts; men had 19 percent reduced risk.

“Many people have been told that nothing can be done about cataracts—that they are a natural effect of the aging process,” says Robert Abel, Jr. M.D., author of The Eye Care Revolution and member of the Lutein Information Bureau Advisory Board. “But they're now finding out that dietary changes, including consumption of lutein, may have a significant impact on risk reduction.”

At the same time, consumers are taking charge of their eye health and seeking out possible solutions. A recent independent survey of consumers shows lutein awareness at 44 percent across all age groups and at more than 57 percent among consumers aged 65 years or older.

Mounting scientific evidence also has convinced eye doctors of the many benefits of lutein, with 84 percent currently recommending lutein to their patients, according to an independent survey of 300 U.S. ophthalmologists and optometrists.

These eye doctors also support use of lutein for long-term eye health (91 percent), believe consumers should supplement their diet with lutein daily (71 percent) and believe lutein is the nutrient that best supports long-term eye health (58 percent).

What is lutein?

Lutein (LOO-teen) is a nutrient found predominantly in vegetables, particularly in dark green, leafy vegetables such as spinach and kale. Lutein belongs to a class of natural, fat-soluble pigments called carotenoids. It promotes long-term eye health in two ways. First, acting as a light filter, lutein protects the eyes from some of the damaging effects of the sun. Second, as an antioxidant, it protects the eyes from the damaging effects of aging.

Foods considered good sources of lutein and zeaxanthin include:

- Eggs
- Leafy greens like spinach, kale, turnip greens, collard greens, and romaine lettuce
- Broccoli
- Zucchini
- Garden peas and Brussels sprouts

Lutein is found naturally in the human body. In fact, it is the only carotenoid found in large quantities in the retina and at low levels in the lens of the eye. The human body is unable to manufacture lutein, however, so the body must rely on the consumption of lutein-rich foods or lutein supplements to replenish lutein levels and counteract oxidative damage from light as well as the effects of aging.

A 1994 Harvard University study by Dr. Johanna Seddon pointed first to lutein's important role in maintaining long-term eye health. Since then, more than a dozen scientific studies published by such peer-reviewed medical journals as the *Journal of the American Medical Association*, Archives of Ophthalmology and the *American Journal of Clinical Nutrition* have continued to show an association between lutein intake and various long-term eye health benefits.

Editor's Note: Look for a good quality supplement combination of Lutein and Zeaxanthin containing either FloraGLO® brand lutein or Lutemax 2020 and Zeaxanthin. Check our Products We Like section for more information on recommended products

Lyc-O-Mato® Standardized Natural Lycopene Complex

by James Balch, M.D.

The good news is that there is clinical proof you can build a powerful antioxidant defense system against prostate cancer. By incorporating LYC-O-MATO® (standardized natural tomato extract) into your daily nutrition program you can access remarkable fighting power against prostate cancer and a host of other degenerative diseases.

The standardized natural tomato extract contains several phytonutrients found in tomatoes including lycopene, tocopherols, vitamin E, phytofluene, phytoene, phytosterols, beta carotene and more. LYC-O-MATO is extracted from non-GMO tomatoes grown in Israel that contain four times the lycopene content of tomatoes grown elsewhere.

A six-year Harvard Medical School study of healthy males found that consuming tomatoes, tomato sauce or pizza more than twice a week, as opposed to never, was associated with a reduced risk of prostate cancer of 21 to 34 percent, depending on the food.

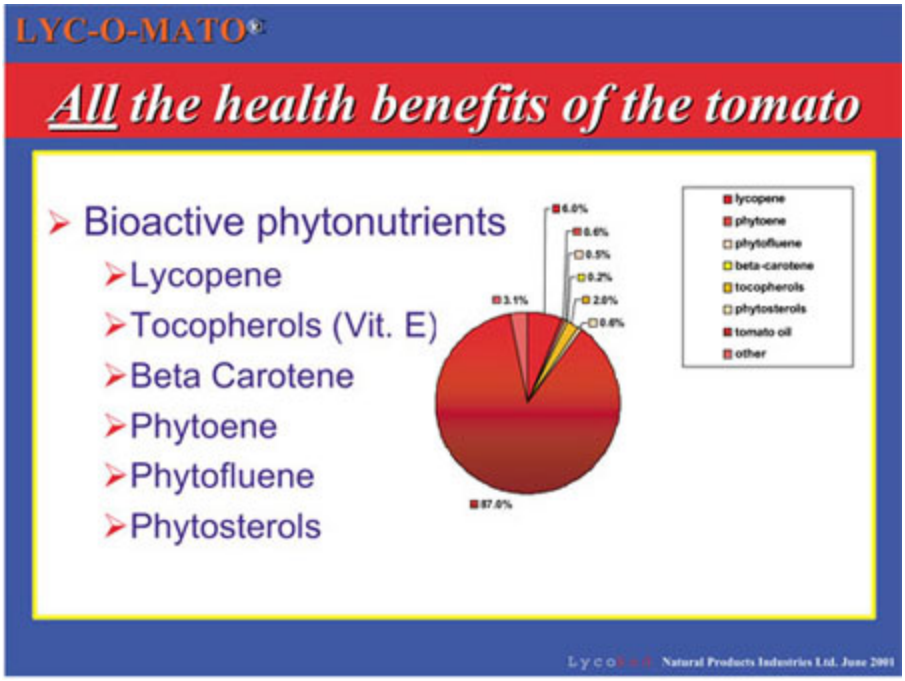
As exciting as its cancer-prevention potential is the evidence that shows lycopene may help fight existing cancer. A recent paper published in the *Cancer Epidemiology, Biomarkers and Prevention* by Omer Kucuk, M.D., professor of medicine and oncology, and his colleagues at the Karmanos Cancer Institute in Detroit, Michigan, evaluated the effect encapsulated LYC-O-MATO had on patients with existing prostate cancer. In this study, Dr. Kucuk and colleagues followed 30 men with localized prostate cancer who were scheduled to undergo surgical removal of the prostate. For three weeks prior to surgery the study participants were randomly assigned to receive either 250 milligrams LYC-O-MATO from LycoRed Natural Products, Beer-Sheva, Israel (which contains 15 milligram of lycopene) twice daily or no intervention. Following removal of the prostates, the glands were analyzed to determine whether there were any differences between the two study groups.

The investigators found that the treated group had smaller tumors, which were more likely to be confined to the prostate. Levels of serum PSA were found to decline in the patients who received LYC-O-MATO tomato extract. In addition, the tumors in patients who consumed this natural lycopene showed signs of regression and decreased malignancy.

“This was the first published report from a randomized prospective clinical trial showing the efficacy of a tomato extract supplement against prostate cancer,” said Dr. Kucuk. “Previous reports were largely epidemiological studies showing an association between consumption of

tomato products and decreased risk of prostate cancer. Furthermore, our findings suggest that a tomato extract in the form of LYC-O-MATO may not only help prevent prostate cancer but also may be useful in treating prostate cancer."

Research using standardized LYC-O-MATO natural tomato extract is also good news for mild hypertensive patients reluctant to make lifestyle changes.



Findings published in the *The American Journal of Hypertension* provide evidence that LYC-O-MATO may help lower blood pressure in hypertensive patients. The study, presented at the Sixteenth Annual Scientific Meeting of the American Society of Hypertension on May 18, 2001, may provide a new alternative for about 50 million Americans who have hypertension.

Americans interested in lowering their risk of high blood pressure are frequently encouraged to exercise and follow a low-fat diet rich in fruits and vegetables. Typically, however, many are reluctant to make changes in their lifestyles. In fact, according to NOAH, an online health resource maintained by City University of New York, only 68 percent are aware of their high blood pressure condition and only 27 percent have it under control. High blood pressure contributes to 75 percent of all strokes and heart attacks.

Now there is a natural alternative to controlling hypertension that may prevent Americans from making difficult lifestyle changes and/or taking drugs with harmful side effects.

In a single-blind, placebo-controlled crossover trial, Esther Paran, M.D., the study's principal investigator, evaluated the effect of LYC-O-MATO® on grade 1 hypertensive patients. In this study, 30 grade 1 hypertensive patients between the ages of 45–60 were administered a daily dose of identical placebos for the first four weeks of the study, followed by a 250 mg daily dose of LYC-O-MATO® for the final eight weeks of the study.

Preliminary results of this study indicate a significant reduction in systolic blood pressure in treated patients. “We are optimistic about LYC-O-MATO'S potential in managing hypertension,” Dr. Paran said. “The results of this study demonstrate the ability of LYC-O-MATO® to reduce systolic blood-pressure, warranting additional studies in the future.”

Other recent studies suggest that LYC-OMATO ® also provides a considerable level of defense against degenerative diseases including heart disease. Considering the results of these studies, combined with its positive effects on blood pressure, the importance of maintaining a normal level of natural phytonutrients like lycopene, phytoene, phytofluene and beta carotene in the human body is evident. It is recommended that individuals consume at least 80–250 mg of LYC-O-MATO® per day, which contains 15 mg of lycopene as well as other phytonutrients, to maintain good health.

www.lycomato.com, or visit the American Society of Hypertension Web site at www.ash-us.org

Grape Seed Extract and the French Paradox

What is the French paradox?

Several years ago, epidemiologists studying heart disease in Europe noticed something strange—high fat leads to heart disease, right? Not in France. The French eat a large amount of cream, rich sauces, delicious desserts and a wide variety of tasty cheeses. Yet heart disease is lower in France than the rest of Europe. This phenomenon is called the French paradox. Check this out—the French imbibe more wine than the rest of Europe.

The goodness of wine—flavonoids

What's in the wine? Water, alcohol and several other compounds (such as sulfur dioxide, carbon dioxide, tartaric acid) and more importantly flavonoids. Flavonoids are a large group of phenolic compounds that occur in fruits, cereals, legumes, vegetables, nuts, seeds, herbs, spices, stems and flowers and also in beverages such as tea, cocoa, beer and wine. Flavonoids have several

properties that could prevent heart diseases. They are antioxidants that help with the oxidation of low-density lipoproteins (LDL). They also have anti-inflammatory properties and a beneficial effect on blood vessels as well.

Grape seed—a vital source of flavonoids Grape seeds contain 5–8 weight percent of flavonoids. Commercially available grape seed extracts such as MegaNatural™ Gold (Polyphenolics, Madera, California) are a rich source of flavonoids. Benefits of flavonoids For several years scientists at the University of California-Davis have studied the effect of flavonoids from grape seeds on blood vessels and how it can reduce cardiovascular risk factors. Loss of endothelium-dependent relaxation (EDR) due to atherosclerosis is the primary cause for the formation of plaque in coronary arteries that leads to heart disease. EDR is caused by the release of nitric oxide (NO) from endothelial cells of the blood vessel. Experimental evidence led to the speculation that the release of NO could be mediated by a series of events that are initiated by a receptor, which is specific to flavonoids. EDR can be readily demonstrated by control experiments using established procedures. The effect of flavonoids on EDR was studied in detail over the past several years. Previous studies regarding the effect of flavonoids on EDR yielded conflicting results, possibly due to the variations in he quality of the extracts examined. However, recent studies using the commercially available grape seed extract MegaNatural Gold provided conclusive evidence that flavonoids have a protective effect against the development of endothelial dysfunction.

In the experiments, a group of rabbits fed only with cholesterol showed loss of EDR. But, a group of rabbits fed with both grape seed extract, MegaNatural Gold and cholesterol showed no loss of EDR, proving the protective effect of the grape seed extract, MegaNatural Gold.

Antioxidant activity of grape seed extracts Another study at the University of Scranton has demonstrated the superior antioxidant activity of grape seed extracts (GSEs) overwine, grape juice, vitamin C and vitamin E. Commercial products like MegaNatural Gold were used for both the in vitro and in vivo studies.

In one such study, a significant increase in the blood plasma antioxidant activity was observed within one or two hours after the consumption of grape seed extract. Nine human volunteers were given a 600 mg dosage of GSE and by using the RANDOX bio-assay study an increase up to 12 percent of blood plasma antioxidant activity was observed. This dosage could be correlated to drinking 300 ml of red wine or consuming 1250 mg of vitamin C.

In order to determine the GSE dosage that is required to have a higher bio-availability of polyphenols in blood plasma for improved antioxidant activity, nine subjects were given varied dosages of the flavonoid, epicatechin. Epicatechin is one of the flavonoids present in all grape seed extracts. The in vivo antioxidant study has shown that a dosage of 300 mg was more effective than 200 mg. In fact at 300 mg the antioxidant capacity in the blood was still increasing after four hours, indicating that at this dose the antioxidant effect will remain in the blood for six to eight hours.

A long-term study involving a dosage of 2 x 300 mg/day of GSE with 17 human volunteers was also conducted to understand the beneficial effect of GSE in reducing high cholesterol. Patients with high cholesterol experienced a decline in total cholesterol up to 12 percent and a corresponding decrease up to 16 percent in LDL, the so-called "bad cholesterol" as well.

These studies have once again confirmed the long-term effect of GSE s in controlling the level of cholesterol and triglycerides and reducing the risk of heart disease.

Implications for heart disease Endothelial dysfunction (loss of EDR) exists in hypertensives, diabetics, smokers, postmenopausal women and individuals with hyperlipidemia. All of these conditions are potential cardiovascular risk factors. Experimental evidence leads to the belief that polymeric flavonoids as a part of the diet may have a protective effect against the development of endothelial dysfunction. These findings, along with the established anti-inflammatory and antioxidant effects of flavonoids, could be a possible explanation for the French paradox.

A substitute for aspirin for heart health?

Many individuals take an aspirin a day to prevent their blood from becoming too "sticky." Technically they are trying to prevent an increase in platelet aggregation. Blood platelets are like tiny band-aids in that they help to seal wounds by causing the blood to clot. Unfortunately, if the platelets clump (aggregate) too readily, they can cause a great deal of damage to the arteries. They can further the development of arterial plaques and they can reduce the flow of blood through the capillaries. Diabetics and smokers are two groups which commonly suffer from poor circulation and excessive platelet aggregation. Not surprisingly, both groups suffer from elevated rates of damage to the arteries.

Aspirin may provide some potential benefits for the heart, but it also has a number of side effects. The best known of these are damage to the stomach and the small intestine, but there are other dangers such as excessive bleeding (an increase in bleeding time—including inside the eye) and a reduced rate of repair to the tendons and the joints.

Do we really need these side effects? Of course not. Grape seed extract provides extended protection against platelet aggregation without causing any unwanted increase in bleeding time. A number of tests have confirmed this protection including human trials conducted by Serge Renaud of the French National Institute of Health and Medical Research. Dr. Renaud demonstrated that grape seed extract can protect against the rebound in platelet aggregation which follows the ingestion of alcohol. Moreover, the compounds found in grape seed extract have a special affinity for the surfaces of the vascular system, the "pipes" as it were, of the body. This special affinity appears to improve the elasticity and the permeability of the capillaries, veins and arteries—the entire vascular system. Grape seed extract protects the ground substance (the proteoglycan matrix) of the blood vessels directly while at the same time it reduces the unwanted adhesion of platelets and other blood components. The suggested intake for these benefits is 200 to 300 milligrams (mg) per day.

The Health Advantage of Food-form Selenium

by Bill Sardi

"The finding that selenium, an essential nutrient posing negligible risk at the 200 mcg intakes studies, can substantially cut the risk of death from cancer is really a revolutionary finding. I cannot think of any other agent, nutritional or pharmaceutical, that is proven to cut the deaths from cancer by half in any human population anywhere in the world. "These remarkable clinical outcomes with selenium for cancer prevention are not a deviation from other research with selenium conducted with animals, with selenium-antioxidant enzymes, with cells in culture. Yet the potential they represent for cutting the emotional, spiritual and financial costs that cancer imposes on human society is almost beyond belief. Just shut your eyes for a moment, take a deep breath and think of all the people you have known who suffered and died from cancer."

—Parris M. Kidd, Ph.D., science editor *Total Health*

SCIENTISTS FIRST CALLED SELENIUM TOXIC. THEN FOLLOWING ITS RECOGNITION FOR ANIMAL HEALTH, RESEARCHERS IDENTIFIED IT AS AN ESSENTIAL ELEMENT FOR HUMAN GROWTH.

Now investigators wonder where the health benefits of selenium stop. The first selenium function in animals wasn't discovered until 1973. Dr. John Rotruck and his colleagues at the University of Wisconsin demonstrated that selenium was incorporated into molecules of an enzyme called glutathione peroxidase (GPX). This vital enzyme protects red blood cells, cell membranes and sub-cellular components against undesirable reactions with soluble peroxides. The discovery of GPX opened the door to our understanding of how selenium is protective against cancer, heart disease, arthritis and accelerated aging.

This much misunderstood trace mineral may not gain the status of a drug simply because its primary role is disease prevention. Wherever soil is rich in selenium, certain diseases of livestock are virtually non-existent.

But how could selenium, provided in dosages less than the weight of a paper clip, protect a 150-pound human from disease?

Selenium and Cancer

In what was called the most startling cancer prevention study ever published, University of Arizona and Cornell University researchers recently discovered that selenium food supplements significantly reduce the incidence of nearly all forms of cancer. In 1996 researchers Larry Clark, Gerald Combs and Bruce Turnbull of Cornell University reported on the 10-year use of a 200 microgram supplement of protein-bound selenium among 1312 patients with a history of basal cell or squamous cell skin cancer. While selenium had no effect upon skin cancer, it had a startling effect upon other types of tumors.

A Harvard researcher was quoted as saying: “If the effect of selenium is this large, it would be more important than anything else we know about in cancer prevention.” The results of the multi-center study were so surprising, many health researchers still want more proof.

Larry Clark, the senior researcher in this study, remarked that the type of selenium used in this study is not commonly found in all vitamin supplements. It's a special type of selenium that is grown organically in yeast. “Most of the selenium on the market is inorganic sodium selenite or sometimes they throw sodium selenite into yeast, but they are not bound together as the yeast grows, yet it is still called high-selenium yeast.”

Which type of selenium supplement?

In plant foods, selenium is bound to an array of amino acids (methionine, cysteine, others) and is thus a more stable form. In 1984, a MIT study determined that organically-bound forms of selenium are able to increase the body selenite exchangeable pool size about 70 percent more effectively than inorganic selenite or selenate. The superiority of protein-bound selenium is demonstrated in recent study where selenium-enriched broccoli was shown to inhibit colon tumors in rodents. Researchers observed that selenium-enriched broccoli is more effective than inorganic forms of selenium against colon tumor formation.

Another example of the superiority of protein-bound selenium over inorganic selenium has become apparent in studies of eye disease. One report suggests that “dietary supplementation with selenium should be explored as a means of preventing macular degeneration.” However, researchers have found that blood levels of selenium were lower among patients with macular degeneration even though seven of 10 patients studied took selenium supplements, mostly consisting of 80 micrograms of inorganic selenium (selenate). Lack of consumption of selenium does not appear to be the problem in these cases. Researchers surmise that the form of selenium is of importance. Some studies report that even 200 microgram doses of inorganic selenium fails to increase blood plasma levels of selenium in the eye, while amino acid-bound selenium increases plasma and whole blood levels.

Consumers should look for organically-bound selenium in supplements rather than the inorganic forms (selenite, selenate). The question is how to duplicate the same selenoproteins provided in plant foods in a food supplement?

Slow-growing *Saccharomyces cerevisiae*, baker's yeast, is employed to bind amino acids naturally with selenium. Some selenium food supplements only mix inorganic selenium with yeast but this is a shortcut that fails to do what nature does—slowly incorporate selenium into an array of about 20 amino acids. Yet the label on these food supplements may still read “selenium yeast.”

Numerous food supplements provide selenium bound only to one amino acid, selenomethionine. But the food supplement that dramatically reduced the cancer risk in 1996 employed a form of selenium bound to a full array of amino acids, like in foods. Only one brand of food supplement provides this complete food-form selenium, called SelenoExcell.

Due to years of misinformation the word “yeast” draws the attention of some consumers who believe they must avoid yeast products. Beneficial nutritional baker's yeast does not contribute to yeast infections such as *Candida albicans*. Selenium yeast is carefully pasteurized and dried after it is grown. This kills the yeast and it can no longer grow or multiply. Brewer's yeast has been a staple of the health food industry since its inception and is no cause for concern.

Only one company is going through all the trouble to manufacture a consistently reliable form of selenium organically bound to a full array of amino acids as found in foods. It goes by the trade name SelenoExcell.™. All forms of selenium have health benefits. But we have to go with the science. Until we know more, look for that branded ingredient.

Bill Sardi is president of Knowledge of Health, San Dimas, California.

ROSMARINIC ACID

by Rina Reznik, Ph.D.

To protect ourselves we invest in lifestyle changes, exercise, a healthy diet and supplementation. Antioxidants are only one element in the big picture, so products with multiple uses are particularly useful. After all, there's a limit to the number of supplements we can swallow in a day, let alone afford, so we need to supplement wisely. For example, consuming un-denatured whey protein raises intracellular glutathione levels and takes advantage of its three protective functions: T-cell synthesis, anti-oxidation and detoxification. Spirulina is an effective dietary antioxidant with dozens of well-known health benefits. Rosmarinic acid is another product that offers multiple advantages.

Rosemary and its cousins, oregano and thyme, have been known for their medicinal properties for centuries and rosemary oil has long been used in cooking, aromatherapy and in hair and skin tonics. It has been described traditionally as good for the skin, scalp, digestion and treatment of colds and is used as an antiseptic, stimulant and antispasmodic. Today medical scientists are particularly interested in rosmarinic acid for its anti-inflammatory, antiallergic and antioxidant properties.

Rosmarinic acid's multiple value also lies in its boxer's one-two approach: first, as a purely natural food additive it prevents or neutralizes the harmful oxidation that takes place while food is on the shelf, enhancing its quality and helping to prevent an additional tax on the body's over-burdened defense system. Then once the food is eaten, the same additive turns out to be a powerful dietary antioxidant. Of course it can also be used for direct supplementation. An added bonus is that rosmarinic acid does not interfere with intracellular oxidant-antioxidant balance and enables the immune system's phagocytes to use their free-radical weapons effectively against incoming disease organisms.

RA's antioxidant power

The most common free radicals attacking living tissue are reactive oxygen species (ROS)—or oxyradicals. They include the peroxyl, nitric oxide and superoxide-anion radicals plus singlet oxygen, peroxynitrite and hydrogen peroxide. Worst of all is the dangerous hydroxyl radical, formed by the combination of the weaker superoxide radical with hydrogen peroxide. Rosmarinic acid neutralizes the superoxide-anion and thus makes a major contribution to curbing oxidative damage in the body.

Rosmarinic acid also takes the heat of the more well-known antioxidants by getting into the fray and dealing with free radicals first, leaving vitamins C, E and others intact for later use. This extract is also one of the few antioxidants able to cross the blood-brain barrier and combat the superoxide radical in the brain, where researchers hope it may help prevent or combat such degenerative conditions as Alzheimer's disease.

Researchers at the Israeli biotechnology company, RAD Natural Technologies, discovered that certain natural species of the plant *Origanum vulgare* contained particularly high concentrations of rosmarinic acid. Without genetic modification the plant yields a highly purified extract that is effective in very low concentrations. With neither solvents nor processing chemicals, RAD Natural Technologies is able to preserve the integrity of the plant extract and produce a water-soluble powder that can alternatively be emulsified and thus dissolved in fats and oils. It is ideal for industrial applications. If you've always thought of antioxidants as pills and dietary supplements, think again.

The company's rosmarinic acid product is called Origanox and it is sold for food processing, cosmetic and dietary purposes. Its antioxidant properties preserve natural pigments, odors and flavors and also protect vitamins and other active ingredients from the degenerative effects of oxidation. It also possesses antibacterial, antifungal, antiviral and anti-inflammatory properties and is easily absorbed into the skin, where it potentially supports to neutralize the harmful effect of ultraviolet radiation.

Rosmarinic acid maintains its electron-absorbing properties at sustained high temperatures. That means that when it is added to edible oils, the number of free radicals released by frying is diminished. It is stable for long periods and at temperatures as high as 180 C⁄356 F so it can be baked into foods without impairing its antioxidant properties.

In Summary

Free radicals come at us from every conceivable direction and we need a good variety of antioxidants to protect ourselves. Some, like glutathione, are produced by the body, and are dependent upon a supply of raw materials from dietary sources. Others, like vitamins C and E, are built into the foods we eat or supplement in our diets. We may not be used to thinking of food preservatives as health aids but rosmarinic acid is a valuable aid that supports to preempt free radicals before they form in stored food and prevents the most harmful effects resulting from cooking with all sorts of oils. It also functions as a powerful antioxidant with the rare ability to cross the blood-brain barrier.

The essential oil of *Origanum vulgare* is a powerful, anti-microbial agent and natural, antiseptic product. It has many, very promising applications in certain feed and food products besides being a flavor enhancer and therapeutic component in health food supplements. This potent and adaptable product promises to become a valuable addition to our preventive medicine arsenal.

Tocotrienols—Their Role In Health

by Andreas M. Papas, Ph.D.

TOCOTRIENOLS ARE MEMBERS OF THE VITAMIN E FAMILY.

Mention vitamin E and most people, even scientists, think alphatocopherol. It is only recently that scientists and now the consumers have been reminded that vitamin E is a family of compounds.

Tocotrienols are members of the vitamin E family. Unlike some vitamins which consist of a single compound, vitamin E consists of eight different compounds, four tocopherols and four tocotrienols (designated as alpha, beta, gamma and delta). Our food contains all eight compounds. Most vitamin E supplements, however, contain only alphatocopherol because it was thought that only this one was important. Emerging research proved this understanding wrong. In order to get the full spectrum of the many benefits of vitamin E we must use products that contain the complete family of tocopherols plus tocotrienols.

Tocotrienols are most abundant in cereal grains and the fruit of palm and are extracted commercially from palm oil and rice bran oil.

Tocopherols and Tocotrienols: Similarities and Differences

Each tocotrienol has similarities to the corresponding tocopherols. For this reason tocotrienols, like tocopherols, are excellent antioxidants. Tocotrienols however, have three unsaturated sites on the tail of the molecule. Scientists are discovering important and unique benefits of tocotrienols.

Underscoring the importance of taking the whole vitamin E family is the evidence that not only tocotrienols but even the other tocopherols have unique functions different from those of alpha-tocopherol. For example:

- Gamma-tocopherol, not alpha, is the effective form for fighting nitrogen radicals which contribute to the development of arthritis, multiple sclerosis (MS) and diseases of the brain such as Alzheimer's.
- Gamma-tocopherol and its major metabolite inhibit cyclooxygenase activity. This effect is very important because cyclooxygenase causes inflammation, which contributes to the progression of chronic diseases including heart disease and cancer.
- High blood levels of gammatocopherol in men are associated with lower risk of prostate cancer.

The Science Behind the Unique Functions of Tocotrienols

Research produced evidence of the biochemical basis of the important and unique effects of tocotrienols. Tocotrienols and in particular gamma-tocotrienol appear to act on a specific enzyme called 3-hydroxy-3-methylglutarylcoenzyme A reductase (HMG-COA) involved in cholesterol production in the liver. Tocotrienols suppress the production of this enzyme, which may result in less cholesterol being manufactured.

Tocotrienols slow down the growth of some types of human cancer cells, and particularly breast cancer cells, while alpha, beta and gamma tocopherols are ineffective. Gamma-tocotrienol suppresses the growth of rat melanoma and human leukemia cells, human breast adenocarcinoma and human leukemic cells.

Benefits for Cardiovascular Health—Clinical Evidence

The strongest evidence yet for tocotrienols comes from a clinical study in which 50 patients had stenosis of the carotid artery. These patients, ranging in age from 49 to 83 years, were divided in two groups. One group received approximately 650 milligrams of tocotrienols plus tocopherols. The other group received a placebo. All patients were examined with ultrasonography which measures the narrowing of the carotid artery.

- Placebo group: Fifteen patients showed worsening of the stenosis, eight remained stable and two showed some improvement.
- Tocotrienol (plus tocopherol) group: Three patients showed minor worsening and 12 remained stable. What is remarkable is that 10 patients showed regression of stenosis—their condition improved.

The tocotrienol group had also significant reduction in TBARS, a test that measures oxidation. A tocotrienol-rich extract from rice bran oil reduced triglycerides and LDL in these patients. We are studying further these effects of tocotrienol-rich products from rice bran oil.

Topical Use of Tocotrienols

Tocotrienols, like tocopherols, protect the skin against damage from ultraviolet radiation, pollution, cigarette smoke and other stress factors. Topically applied tocotrienols and tocopherols penetrate the entire skin to the subcutaneous fat layer within 30 minutes and significantly increase the concentration of these antioxidants in the deeper subcutaneous layers.

Safe and Effective Use Levels

Tocotrienols and vitamin E in general have an excellent safety record.

How much tocotrienols to take? Please remember that tocotrienols are available commercially as mixtures with tocopherols. If you are at high risk for heart disease, you may consider levels up to 300 mg per day of tocotrienols. For the great majority of consumers who want to get the benefit of the complete vitamin E family, much lower levels may still provide benefits.

It is extremely important to take products that contain natural tocopherols plus tocotrienols. While our individual needs differ, the following general guidelines might help choose the right level for you.

- The adequate level—the 100/100 system: Take 100 IU plus 100 mg of mixed tocopherols and tocotrienols. For healthy young adults with no family history of chronic disease.
- The medium level—the 200/200 system: Take 200 IU plus 200 mg of mixed tocopherols and tocotrienols. For young adults with some risk factors and healthy people without risk factors up to 50 years old.
- The high, yet very safe dose—the 400/400 system: Take 400 IU plus 400 mg of mixed tocopherols and tocotrienols. This is the level for people who, because of their family history for chronic disease, age, level of stress, diet and other factors, want to take a higher level.

Andreas M. Papas, Ph.D., is the author of *The Vitamin E Factor* (paperback) and editor of the scientific book *Antioxidant Status, Diet, Nutrition and Health*, Dr. Papas is senior technical associate at Eastman Chemical Company and adjunct professor, at the College of Medicine of East Tennessee State University and senior scientific advisor, Cancer Prevention Institute, Harvard School of Epidemiology. —www.vitaminefactor.com

Ten Additional Important Antioxidants

COQ10 FOR ANTI-AGING AND A HEALTHY HEART

Coenzyme Q10 is an antioxidant compound similar to vitamin K and is naturally manufactured in the liver as well as every cell in the body. But even though COQ10 is produced in the body, many people have deficiencies, especially those suffering from cardiovascular disease and heart failure.

Every cell must have a way of obtaining energy. In cardiac cells, as well as throughout the body, oxygen-based production occurs within the cellular power plants called mitochondria. Here COQ10 provides essential energy in its most basic form—adenosine triphosphate (ATP)—the energy of life. Without adequate COQ10 as a cofactor, ATP synthesis slows down, eventually leaving the cell in a vulnerable state.

Dietary sources of COQ10 come mainly from beef heart, pork, chicken liver and fish (especially salmon, mackerel and sardines). Vegetarians typically will not get enough COQ10 unless they eat large quantities of peanuts and/or broccoli. The average person only gets five to 10 mg of COQ10 each day from diet alone. Most people would benefit from far more COQ10 than can be gleaned from the daily diet.

Although COQ10 can be synthesized by the body, many individuals are deficient in this vitamin. Illness depletes the body's stores even further. Taking cholesterol-lowering drugs such as HMG-COA reductase inhibitors can literally “kill” COQ10 synthesis. Other drugs, such as beta blockers and some of the older antidepressants, also interfere with COQ10-dependent enzymes, lowering its concentration in the body.

Any women taking a statin drug, especially those at high risk for breast cancer, should take at least 100 mg of COQ10 a day.

VITAMIN C

Vitamin C (ascorbic acid) is a very powerful nutrient and the premier water-soluble antioxidant. It participates in over 300 biochemical reactions in the body and is important in maintaining homeostasis as well as building tissue.

Death is inevitable if vitamin C is not provided. It is truly essential to human life. New research into the actions of vitamin C has sparked a greater understanding of the remarkable health-promoting properties of this essential nutrient. The new evidence validates that vitamin C supports cardiovascular and respiratory function, cognition, bone development and mineralization, vision and may even lower the risk of stress-related diseases and certain types of cancer.

- **Cardiovascular Health.** High dietary vitamin C intake has been shown to significantly reduce the risk of death from heart attacks and strokes in numerous population studies. Also, researchers have found that vitamin C offsets spasms of the coronary arteries.
- **Immunity Booster.** A recent study reported an 85 percent lower incidence in cold and flu symptoms with high vitamin C doses.
- **Collagen Maintenance.** Vitamin C is important for the formation and maintenance of collagen, the intercellular cement that binds tissues together. Collagen provides tensile strength to bones, cartilage, teeth, tendons and ligaments. There is a positive association between vitamin C and bone mineral density (BMD) in postmenopausal women.
- **Cancer.** Vitamin C functions as an antioxidant to protect cellular structures, including genetic mechanisms, an enhancer of the immune system and to protect against cancer-causing environmental irritants and pollutants. Many of the benefits of vitamin C supplementation stem from its antioxidant properties. The antioxidant properties of vitamin C become more important as aging occurs, especially if there is stress or disease.

ASTAXANTHIN

Astaxanthin is a member of an elite class of carotenoids known as xanthophylls.

Astaxanthin is believed to be the most active of these carotenoids. Researchers have discovered that the most abundant and concentrated form of astaxanthin is found in the natural, renewable material extracted from microalgae.

Because of its unique molecular structure, astaxanthin is unlike any other antioxidant in that it can perform a wide variety of tasks including:

- increasing HDL (good cholesterol)
- increasing strength and endurance
- stimulating the immune system
- protecting and enhancing eye health.

Astaxanthin has been shown to perform effectively the three key tasks of an antioxidant: quenching, scavenging and trapping free radicals. Astaxanthin is more powerful than many other carotenoids because:

- its low molecular weight allows it to actually cross the blood-brain barrier, making it available to the eye, brain and central nervous system
- it is more resistant to damage, allowing it to scavenge longer and trap more types of free radicals
- it acts like a bridge, transporting free radicals along its long chain to water-soluble antioxidants like vitamin C inside and outside of the cell.

ACETYL-L-CARNITINE

Acetyl-L-carnitine is a special form of carnitine that has the particular ability to optimize brain function. Acetyl-L-carnitine is able to cross into the brain more effectively than regular carnitine. It therefore enhances brain cell function much better than regular carnitine. As we age, acetyl-L-carnitine levels in our brains go down and for optimal brain function, supplements of acetyl-L-carnitine become mandatory.

Acetyl-L-carnitine acts in many ways to prevent the deterioration of brain cells that normally happens with age. It does this in many ways. It acts as a powerful antioxidant, provides the brain with healing energy and increases levels of a very important messenger molecule called acetylcholine. It is acetylcholine which becomes deficient in the brains of Alzheimer's patients and that is why these patients have such poor memory function. By increasing levels of acetylcholine, acetyl-L-carnitine helps the memory work better and may help prevent Alzheimer's disease as well.

GREEN TEA

Green tea is the antivirus, anticancer, super antioxidant. It is the most popular of Asian drinks and has been known for centuries to have a long list of health benefits. Interestingly, after water it is the most widely consumed beverage on the earth.

Dr. Earl Mindell states, “The antioxidants specific to green tea are polyphenols, bioflavonoids that act as super antioxidants by neutralizing harmful fats and oils, lowering cholesterol and blood pressure, blocking cancer-triggering mechanisms, inhibiting bacteria and viruses, improving digestion and protecting against ulcers and strokes. The specific type of polyphenol found in green tea is called a “catechin.”

Other ingredients in green tea include the green chlorophyll molecules but also important are the proanthocyanadins similar to those found in grape seed extract, pine bark, bilberry and gingko. The specific tea is a variety called Camellia sinensis. Camellia sinensis in the West is known as black tea, such as Earl Grey tea, orange pekoe tea or English breakfast tea.

The antioxidant properties of green tea are responsible for its most important benefits. The Chinese always claimed that tea slows aging but it was not until we understood the role of oxidation in aging and the antioxidant function of flavonoids that we knew how this mechanism

might work. Researchers at University of California- Berkeley found that green tea extract was the best at scavenging the deadly hydroxyl radicals. Three diseases that we focus on regarding green tea are heart disease, AIDS and cancer.

GREEN FOODS

It is well known now through modern research that green foods are rich in vitamins, minerals and enzymes. They help protect against cancer, heart disease, digestive problems and many other modern disorders. Green vegetables are excellent sources of complex carbohydrates, dietary fiber, beta carotene and chlorophyll. Possibly most important of all, they have potent antioxidant activity. Besides, they are low in fat and high in nutrients, an excellent combination.

The importance of green foods in the diet is now being validated scientifically worldwide. It is amazing how long it takes us to discover that foods were made correctly in the first place. They contain exactly what we need in their natural state. We have to find a way to take advantage of the whole foods naturally made and most of us are not doing that presently with our diets. In fact, it would be difficult for anyone to eat green plants to equal the amount of nutrition in concentrated green food supplements. So until you are ready to sidle up to a fivepound salad of spinach, watercress, alfalfa and kelp, the concentrated supplements mentioned here are probably your best source for the vital nutrients you need from green foods.

ALPHA LIPOIC ACID

Alpha lipoic acid is a vitamin-like antioxidant that is produced naturally in the body and found in certain foods such as potatoes and red meat.

It is the only fat and water soluble free radical antioxidant, therefore, it is easily absorbed and transported across cell membranes, protecting us against free radicals both inside and outside our cells.

Alpha lipoic acid has been used for years throughout Europe to treat and prevent complications associated with diabetes, including neuropathy, macular degeneration and cataracts. Studies show that diabetics lower their insulin requirements; this also helps reduce complications.

An abundance of promising research has also shown the ability of alpha lipoic acid to inhibit replication of HIV and other viruses, to protect LDL cholesterol from oxidation which is associated with cardiovascular disease, to protect the liver from damage from alcohol or other toxins and also to prevent damage from radiation.

We do not obtain enough alpha lipoic acid through the diet to obtain this protection, so supplementation is required—100 to 200 mg daily. Therapeutic doses are higher.

GLUTATHIONE

Essential for many cellular functions, glutathione is a tripeptide of connected molecules composed of three nonessential amino acids: cysteine, glutamic acid and glycine.

Without glutathione people suffer from an inability to detoxify metabolic wastes and in eliminating toxic substances like heavy metals and other environmental poisons. This may lead to heart disease, joint disorders, cancer and problems with the endocrine, immune and nervous systems.

Even healthy people under stress can become subject to a disrupted balance. They could be sick or battling an inflammation or infection, or healing from an injury, while more free radicals are created and must be eliminated. Glutathione will do the job. It will also seek out the free radicals formed when people are exposed to cigarette smoke, alcohol, mercury, air pollution, food additives, pesticides and ultraviolet light.

Needed cofactors that properly assist glutathione function are the following: alpha lipoic acid, riboflavin (vitamin B2) and the minerals selenium and zinc, of which selenium is a vital component.

PYCNOGENOL®

Extracted from the bark of *Pinus maritima*, the coastal pine tree found in abundance in southern France, pycnogenol is made up of a combination of flavoids that occur naturally in small amounts in some fruits and vegetables. However, antioxidant-rich fruits, vegetables and nuts lose their potency when they are harvested, processed, frozen and cooked. A study in the British scientific journal, *The Lancet*, showed that risk of heart disease was 50 percent lower in populations that consumed high amounts of flavonoids (at least 30 mg a day) than groups that took in low amounts of these antioxidants.

Decades of laboratory research and clinical studies conducted by Dr. Jack Masquelier show that pycnogenol contains approximately 40 natural ingredients including proanthocyanadins, organic acids and related bioavailable components such as glucosides and glucose esters. It is a potent antioxidant that protects against free radicals, has been shown to be many times more powerful than vitamin C or vitamin E and has the added benefit of working synergistically with many nutrients that support health.

Millions of people in Europe and the United States, athletes in particular, rely on pycnogenol to maintain skin health and overall health during the aging process. It is one of the best tried-and-tested products in its category, non-toxic and non-carcinogenic.

GARLIC

Garlic is the most studied herb in history. It has more benefits than any other single food. Tradition has told us that garlic has beneficial effects on health and longevity. Science is beginning to validate many of these claims including garlic's ability to prevent heart disease, fungal overgrowth and infectious diseases, the ability to remove toxic metals from the body and its powerful antioxidant and anticancer effects.

A Summary of Garlic's Many Benefits Includes:

- having been shown to have powerful immune-boosting properties and may be valuable in fighting off viral infections such as the common cold.
- having been shown to help lower blood pressure in those with hypertension.
- working as a natural antibiotic and reducing the number of harmful bacteria in the body.
- reducing blood cholesterol and triglyceride levels and has been shown to limit the deposition of plaque on artery walls.
- having been shown to help the body eliminate parasites.
- reducing the amount of the yeast, Candida albicans, in the human GI tract and has been shown to be beneficial in fighting systemic yeast infections.
- having been shown to lower blood sugar and be of significant benefit to diabetics.
- having been shown in population and laboratory studies to help prevent a wide variety of cancers.
- containing selenium, a cancerpreventing, immune-boosting and antiinflammatory nutrient.

Editor's Note: We highly recommend the most studied garlic supplement on the market. Kyolic AGED Garlic is Organically grown, and aged up to 20 months to enhance the nutritional value of the garlic, remove its pungent odor and make it gentle on the stomach. Kyolic is heavily researched with over 750 scientific studies.

BOOKS FOR FURTHER READING ON ANTIOXIDANTS:

Drug Muggers
Which Medications Are Robbing Your Body of Essential Nutrients—and Natural Ways to Restore Them
by Suzy Cohen, RPh
Rodale Books; 1 edition (February 15, 2011)

The Garlic Cure
by James F. Scheer, Lynn Allison and Charlie Fox
Alpha Omega Press, Fargo, ND (2002)

The Garlic Cookbook: For the Best and Most Unique Garlic Recipes You Will Ever Try!
by Martha Stephenson
CreateSpace Independent Publishing Platform (April 19, 2017)

Healthy Healing—Avoid side effects, drug interactions and high medical costs with America's Original Guide to Natural Healing (14th Edition)
by Linda Page, N.D., Ph.D.
Healthy Healing Publications; 14th edition (November 15, 2011)

Prescription for Nutritional Healing
Fifth Edition: A Practical A-to-Z Reference to Drug-Free Remedies Using Vitamins, Minerals, Herbs & Food Supplements

by Phyllis A. Balch, CNC
Avery; 5 Rev Upd edition (October 5, 2010)

The Longevity Kitchen—Satisfying, Big-Flavor Recipes Featuring the Top 16 Age-Busting Power Foods
by Rebecca Katz and Mat Edelson
M. Evans and Company, Inc., New York, NY (1998)

Brain Maker:
The Power of Gut Microbes to Heal and Protect Your Brain–for Life
by David Perlmutter, MD
Little, Brown and Company; 1 edition (April 28, 2015)

The Grain Brain Whole Life Plan:
Boost Brain Performance, Lose Weight, and Achieve Optimal Health
by David Perlmutter, MD, Kristin Loberg
Little, Brown and Company (November 15, 2016)

Editorial Reviews

"*The Grain Brain Whole Life Plan* provides a step-by-step, proven approach that will help you reclaim and sustain health, vitality, and happiness for a lifetime." Melissa Hartwig, author of *Food Freedom Forever* and coauthor of *The Whole30*

"Dr. Perlmutter, an acclaimed neurologist, has for years been a pioneer of the gut-brain connection. In *The Grain Brain Whole Life Plan*, he combines his clinical expertise, insights into the latest scientific developments, and immense compassion into a powerful prescription for brain health." David S. Ludwig, MD, PhD, professor, Harvard Medical School, and author of *Always Hungry?*

"Dr. Perlmutter's groundbreaking work has changed the way we think about inflammation—its causes and the damage it can do. I've gotten tremendous benefit from his books and *The Grain Brain Whole Life Plan* gives us simple and direct ways to prevent and treat diseases in easy and delicious ways." Bonnie Raitt

"Dr. David Perlmutter is one of the first people to not only suggest that modern degenerative diseases are likely caused by poor diet and alterations in gut health, but he has produced clinical research indicating these conditions may be avoided or reversed by altering one's diet and lifestyle. *The Grain Brain Whole Life Plan* is the culmination of more than 35 years of clinical practice and research that will help you look, feel and perform your best." Robb Wolf, author of *The Paleo Solution*

"Dr. Perlmutter sifts through the emerging research on how to create brain and body health. And he created The Grain Brain Whole Life Plan, a manifesto for the new medicine, the roadmap for how to care for the one precious human life that you have. If you want to live strong, feel good,

boost your brain function, and become more connected and engaged to your own life, then you need a plan. This book is that plan." Mark Hyman, MD, author of *Eat Fat Get Thin* and director of Cleveland Clinic Center for Functional Medicine

"If everyone were to follow *The Grain Brain Whole Life Plan*, there would be a dramatic reduction in obesity, diabetes, cancer, dementia, arthritis—in short, the world would be a better place." Dale Bredesen, MD, professor and director of Alzheimer's Disease Research, UCLA

"The Grain Brain Whole Life Plan presents a comprehensive, practical, step-by-step approach aimed at people suffering from a variety of chronic neurological, psychiatric, and medical conditions. Dr. Perlmutter not only gives specific dietary recommendations, including a diet rich in plant-based fiber, but also prescribes important lifestyle changes such as physical exercise, stress reduction, and improvement in sleeping habits." Emeran A. Mayer, MD, author of *The Mind Gut Connection* and director of the Oppenheimer Center for Stress and Resilience at UCLA

Doctor Parris Kidd

Dr. Kidd has been a contributing editor and science advisor to Total Health magazine since 1996. His columns include interviews with Dr. Andrew Weil, cancer treatment pioneers Drs. Nick Gonzalez and Linda Isaacs, Dr. Dharma Khalsa, Dr. Barrie Tan, and environmentalist Erin Brockovich. Other columns such as *Why You Should Take Vitamins* became instant classics. Dr. Parris Kidd's website provides detailed information on his professional reviews, seminars, books and other career accomplishments.

Website: www.dockidd.com