

## **Antioxidants and Your Health**

Free radicals are believed to be a major factor in virtually all disease and also in the aging process itself. The body is composed of cells that are made up of smaller molecules called atoms. Atoms contain a nucleus in the center and are surrounded by electrons. When biological oxidation takes place electrons are shared between two or more atoms and energy is produced. In the process of moving electrons from one oxygen molecule to another sometimes an electron escapes and becomes a “free” electron which is then called a “free radical”. Free radicals can attack and oxidize DNA which causes mutation within the cells of the body and depending on where these free radicals end up. Free radicals eventually cause disease like cancer, diabetes, heart disease and stroke. Free radicals also cause premature aging.

Antioxidants protect the body by fighting these free radicals and helping to keep the body healthy and youthful. Antioxidants are made in the body and ingested in our food. They are made up of vitamins, minerals and other nutrients that strengthen and protect the body. There are several thousand phytochemicals (plant based chemicals) but fifty are commonly recognized as being especially helpful in preventing disease and aging.

We are going to discuss only a small group of antioxidants that Lester Packer, Ph. D. and noted research scientist of forty plus years refers to as the “antioxidant network”. Dr. Packer is the founder of the Packer Laboratory and host of the Gordon Conference that gets together antioxidant research scientists from all over the world to collaborate on their findings. This informational piece is a summary of Lester Packer’s findings and recommendations.

These few special antioxidants, the antioxidant network, display properties when working together that allow them to become much more powerful and effective than when working alone. They become like a symphony - the whole is greatly enhanced by working together.

In the body, when a free radical is invaded by an antioxidant the antioxidant is converted to a weak free radical itself which is then more easily killed by the immune system. However, when there is a strong antioxidant network in the body the other antioxidants within the network will come to the aid of the antioxidant that has been converted to the weak free radical – and save it. These network antioxidants have the ability to recycle or regenerate the changed antioxidant. It is converted from being a weak free radical back into being an antioxidant again. This recycled antioxidant can now seek out and invade another free radical and so the cycle continues. The network antioxidants increase the healing potential of each antioxidant exponentially by regenerating and recycling each other. Truly remarkable!

These antioxidants work together to help regulate the expression of our genes which in turn monitors every action of every cell within our body. As we age our antioxidant network becomes overwhelmed due to accumulated stresses which can include: pollution, smoking, poor diet, lack of exercise, excessive alcohol, drug use (prescription and over-the-counter) and/or stress. It is therefore, vitally important to keep the antioxidant network as strong as possible.

**Network Antioxidants** include:

### **Lipoic Acid**

Lipoic acid is the most versatile and powerful of all the antioxidants. It has been shown to be effective in treating complications from diabetes and may offer significant protection from stroke, heart disease and cataracts. It is the only antioxidant that can significantly increase the levels of glutathione in the body. Glutathione is instrumental in helping the body rid itself of toxins. Studies in the Packer laboratory have shown that lipoic acid can increase glutathione levels in the body by as much as 30%.

Lipoic acid also strengthens memory and helps to slow aging of the brain. It has also been reported to reverse mushroom poisoning and has been shown to be successful in healing the liver. Lipoic acid boosts the entire antioxidant network and is the only antioxidant that can enter both the fatty and watery parts of the cell. Lipoic acid is the only antioxidant that can regenerate itself. It is produced in the body and is found in small amounts in potatoes, spinach and red meat. However, lipoic acid production decreases significantly as we age. Supplementation under the Packer Plan recommends 100 mgs of lipoic acid per day (50 mg in the AM and 50 mg in the PM)

Here is one study demonstrating the potential impact of lipoic acid on stroke victims. Lipoic acid was given to rats after inducing a stroke and the results showed significant protection against stroke related injury to the brain. In a test group of rats, 80% of all rats died within 24 hours after inducing a stroke and then restoring oxygen to the rats' brains. A second group of rats were made to have a stroke and then injected with lipoic acid right before the restoration of oxygen and blood flow to the brain, only 25% of these rats died and the brains of the survivors appeared to be perfectly normal following the stroke. Similar results were noted with rats related to recovery from heart attacks.

Since Americans are at high risk for diabetes this is another interesting study related to the use of lipoic acid. Type II diabetes generally shows itself as a result of insulin resistance; the body has plenty of insulin but the cells cannot use it effectively. Eighty-five percent of all cases of Type II diabetes begin after age 35 with people age 75 or older having a twenty times higher risk than people who are age 50. Lifestyle and diet play a big role in the onset of Type II diabetes. Lipoic acid can help improve the utilization of glucose by the muscles and may help prevent the onset of the disease.

The brain is very susceptible to oxidative stress and free radical damage because it is one of the hardest working organs of the body. As we age there is a significant decline in the production of neurotransmitters in the brain as well as a loss of brain cells. Lipoic acid has been shown to reduce the amount of oxidative stress in the brain of older test animals. Interestingly, lipoic acid supplementation did not have an impact on younger animals, perhaps because they are not depleted in lipoic acid. In addition to lipoic acid, supplementation of Vitamin E, ginkgo biloba and the pine bark extract called Pycnogenol has been shown to play a key role in keeping the brain sharp.

### **Vitamin E**

Vitamin E is the body's primary fat-soluble antioxidant and must be obtained from food and supplementation. Vitamin E is needed in only small amounts and travels throughout the body in molecules called lipoproteins (fat proteins) and protects them from oxidation. The oxidation of lipoproteins is believed to be the first step in heart disease.

Numerous tests have shown conclusively that Vitamin E can help to prevent heart attacks by helping to keep the arteries clean. In the 1980s there were 200,000 coronary bi-pass surgeries; however, within a

short time the arteries of these bypass patients were filled again with plaque. Clearly, preventive measures are important in preventing and reducing the risk of heart disease. A famous Harvard study of 87,000 nurses showed that those who took Vitamin E supplements for just two years had a decreased risk of heart disease by 41%. Another study of 29,000 male health professionals showed a reduced risk of 37% when 200 I. U. of Vitamin E were taken daily.

Vitamin E has also been shown to be protective against prostate cancer and may inhibit the growth of breast cancer cells. It may also slow the progression of Alzheimer's disease. It is great for the skin and helps relieve symptoms of arthritis and may have a positive impact on the prevention of cataracts.

There are four types of Vitamin E and all are important. Vitamin E is recycled in the network by Vitamin C, lipoic acid and Coenzyme Q10. We get Vitamin E from raw vegetable oils, nuts, rice bran oil, barley and in small amounts from green leafy vegetables. The Packer Plan recommends 500 mgs of mixed Vitamin E (tocopherols and tocotrienols) daily. It is recommended to buy natural Vitamin E which will be shown as d-alpha tocopherol (synthetic is shown as dl-alpha tocopherol and is a petroleum based product; natural Vitamin E is plant based).

### **Vitamin C**

Vitamin C is a water-soluble antioxidant and is obtained from foods and supplements. Vitamin C is a potent free radical killer and is essential for a strong immune system. It can help reduce the risk of dying from heart disease and cancer. It works by shielding DNA from free radical damage and also is shown to protect sperm. Vitamin C protects against nitrosamines, cancer causing agents found in foods, that may cause the initiation of cancers of the mouth, stomach and colon. Vitamin C works with Vitamin E to prevent oxidation of lipoproteins that can lead to heart disease. It is considered the hub of the antioxidant network.

Vitamin C is great for the skin because it is essential to the production of mature collagen, the protein that forms all connective tissues. It is the cellular glue that holds the body together. Vitamin C works even better for collagen production when combined with Vitamin E and Pycnogenol.

An interesting study showed that less, rather than more, Vitamin C may improve its absorption by the body. According to Packer if you ingest 180 mg of Vitamin C about 50% will be absorbed by the body. If you ingest 2,000 mg of Vitamin C about 10% will be absorbed and 90 % will be excreted! Packer recommends lower doses of Vitamin C for maximum absorption.

Vitamin C is abundant in plants but cannot be made in the human body. Good sources of Vitamin C include many fruits and vegetables like red peppers, broccoli, cabbage, berries, potatoes, tomatoes and citrus fruit. Packer recommends 500 mg daily of ester C which is easier to digest and does not cause an increase in stomach acid. Take Vitamin C twice daily since it is a water-soluble vitamin (250 mg AM and 250 mg PM).

### **Coenzyme Q10 (Co Q10)**

Coenzyme Q10 is a fat-soluble antioxidant that works synergistically with Vitamin E to protect the fatty part of the cell from free radical attack. Co Q10 regenerates Vitamin C. It has been shown to be an effective treatment for heart failure, angina and high blood pressure. It is also being investigated as a treatment for cancer and age-related brain diseases like Parkinson's and Alzheimers. Co Q10 is also used to assist in the healing of gum disease.

Coenzymes are proteins found in living cells that bring about chemical changes by working with an enzyme to produce a particular reaction. Co Q10 is involved in the Krebs Cycle which is the mechanism the body uses to produce fuel. Co Q10 works like a spark plug and is present in all cells. Since Co Q10 is required for energy production in the body it is especially important to the heart. The heart muscle is in continual activity and never gets a rest. People with heart problems often have critically low levels of Co Q10. One study of 428 heart patients showed that more than half of them improved after just 18 months of supplementation with Co Q10 with virtually no side effects being reported. The improvements from the use of Co Q10 based on the NYHA Scale (NYHA classifies heart disease severity - Class I being least serious and Class IV being severe). Fifty percent of the patients using the Co Q10 supplementation improved one level on the NYHA scale, 28% by two classes and 1.2% by three classes. These patients also reduced the frequency of angina episodes by 53%.

**WARNING:** Heart patients taking statin drugs should not take Co Q10 as the drugs inhibit the synthesis of Co Q10 by the body and life threatening results could occur.

Co Q10 levels also seem to have a relationship to cancer. Cancer is not one disease but an umbrella term for many diseases characterized by the abnormal growth of cells. When an errant cell mutates and begins to divide exponentially, the process of cancer begins. Statistics suggest that one in three people in North America will get cancer at some point in their lifetime. The cause is generally a combination of genetics and environment. Antioxidants help keep the free radicals under control and can also suppress or activate the genes that control cell growth. Cancer patients been shown to have lower levels of Co Q10 in their blood according to studies conducted in 1991 by Karl Folkers. Supplementing Co Q10, which increases the effectiveness of Vitamin C, may be the key to helping reduce the risk of developing cancer and the risk of brain aging and deterioration.

**WARNING:** Cancer patients should not take antioxidants while undergoing treatment without the approval of their physician since some cancer treatments are designed to increase levels of disease-fighting free radicals to kill off cancer cells.

### **Glutathione**

Glutathione is the most abundant antioxidant in the network and is produced by the body from three amino acids found in food. These include: glutamic acid, cystein and glycine. Glutathione is found in virtually every cell in the body and is important to the destruction of free radicals. After age 40 the body produces less glutathione and by age 60 there can be as much as a 20% drop in glutathione levels in the body. Keeping high levels of glutathione are important in reducing the potential of premature aging.

Glutathione regenerates Vitamin C. It is instrumental in the detoxification of drugs and pollutants in the body and for healthy liver function. It helps keep the immune function strong and is involved in the transport of amino acids which are the building blocks of protein.

Of all the antioxidants, one should be especially vigilant with glutathione levels. There are several million more glutathione molecules in the cells than there are Vitamin E molecules and astonishingly high levels of glutathione are found in the liver, a key detoxification site in the body. Glutathione is found in the sap of the cell and is its primary antioxidant protector. Glutathione is constantly being made by the body and tucked away in protein to be used in an oxidative stress emergency.

**NOTE:** N-acetyl-L-cystein (NAC) is claimed to be a good booster of glutathione, however, lipoic acid is much more effective and provides numerous benefits of its own, as stated earlier. Glutathione can be depleted by smoking, eating chemical laden foods, (including meats that contain nitrates and nitrites),

excessive alcohol intake and taking acetaminophen (common pain killers). Glutathione is also found in high quantities in the lens of the eye. It is also thought to be protective against UV radiation.

The best way to boost glutathione is with the supplementation of lipoic acid (100 mg per day). Glutathione is also abundant in fruits, vegetables and freshly cooked meat, but it is broken down during digestion so the body needs to make it from the building blocks of glutamic acid, cysteine and glycine.

## **Network Boosters**

The antioxidant network is a powerful ally to health. It can be enhanced by making sure there is sufficient intake of flavonoids, phytochemicals, vitamins and minerals found in foods, herbs and beverages (like tea). Below are lists a few noteworthy network boosters worth considering.

### **Flavonoids**

Ginkgo Biloba and Pycnogenol are both helpful with improving memory and concentration. They have been used to treat attention deficit disorder and are also powerful free radical scavengers in their own right. These flavonoids help regulate nitric oxide (which regulates blood flow) and can help prevent blood clots, protect against oxidation of LDL cholesterol and lower blood pressure. They also improve sexual function in men and help to reduce inflammation and bolster the immune function.

The Packer Plan recommends 30 mg of Ginkgo Biloba and 20 mgs of Pycnogenol daily.

### **Selenium**

Selenium is a mineral that is not produced by the body and must be obtained through food and water. Many foods are depleted in selenium since they may be grown in parts of the country with selenium depleted soil. Areas of particular concern include parts of the northeast. Colorado Springs, Colorado is an area that is very high in selenium and also has lower rates of heart disease. Selenium is an essential component in the production of several enzymes that affect the antioxidant network. Selenium also works synergistically with Vitamin E. A lack of selenium is strongly associated with increased risks for heart attack, stroke and many cancers.

Packer's recommendation is 200 mcg per day. Food sources include garlic, onions, wheat germ, red grapes, broccoli and egg yolks.

**The Packer Plan** - to help reduce aging, reduce the risk of disease, improve the immune system and protect the brain consider the following guidelines:

- Eat seven to ten servings of fruits and vegetables per day
- Eat a wide variety of colors and types of fruits and vegetables – eat organic whenever possible
- Limit fat consumption to 30% of your daily calories and use raw un-hydrogenated oils
- Take the Basic Antioxidant Cocktail daily and enhance it with additional supplements, if you have certain risk factors (smokers, diabetics, high risk of cancer, heart disease, menopause etc.)

According to Packer particularly good food choices include: apples, berries, carrots, citrus fruits, cruciferous vegetables, dried fruit (without sulfites), garlic, onion, all greens, red grapes, red wine, sesame seeds and oil, soy foods, spinach, sweet potatoes, tomatoes, teas (green, oolong and black), tumeric, walnuts and winter squashes,

## Packer Basic Daily Antioxidant Cocktail

Morning Supplements	Evening Supplements
Vitamin E Family (1) 100 mg tocotrienols (2) (1) 200 mg mixed tocopherols	Vitamin E Family (1) 200 mg natural alpha tocopherol
Co Q10 (1) 30mg Co Q10	
Lipoic Acid (1) 50 mg lipoic acid	Lipoic Acid (1) 50 mg lipoic acid (2)
Vitamin C (1) 250 mg ester C	Vitamin C (1) 250 mg ester C
Folic Acid (1) 400 mcg folic acid	Ginkgo Biloba (1) 30 mg ginkgo biloba
Biotin (1) 300 mcg biotin	Selenium (1) 200 mcg selenium
Vitamin B <sub>6</sub> (1) 2 mg vitamin	
Multivitamin Supplement without iron unless advised otherwise (excess iron is a major risk factor in heart disease)	

Biotin is a B vitamin that is a cousin to lipoic acid and is known to improve insulin resistance in animals and humans. Biotin, Vitamin B<sub>6</sub> and Folic Acid all work with lipoic acid. Folic acid is also included because it is known to help protect against heart disease, cancer and birth defects. It also helps to maintain normal homocysteine levels; when homocysteine levels are high it known to be an indicator of increased risk of heart disease and cancer.

### **Special Risk Groups**

#### **Smokers**

Need more lipoic acid and should not take carotene or carotenoid supplements. Eat a diet rich in vegetables and fruits. Also take extra tocotrienols, Co Q10 and Pycnogenol.

#### **Diabetics**

Because of impaired glucose tolerance additional supplements here should include: gama linolenic acid (GLA), chromium and extra lipoic acid.

#### **Athletes**

Because of the additional stress on the body due to the strenuous exercise athletes should add L-carnitine which is synthesized by the body but shown to be needed in higher amounts by athletes.

#### **Menopausal Women**

Post- Menopausal women need additional calcium and Vitamin E to help protect the bones and reduce the risk of breast cancer.

### **High Risk for Cancer**

These people should limit their risk to know carcinogens like cigarette smoke and increase intake of lipoic acid, Vitamin E, Co Q10 and Pycnogenol.

### **Picky Eaters**

People who do not eat a wide variety of fruits and vegetables should consider taking a flavonoid complex, cruciferous-plus and mixed carotenoid complex to ensure they are getting all the phytochemicals, vitamins and minerals needed for health. NOTE: Smokers should not take the carotenoid complex.

### **References:**

Packer, L., & Colman, C. (1999). The antioxidant miracle. New York: John Wiley & Sons.