ANTIOXIDANTS

In the free radical section it was shown that electrons can be torn away from a molecule, leaving the molecule with an unpaired electron in its outer electron orbital. These extremely reactive entities are major sources of damage that cause cancer, cardiovascular disease, and aging. The term oxidation is used to describe this type of chemical reaction in which an electron is removed from a molecule. The free radical process of oxidized entities causing damage (in a chain reaction process) is also referred to as oxidation. In the free radical section I said that aging is the accumulation of unrepaired free radical damage. This aging process can also be called oxidation.

When compared to a human who would have died at 80,
he might live to 120 or more.

There are chemicals that I refer to at the end of the free radical section, as nutrients that can protect and repair free radical damage and block free radical chain reactions. They are sometimes called free radical scavengers, but they are also called antioxidants. The antioxidant, by chemically reacting with the free radical (oxidized entity), protects the body from the damage that would otherwise be caused. Vitamins like vitamin C and vitamin E readily release electrons, which can join with the free radicals' unpaired electron, and, in so doing, they make stable entities out of the former reactive free radicals and thereby prevent the bodily damage from free radicals tackling other molecules.

When these antioxidants are tested on research animals, the animals sometimes live 50% longer. When compared to a human who would have died at 80, he might live to 120 or more. When this research is done, usually only one antioxidant at a time is supplemented, and just adding extra amounts of one antioxidant nutrient results in longer life spans. Animals that were fed antioxidants while pregnant, had offspring with greatly increased life spans. Large numbers of studies have shown that the addition of one or more antioxidant nutrients inhibits cancer, and tests have shown cancers to regress from the addition of antioxidants. Many antioxidants nutrients stimulate the immune system. It is the immune system's job to prevent and repair damage caused by free radicals. These antioxidant free radical scavengers improve the immune defense responses of T-cells (managers and killer white blood cells) and B-cells (white blood cells that make antibodies and take instructions from T-cells)

Vitamin A increases the size of the thymus gland (heart of immune system) and boosts its functional ability. Vitamin A also prevents the decrease in thymus size that occurs after injuries,

Antioxidants and Related Substances

Antioxidants	Immune Boosters	Removes Toxins (immune supportive)
Vitamin A	CoQ10	Sodium Alginate
Vitamin C	Arginine	Lecithin
Vitamin E	Ornithine	Calcium
Zinc	Vitamin B_{15} (DMG)	Magnesium
Selenium	Vitamin B_6 (pyridoxine)	
Vitamin B_1 (thiamine)	Vitamin B_{12} (cobalamin)	
Beta Carotene	Vitamin B_2 (riboflavin)	
Cysteine	Vitamin B_3 (niacin)	
Ascorbyl Palmitate	Acidophilus	
Vitamin B_5 (pantothenic acid)	Manganese	
Canthaxanthin	Trace Elements	
PABA (B vitamin)		
BHT		
SOD (superoxide dismutase)		

Since the immune system is responsible for dealing with the poisonious agents that age us and cause disease, any supplement that boosts the immune system must also be considered anti-aging and related to anti-oxidants.

radiation exposure, surgery, etc. Vitamin E stimulates immune system response. Peroxidized (rancid) fats, which are carcinogens, mutagens, immune-suppressants, and producers of some of the most deadly of free radicals—hydroxyl radicals, can be controlled and prevented by the oil-based vitamin E. By vitamin E controlling the formation and resulting damage from peroxidized fats, the immune system is freed of having to deal with them. The body produces enzymes as defensive mechanisms against free radicals such as superoxide dismutase (SOD) and glutathione peroxidase. For instance, the glutathione peroxidase enzyme must contain four atoms of the antioxidant selenium. It also contains the antioxidant cysteine. You can find an atom of the antioxidant zinc in the center of a superoxide dismutase molecule. The deadly free radicals known as superoxide radicals are thought to be the main culprits in arthritis and cataract formation. The superoxide dismutase enzyme is our body's major defense against these free radicals.

Canthaxanthin is said to be even better then beta carotene at protecting the body from singlet oxygen damage.

Since free radicals cause disease and premature aging, and since antioxidants prevent and repair the free radical damage, antioxidants give a needed boost to our already over-worked immune systems. Some nutrients stimulate the immune system which ultimately has to deal with free radicals. Other nutrients help in the removal of toxins from our body. Since unremoved toxins would otherwise take energy away from the immune system, the nutrients that remove toxins must be considered immune-supportive. So, nutrients that remove toxins, nutrients that stimulate the immune system, and true antioxidants (that release electrons) must all be considered anti-disease and anti-aging.

There are synthetic chemicals like BHT (butylated hydroxytoluene) that have antioxidant properties. But with few exceptions antioxidants, immune stimulants, and immune supporters are vitamins, minerals, and amino acids (protein building blocks).

I earlier used vitamin A as an example of an immune stimulant because it increases thymus gland size and boosts the gland's functional capacity. Since the thymus is the master gland of the immune system, it should go without saying that the whole immune system gets a boost when the thymus is boosted. Vitamin A also prevents the shrinkage of the thymus that occurs with injuries, radiation (like chest x-rays) damage, surgery, etc. In animals that are exposed to cancer-causing chemicals, all but the ones that are given vitamin A develop cancer. Vitamin A protects tissues like skin, stomach, and lungs from developing cancer. Beta carotene has recently been reported by the media as being anti-cancer, anti-aging, etc. Beta carotene is converted in the body

to vitamin A when the body needs vitamin A. So, I'm sure these reports are true. Beta carotene and canthaxanthin, both referred to as carotenoids, have unique abilities to deal with singlet oxygen (formed from sunlight, ozone, ultraviolet light, and even normal metabolism) especially well. Canthaxanthin is said to be even better than beta carotene at protecting the body from singlet oxygen damage. Vitamin A, beta carotene, and canthaxanthin are all true antioxidants because they readily release electrons to stabilize free radicals.

Another true antioxidant is of course vitamin C. Vitamin C is good in so many ways that it is like a miracle drug. It releases electrons like true antioxidants, stimulates the immune system like immune stimulants, and also removes toxins like immune supportive agents. It enables the body to fight bacteria, viruses, atherosclerotic plaques, tumors, and cancer many times better. In one study, terminal cancer patients who took vitamin C survived more than four times longer than the control group. A huge percentage of the terminal cancer group taking vitamin C in the study were reported 'cured'. In fact, vitamin C is directly toxic to many types of cancer cells when taken in large doses. Vitamin C stimulates the immune system by making white blood cells more active and stimulating them to mature much faster. The immune system responds to vitamin C by

Our brain and spinal cord have the highest concentration of vitamin C because they contain large amounts of lipids.

producing much more interferon, which is a potent anti-cancer, anti-virus chemical. Vitamin C prevents the formation of carcinogenic (cancer causing) compounds formed from eating nitrates and nitrites (found in packaged meats like bologna, bacon, hot dogs, ham, turkey slices, etc., and in other processed foods). Vitamin C has successfully treated tuberculosis, scarlet fever, pelvic infections, polio, measles, encephalitis septicemia, herpes, pneumonia, rabies, rattlesnake bites, scorpion stings, and lead poisoning. For the healing of wounds, vitamin C is a must. Broken bones healed in half the normal time when vitamin C was supplemented. When recovering from a heart attack, white blood cells carry vitamin C to the heart from other areas of the body even if it leaves the other areas vitamin C-deficient. The body does this for the protection vitamin C gives against free radicals. Our brain and spinal cord have the highest concentration of vitamin C because they contain large amounts of lipids. In the section on lipids, it is explained that polyunsaturated lipids are extremely prone to oxidation which causes free radical damage. So without the free radical protection from vitamin C, severe brain and spinal cord (nerve) damage would occur immediately. Vitamin C provides protection from chemicals associated with smoking, drinking, and pollution (acetaldehyde, carbon monoxide, nitrogen oxide, cadmium, polynuclear hydrocarbons, etc.)

Vitamin C reduces elevated serum cholesterol levels (blood cholesterol levels). In the lipid

section I talk about cholesterol being an antioxidant and high blood cholesterol levels are a response of the body trying to protect itself from free radical damage. Obese people, smokers, drinkers, and people with clogged veins have high levels of free radical damage and the corresponding high level of cholesterol. When vitamin C is supplemented and its antioxidant ability of preventing and repairing the free radical damage takes effect, the body responds with less cholesterol synthesis and therefore lower blood levels. Vitamin C also helps in the conversion of cholesterol to bile acids which are necessary for fat digestion.

Vitamin E is the most important antioxidant in preventing this lipid oxidation process.

Vitamin C has a powerful synergistic effect (greater total effect than just the sum of the individual effects) with other antioxidants. In fact, a high vitamin C blood level was the best indicator of a long healthy life in studies performed. *The benefits received from vitamin C is determined by the lowest daily blood level—not the highest blood level of the day.* It must be spread out over the day to maintain a high blood level—preferably every three or four hours.

I keep mentioning that certain lipids (oil and fat) are especially prone to oxidation which results in the generation of tremendously damaging free radicals. Once oxidized, these peroxidized lipids cause cancer, induce an abnormal process of blood clotting that results in heart attacks and strokes, and damage DNA and RNA which controls growth, development, and programmed aging. Vitamin E is the most important antioxidant in preventing this lipid oxidation process. It prevents the formation of abnormal blood clots, by preventing free radicals from inhibiting prostacyclin (anti-clot hormone) production. Prostacyclin (PGI_2) lines the walls of healthy blood vessels and peroxidized lipids prevent the formation of the protective hormone prostacyclin. When vitamin E controls free radicals from peroxidized fats, generous amounts of the health-promoting hormone, prostacyclin, is produced.

Pollution attacks lipids (fats) in the lungs and causes the lung lipids to oxidize. Lipid damage to lungs is greatly decreased by vitamin E.

By preventing peroxidation, vitamin E maintains thymus cells' and white blood cells' membranes in a normal configuration. The immune system is greatly stimulated by vitamin E's ability to maintain intact membranes. Both B-cells and T-cells (white blood cells—immune system weapons) are tremendously stimulated when vitamin E is supplemented. So, like vitamins A and C, vitamin E is an immune stimulant as well as a true antioxidant.

Being a true antioxidant, vitamin E's free radical scavenging ability is the mechanism of its well documented protective effects in cardiovascular (heart and blood vessel) disease. There are many conditions that involve poor circulation. Poor circulation results in decreased availability of oxygen to the tissues which in turn greatly increases free radical activity. Vitamin E and other antioxidants (selenium, vitamin C, etc.) provide free radical protection in poor circulation conditions such as atherosclerosis (clogged vessels), intermittent claudication (circulatory failure in limbs), and cerebral vascular insufficiency (poor circulation in the brain). The carbon monoxide from smoking cigarettes destroys hemoglobin's capacity to carry oxygen and makes poor circulation problems worse and the need for antioxidants even more vital.

Vitamin E protects proteins from destruction which accounts for part of its anti-cancer effects. In animals that were given injections of cancer cells, the ones receiving vitamin E either survive or at least live much longer than control animals. In fact deaths from cancer were reduced from 100% to nearly zero in one study on vitamin E. Life span was extended in animals receiving vitamin E. Since free radicals cause the process of cross-linking, the process that causes emphysema (loss of elasticity in lungs) and wrinkling of the skin, vitamin E can slow, prevent, and even reverse this damage. High doses of vitamin E many times cause a dramatic improvement in skin appearance—sometimes noticeable within a few days. I feel one should begin with low doses and work up to higher doses, even though there are no known toxic side effects.

Selenium preserves the elasticity of tissue by its antioxidant ability to protect against free radical damage from peroxidized fats.

Selenium greatly improves vitamin E's beneficial effects. Selenium (and vitamin E) prevents cross-linked peroxidized lipids, which make up lipofuscin (lipofuscin deposits are called age spots, liver spots, etc.—they damage brain cells by choking them), from being deposited and causing brain damage and premature aging problems. Selenium preserves the elasticity of tissue by its antioxidant ability to protect against free radical damage from peroxidized fats. Like the other antioxidants, when selenium intake is high, cancer rates are low and the aging process slows down.

Zinc is also an antioxidant. It is also very immune supportive and boosts overall resistance to infections and diseases. It slows down the aging process, helps prevent wrinkles, and shows anti-cancer properties. Many people consider that vitamin A, C, and E and the minerals zinc and

selenium are the only antioxidants. These people are misinformed. These antioxidants have just been tested the most.

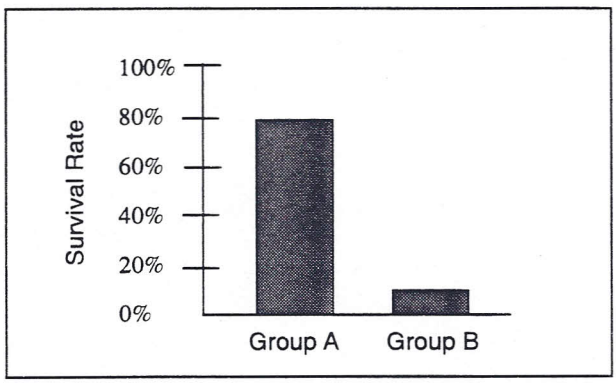
Cysteine is as potent antioxidant. It is an amino acid (building block of protein) that's found mostly in meat and eggs . It protects the body against bacteria, virus, chemical, and radiation damage. It protects the body from premature aging. In fact, laboratory animals' life spans were extended by 30% when cysteine was supplemented. It blocks the activity of harmful chemicals

With ascorbyl palmitate, the fatty structures of the heart, brain, and nervous system can get free radical protection.

in tobacco smoke and air pollution, which if uncontrolled leads to cancer and emphysema. It helps control damage from alcohol ingestion. It increases survival rate of animals with tumors by 800%! (see chart) The combination of cysteine, vitamin C, and vitamin B_1 forms an especially efficient protective package.

Ascorbyl palmitate is vitamin C in a fat soluble form. It can go into the tissues and act as an antioxidant, preventing free radical damage. With ascorbyl palmitate, the fatty structures of the heart, brain, and nervous system can get free radical protection. It's odorless and tasteless and should be added to oils, mayonnaise, and other products that can quickly oxidize and get rancid.

BHT (butylated hydroxytoluene) is a man-made antioxidant. This powerful synthetic antioxidant is used as a food preservative in many products. Tests have shown that BHT decreases



Acetaldehyde (a toxin, created in our bodies by incorrect diet, pollution, smoking, and drinking, that causes cancer and tumors) was fed to two groups of laboratory rats. Thirty minutes before being given the acetaldehyde—Group A was given cysteine supplement—Group B was not.

cholesterol levels dramatically. Since the body uses cholesterol as an antioxidant, the body raises blood cholesterol level to combat free radical attack. Antioxidants that scavenge free radicals lower cholesterol levels because less cholesterol is needed to combat the free radicals.

BHT lowers the susceptibility of liver lipids (fats) to peroxidation and the resulting free radical damage. Like other antioxidants, BHT prevents carcinogen (cancer-causing) induced chromosome damage and thereby dramatically decreases the risk of cancer.

BHT is an effective and non-toxic treatment for herpes infections. I've found it to be a reliable preventive device after the herpes infection is cleared up. Medical doctors prescribe dangerous and mutagenic drugs to treat herpes. These drugs are damaging and ineffective, but the FDA gives full approval of their use. In tests, lab animals life spans were extended by 50% by supplementing BHT, and experiments suggest it could add nearly 39 years to human life span.

Studies have shown arginine and ornithine to prevent tumor development and retard pre-existing tumor growth.

Since the immune system is ultimately responsible for disease and aging control, nutrients that stimulate the immune system must be considered related to antioxidants. Perfect examples of immune stimulants would be arginine and ornithine. They stimulate the pituitary's release of growth hormone, which is the hormone that strengthens and stimulates the immune system's master gland—the thymus gland. In fact, protein in general stimulates the release of growth hormone (and therefore stimulates the immune system), and carbohydrates depress the pituitary's release of growth hormone (and therefore depress the immune system). Studies have shown arginine and ornithine to prevent tumor development and retard pre-existing tumor growth. Arginine and ornithine supplements increase the size of the thymus gland and greatly improve immune responses to bacteria, viruses, and tumor cells. These amino acids also burn body fat, stimulate muscle size, stimulate wound healing, enhance liver function, and increase sperm count and sperm mobility.

Coenzyme Q_{10} is a nutrient that provides the biochemical 'spark' that creates energy in our cells. It was first isolated from heart tissue because the heart uses an enormous amount of energy. It stimulates the immune system because the immune system also uses a great deal of energy. As one grows older, the ability to extract CoQ_{10} from food declines as well as body levels of CoQ_{10}. Experiments show that CoQ_{10} supplementation protects against cancer, increases resistance to infections, doubles antibody levels, and stimulates the immune system's ability to clear invading organisms from the blood. Many claim that it is a true antioxidant and free radical scavenger.

There are micro-organisms which inhabit the intestinal tract and establish an internal 'ecosystem' to maintain health and well-being. These desirable bacteria (acidophilus) can easily be disturbed and killed by pharmaceutical drugs, sugar, and other things. A healthy intestinal flora is essential to absorb nutrients and eliminate wastes. Acidophilus supplementation is so beneficial to the immune system because with a healthy intestinal flora, the body can better absorb antioxidants, immune stimulants, immune supporters, proteins, etc. and eliminate wastes that burden the immune system if retained. Studies show that acidophilus supplementation greatly reduces the incidence of tumors in animals exposed to carcinogens (cancer-causing agents).

A perfect example of an immune supporter is algin. Algin comes from kelp and has the ability to remove toxic, heavy metals like lead, strontium 90, etc. Algin, or sodium alginate, moves through the intestinal tract without being absorbed. As it moves along it absorbs toxins which otherwise would create a tremendous burden on the immune system.

In summary, free radicals are constantly presenting a huge challenge to our immune system. The unprevented and unrepaired damage from free radicals results in disease and aging. Agents that can help the immune system deal with its task can be put into three categories—antioxidants, immune stimulants, and immune supporters. Antioxidants react with free radicals and stop their chain reaction damage. Immune stimulants boost the immune system's ability to protect the body. And immune supporters remove toxins that otherwise would burden the immune system. All of these agents must be considered anti-disease and anti-aging. Most research is conducted by adding one antioxidant, immune stimulant, or immune supporter at a time and the results show an increased life span and/or decreased duration or incidence of disease. Consider the results when combining many of these health-promoting agents!