

A GUIDE TO CELLULAR HEALTH



Chemical Stress



Emotional Stress



Physical Trauma



Infection

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Published by University Labs Press, No. 1 Capitol District
250 S. Hotel Street, Suite 200, Honolulu, Hawaii 96813-2869 U.S.A.

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IMPORTANT NOTICE:

THIS BOOKLET IS DESIGNED TO BE AN EDUCATIONAL TOOL REGARDING FREE RADICALS AND ANTIOXIDANT ENZYMES. IT IS NOT MEANT TO BE USED AS A DIAGNOSIS, RECOMMENDATION, OR GUARANTEE FOR ANY DISEASE OR RESULT FROM USING THE INFORMATION PRESENTED OR THE PRODUCTS MENTIONED. PROPER NUTRITIONAL MEDICAL ATTENTION SHOULD NOT BE AVOIDED OR DELAYED WHEN THERE IS A REASON TO SEEK PROFESSIONAL HELP.

STRESS AND IMMUNITY

Stress is a relatively new notion that everybody talks about, yet few understand. The dictionary defines stress as "pressure", force, strain: a state of physical or mental tension inducing it, or affecting something. "This definition, while obviously correct, is not very helpful in understanding the concept of stress. On the other hand, it is important to comprehend the notion, because all of us are continuously exposed to stress. Stress occurs in many forms. The four major categories which concern us are: 1) chemical stress; 2) emotional stress; 3) physical trauma; and 4) infections.

Each of these stress forms can originate from multiple sources. Most of these have appeared as primary threats in our environment as recently as this century. For example, chemical stress can come from pesticides, insecticides, polluted air and water, heavy metals such as mercury or lead, asbestos and, worst of all, radioactive waste. Even jet travel, a welcome commonplace today but unheard of a mere half a century ago, exposes passengers to unhealthy high levels of ozone and random, cosmic radiations. In the light of such widespread physiological insult, it is a miracle that any of us manage to stay healthy at all.

One of the primary reasons why stress is so important to understand, is because it is intricately linked to the functioning of our immune systems. How have many of us gotten a cold when our defenses were impaired by excessive stress? This is another angle from which to view the recent rash of immune disorders unleashed in our culture. Could these problems be partly caused by an overwhelmed immune system? It should be obvious that this is quite possible, and the more we consider the high levels of stress that most of us are exposed to daily, the more relevant the idea becomes. In other words, understanding and compensating for the stress in our lives will help our immune systems and enhance our abilities to stay well.

This is not to imply that all stress is harmful. Exercise, for example, is a form of stress on the body that is quite healthy. Yet, if we over-exert ourselves during exercise, we can damage the body and create problems. As we have already mentioned, many unavoidable stress factors, such as pollution, and others that cause damage to the body, stem from today's world of technological progress. In many cases the physical result brought on by several different forms of stress is the same. These unnecessary, but avoidable, results are cellular damage caused by overreactive molecules called free radicals.

Due to their overreactive nature, free radicals can be extremely toxic and are a direct consequence of the primary stress factors that adversely affect the immune system and threaten our health. However, this is not to imply that free radicals are always harmful or dangerous. Minute amounts of free radicals are essential for many important functions of the immune system and other vital cellular activities. For example, the immune system will actually generate free radicals to use in the process of removing a virus or bacteria. Only when high concentrations of free radicals are present, or when the levels of free radicals overwhelm the body's ability to remove them, does a threat to our health occur. Maintaining the balance between the free radical activity and antioxidant enzyme supply is one of the important functions of the body. (Fig. 1)

NORMAL BALANCE

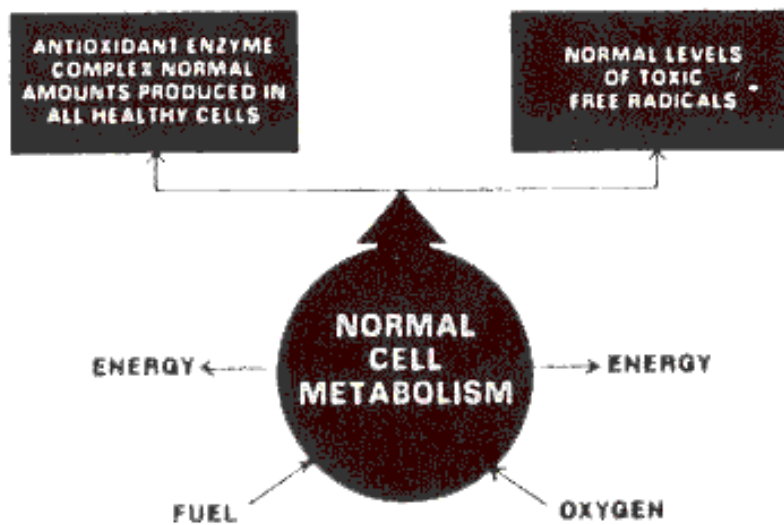


Fig. 1
Balance maintained. Normal levels of toxic free radicals are neutralized by cellular production of antioxidant enzymes.

It is the cell where free radicals are created and do the most damage. In the case of the immune system, this random circulation of unprepared electrons causes communication breakdown between the immune system cells and the body, thus weakening and frequently wiping out some of their signals. Simply put, excess free radicals create chemical reactions in the wrong place at the wrong time causing confusion and wreaking havoc with the cellular environment. If we consider that most components that eventually increase the free radical release in our bodies are ultimately linked to factors generated by the so-called progress of our civilization, it is easy to understand why such an increasing number of us fall prey to germs and viruses.

An immune system overwhelmed by the high toxicity of massive free radical assault will react very poorly, if at all, to threats posed by germs, viruses or to abnormal cell formations (like cancer). This is particularly true if such abnormalities are due to cell poisoning to begin with. Our ability to resist and defeat the onslaught of invaders like germs and viruses rests precisely on the reliability of a strong and capable immune system. Again, stress and the resultant free radicals are a primary cause in weakening the immune system.

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ANTIOXIDANT ENZYMES AGAINST FREE RADICALS

As we have discussed earlier, the different forms of stress exert a common free radical insult on many of the body's vital cellular processes. Understanding the relationship between stress, free radicals and cell damage is very important. By understanding this relationship, we can more effectively ward off the negative effects of stress. The issue becomes even more relevant when we realize that over 30 years of medical research has revealed that intensive free radical activity represents a major cell damaging factor that is implicated in every degenerative disease of our time.

Fortunately this massive amount of medical research, consisting of over 6000 published scientific studies, has also uncovered the primary factors for free radical protection in the body. This free radical protection system is primarily made up of an array of body-produced enzymes called antioxidants. Antioxidant enzymes are the first line of defense against free radicals and must be present in sufficient amounts to avoid unnecessary cellular and tissue damage.

All enzymes are essentially catalysts, that is, they are complex molecules stimulate chemical reactions without becoming consumed or integrated in the reactions that trigger. There are literally thousands of enzymes that occur in nature. Some of these serve to split and break down molecules. These enzymes are able to degrade tissue and compounds into simpler molecules, or in some cases, even to their constituent atoms. Life on this planet would be impossible without enzymes since organic waste and dead tissue could not be disposed of and food could not be digested. Examples of break-down enzymes are the digestive enzymes such as protease or trypsin.

A smaller, but not less important part of all existing enzymes are the types that stimulate the building up - or the synthesizing - of atoms to form molecules. The enzymes that enhance synthesis of atoms and molecules into larger and more complex molecules and tissues are also essential to life. They are linked to the creation of new tissue, and no organism could ever germinate, or grow without their support. Examples of synthesizing enzymes would be ribonuclease (RNA), and deoxyribonuclease (DNA).

Thus, our body functions are regulated by an elaborate system of enzymes responsible for the unhindered operation of most of the complex interactions between breakdown and synthesis, and whose intricate communication patterns we define as life. Without the assistance of enzymes we could never be conceived, nor could we grow or live and, paradoxically, we couldn't even die properly.

Antioxidant enzymes in particular, have the all-important role of controlling and regulating free radical activity in the body; and, therefore, allowing for the possible prevention of unnecessary cellular and tissue damage all too common in our society. Fig. 2

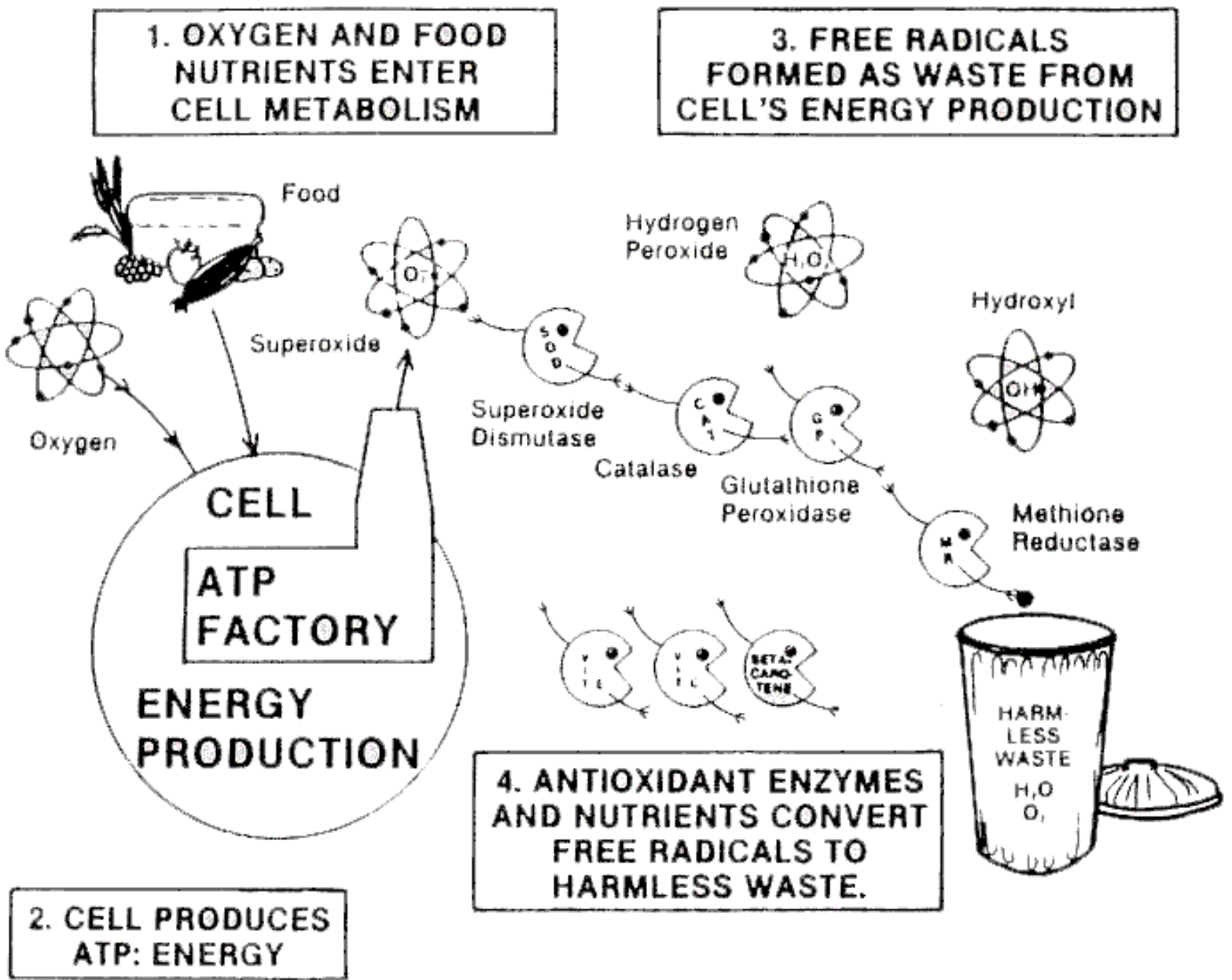


Fig. 2
Adapted from Healing Aids Naturally, L. Badgley; M.D.

The cells utilize oxygen and nutrients to make ATP, the basic energy molecule. Free radical by-products are generated in this process, and are removed by a system of antioxidant enzymes and nutrients. The free radicals which are deactivated are then recycled by the body again. For example, hydrogen peroxide is converted into oxygen and water. If there is plenty of oxygen, fuel, water, and antioxidant enzymes, cell damage is kept at a minimum. If any of these are missing at any point in the system, cell damage, (aging) follows. The body will employ antioxidant nutrients, such as beta-carotene, vitamin E, and vitamin C, to clean up any free radicals that get by the antioxidant enzymes. The antioxidant enzymes remove free radicals 3 to 10 times faster than the antioxidant nutrients.

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AGING AND DISEASE

Despite hundreds of different medical terms that are used to describe them, many aging processes and most diseased conditions are nothing more than an accumulation of cellular damage. In these situations, more cells are being damaged than the body is able to repair or replace. The understanding of this concept and its implications is overwhelming when we realize that much of this cellular damage has its beginning or ending in a free radical induced chemical reaction. When the levels of free radicals are higher than the supply of antioxidant enzymes, we speak of free radical pathology which represents a more accurate definition of the cause of most conditions than the current terms being used which tend to denote the result (i.e. cancer, heart disease, etc...). (Fig. 3) Additionally, free radical damage to certain types of cells is irreversible. Three types of cells: heart muscle cells, nerve cells (which include brain cells), and certain sensor cells of the immune system cannot be replaced in the adult human. Damage to these types of cells must be prevented to ensure a long healthy life.

FREE RADICAL PATHOLOGY

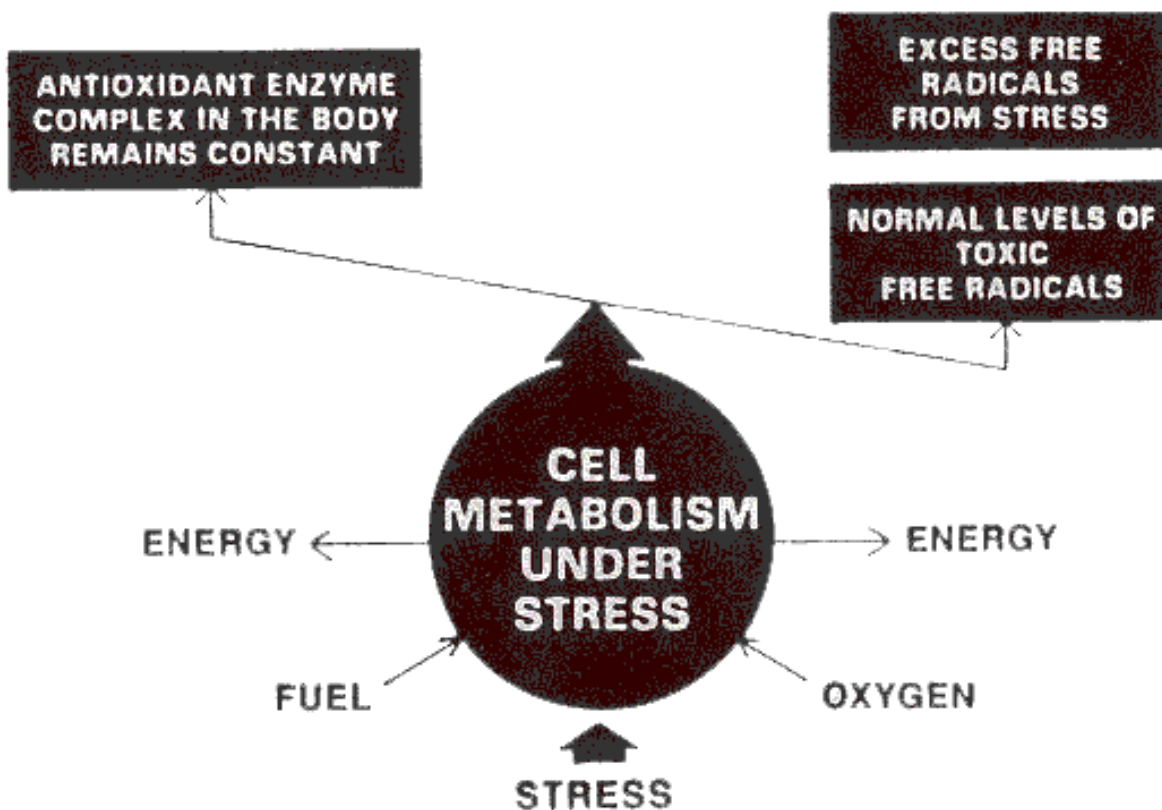


Fig.3
Excess free radicals from stress create imbalance and free radical pathology.

Once again, this is not to imply that excess free radical activity is the sole cause of aging and disease. Yet, it is true that a large majority of unnecessary cellular damage which leads to aging and disease can be avoided by following two simple guidelines. First, the free radical causing stress in our lives must be reduced or removed. Second, the antioxidant enzyme, or anti-free radical defense system, of the body must be properly supported. If even one of these premises can be implemented effectively, the process of our own individual aging and disease potential will be altered significantly.

The unfortunate truth is that many forms of free radical forming stress that originate in our so-called civilized environment and society are completely avoidable. For example, while it is true that it is entirely up to you to give up smoking, drinking and eating junkfood, you'll find it very difficult to avoid inhaling polluted air - especially if you live in the city. Pesticide residues on food and in water are also difficult to avoid completely. Radioactive

wastes and nuclear experiments, as well as increased cosmic radiation due to a weakened ozone layer, are also potentially harmful. Additionally, hundreds of other force fields generated by computers, microwaves, and power lines compound the problem. Unless you are prepared to become a hermit - in which case it would be a different set of stresses you would have to adjust to - there is nothing you can do to eliminate all of these free radical causing stress factors.

Fortunately, there are many things you can do to support the antioxidant enzyme defense system. Even before many of these stress factors were present, the ancient Essene medical practitioners proposed that ingesting certain types of wheat sprouts would be helpful to the body in it's quest to maintain health and balance. Today, confirming ancient Essene experiences, modern scientific analysis has shown that certain types of wheat sprouts will actually enhance the body's production of antioxidant enzymes. This is a paramount in our search for methods of counteracting unavoidable stress. Though adding specially prepared, whole, sprouted foodconcentrates to our diet and supplement programs, we can ensure that excessive free radicals from any source are removed from the body by literally enhancing the body's production of antioxidant enzymes.

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THE MAIN ANTIOXIDANT ENZYMES

Even though the production of antioxidant enzymes in the body is a complex process that is not yet totally understood, there are several processes that we are aware of and which seem to constitute a large part of the finished system.

The antioxidant enzyme defense system consists of hundreds of different substances and mechanisms. This is why only an adequate combination of whole foods, such as sprouted food concentrates, will contain all of the known and unknown nutritional factors that the body requires to enhance it's antioxidant enzyme supply.

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SUPEROXIDE DISMUTASE & CATALASE

We are a species that cannot live without breathing. As a result of this circumstance oxygen has turned into a synonym for life. A fact much less known is that not all oxygen atoms are life supporting. Some are actually quite destructive for our cells.

These unhealthy oxygen atoms are unbalanced and constitute the most common free radical known. Characterized by having an unpaired electron in it's molecular structure, this oxygen free radical, called superoxide , is quite capable of causing cell damage.

The first line of defense the body has against superoxide free radicals is the enzyme known as superoxide dismutase, or SOD, which is considered the most effective antioxidant. The importance of SOD is so paramount for the protection of our cells, that it represents a substantial proportion of the proteins manufactured by the body. In brief, SOD keeps oxygen under control.

In the process of removing superoxide free radicals, SOD rarely operates alone. It requires the enzyme catalase to remove hydrogen peroxide molecules which are byproducts of the reactions created by SOD. Similar to SOD, catalase is abundant in the body. Integrated in all red blood cells, catalase removes hydrogen peroxide from our tissues, preventing both cell damage and, more importantly, the formation of other, more toxic, free radicals. In

nature, and in the body, SOD and catalase always coexist. The natural interaction - synergy - between these two antioxidant enzymes constitute the most effective system of free radical control in our bodies.

Superoxide free radicals initiate the the breakdown of synovial fluid - the lubricating element - in the joints, causing friction and, eventually inflammation. For this reason, the attention of clinical SOD research has been focused primarily on inflammatory processes triggered by superoxide free radicals such as arthritis, bursitis and gout. Deficiency in SOD/catalase is the most notorious nutritional factor in most inflammatory processes. Recent applications of SOD/catalase enhancing foods have also proven to be extremely useful as a pre- and postoperative supplement which stimulates recovery and reduces convalescence periods remarkably.

Considering the powerful link between free radicals and many health problems, supplements that enhance SOD and catalase activity in the body offer tremendous potential in the field of preventive nutrition.

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GLUTATHIONE PEROXIDASE

Glutathione peroxidase is another of the body's major protectors against free radicals. This antioxidant enzyme consists of the amino acid glutathione and trace mineral selenium. These two nutrients team up to combat a specific class of free radicals called peroxides. The main biological function of selenium in mammals is a component of the glutathione peroxidase enzyme. Many of the attributes of selenium and glutathione are actually attributes of glutathione peroxidase.

Cell membranes consist primarily of lipids (fats). These lipid membranes are very susceptible to damage by free radicals, especially peroxide free radicals. This is why rancid fats (lipid peroxides) have been proven to be highly toxic. Glutathione peroxidase prevents destruction of cell membranes by removing several classes of these lipid peroxides.

The main symptoms of excess peroxide free radicals include heart disease, liver disease, premature aging, and skin diseases such as skin cancer, eczema, wrinkling, age spots, dermatitis and psoriasis. Peroxide free radicals mediate much damage to the body by impairing liver functions. Consisting of nearly 50% fatty tissue, the liver is very susceptible to lipid peroxidative damage.

Although used primarily for skin related problems, many environmentally sensitive and chemically poisoned people report that glutathione peroxidase helps them control their allergies and build resistance to the side effects of pollution. Generally speaking, all of the antioxidant enzymes are important to where pollution is a concern due to their ability to remove free radicals generated by toxic substances. The list of protective effects of glutathione peroxidase is growing and is in no way limited to any single symptom such as age spots. The effects of excess peroxidation in our cells is diverse and dangerous and must be limited to maintain cellular health.

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METHIONINE REDUCTASE

Methionine reductase is a unique enzyme that has demonstrated an ability to remove an extremely toxic free radical called the hydroxyl radical. The hydroxyl radical is commonly formed through reactions involving heavy metals and other less toxic free radicals, such as mercury reacting with hydrogen peroxide. The hydroxyl radical has the ability to damage any type of organic cellular tissue and is considered to be the most dangerous free radical. Hydroxyl radicals are also the main toxins generated by exposure to excessive radiation. With their

ability to any type of tissue, symptoms directly related to hydroxyl radical-induced tissue damage are difficult to identify.

One effective detoxifying application for methionine reductase is in the removal of free radical toxins generated by the mercury found in dental fillings. Another interesting application of methionine reductase is for the modern day athlete. It seems that hydroxyl radicals are also formed during exercise. This is especially true if we are exercising in oxygen starved closed rooms or in car exhaust filled polluted environments. It is amazing to see joggers running along the road during rush hour traffic. Quite possibly, they are doing more harm than good.

Most avid exercisers are aware of the need to obtain extra nutrition to fuel their activities. What many miss, is the importance of cleaning out the extra metabolic wastes that are direct results of this exercise. Hydroxyl radicals can be created when we burn fat molecules to produce energy as in strenuous exercise or dieting. This is due to lack of evacuation of chemicals and toxins stored in the fatty tissue which are released when these tissues are used for fuel. These toxins, when not properly evacuated, generate the formation of hydroxyl radicals. People using methionine reductase have reported greater resistance to the ill effects of pollution as well as greater endurance, stamina, flexibility, and ability to recover from extensive exercise. Although it is generally important to exercise, our modern civilized environments force us to compensate for free radical by-products if we wish to gain health or longevity from our workout programs.

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WHOLE FOOD SUPERSPROUT CONCENTRATES:

NATURAL ANTIOXIDANT ENZYME NUTRITION

Today, many people are aware of the nutritional power of "live" foods and try to incorporate raw and/or sprouted foods into their diet. As mentioned earlier, the ancient Essene medical practitioners prescribed sprouted foods to treat and prevent many illnesses. One of the ways that science has demonstrated the relevance of sprouts as a superior source of nutrition, is through the use of certain types of specially developed organically grown sprouts that actually increase the antioxidant enzyme supply of the body. More importantly, these special types of organically grown sprouts seem to carry out this very important task by literally enhancing the body's own production of antioxidant enzymes.

Although it is not totally understood how certain sprouts are able to have this effect on antioxidant enzyme production in the body (i.e, in-vivo), certain characteristics observed during the growth stage of sprouts reveal some important clues. Grains, such as wheat, go through four primary stages of growth - 1) from seed to sprout: 2) from sprout to grass: 3) from grass to grain: and 4) from grain back to seed. At each stage of growth the needs of the plant as well as the nutritional structure and content change dramatically. For example, the sprout contains little or no chlorophyll, whereas the grass, through it's contact with light, contains large amounts of chlorophyll. Another important example is in the protein gluten, the sprout and grass do not. This is why people who are allergic to wheat are able to tolerate wheat sprouts or wheat grass. The fiber content and type changes significantly during the growth cycle of the wheat plant as well. The sprout contains higher amounts of soluble fiber than the grass from predominately insoluble fiber.

Sprouts are the vegetable equivalent to the fetal stage development in humans and animals. This is probably the most important clue in understanding the sprouts ability to affect antioxidant enzyme production in mammals. The sprouts' cells are nondifferentiated, meaning they have not totally taken the structured form yet of the complete plant. At this stage of development, just as in the fetus, the sprout is quite vulnerable to random free radical activity. It must not only contain a large supply of antioxidant enzymes, but also be able to produce more

if the need arises. These antioxidant enzymes preserve vital components ensuring the proper growth and development of the plant. It has also been shown that young children or infants contain much higher levels of antioxidant enzymes, superoxide dismutase and catalase, than their adult counterparts.

As the sprout matures, breaks through the ground, and gains access to light, its antioxidant enzyme content reduces while its chlorophyll, vitamin A, and other nutrients related to photosynthesis increase. Thus, at the earliest stages of development, the sprout has a naturally built-in capacity to produce antioxidant enzymes in whatever amounts that may be necessary to preserve its development.

One of the difficulties of utilizing sprouts to enhance antioxidant enzyme levels in the body is that the amounts required to have an effect are quite large - usually much more than even sprout fanatics are willing, or able, to eat in a day. Fortunately there are products available today, developed from specially developed organically grown wheat sprouts, that contain amounts of antioxidant enzyme nutrition large enough to increase antioxidant enzyme levels in the body.

Using special growing and drying techniques, these antioxidant enzyme products contain over a quart of sprouts to each tablet. The technique employed to produce the finished product guarantees that most of the original active ingredients of the living sprout are preserved in the tablet form. Grown in totally controlled environments, gently dried at room temperature, and tableted without fillers or binders, these whole sprout concentrates are the most powerful food supplement available today. Most importantly, being whole food products, they contain balanced amounts of hundreds of different nutritional factors, instead of just vitamins or minerals in isolated forms. While nutritional imbalances may be created with isolated vitamins and minerals, such imbalances are virtually impossible with unprocessed whole food products. Whole food supersprout concentrates are nature's way of providing antioxidant enzyme nutrition to the body.

The importance of the special techniques utilized in the production of whole food supersprout concentrates is illustrated in one of the double blind studies that was performed with the products. Being a whole food product, creating a placebo that looked identical to the real product, was a difficult task. Yet, realizing that enzymes and co-enzymes are degraded when exposed to excessive heat, the placebo was then created by overheating the original product. While the original product created a dramatic increase in the antioxidant enzyme activity in the test group, the cooked product had no effect on the antioxidant enzyme activity in the placebo group. (fig. 4) How many of us eat primarily cooked foods in our diets? It is easy to see that eating primarily cooked foods, coupled with excessive free radical causing stress could contribute to create the problem of poor levels of health that afflict people in civilized cultures.

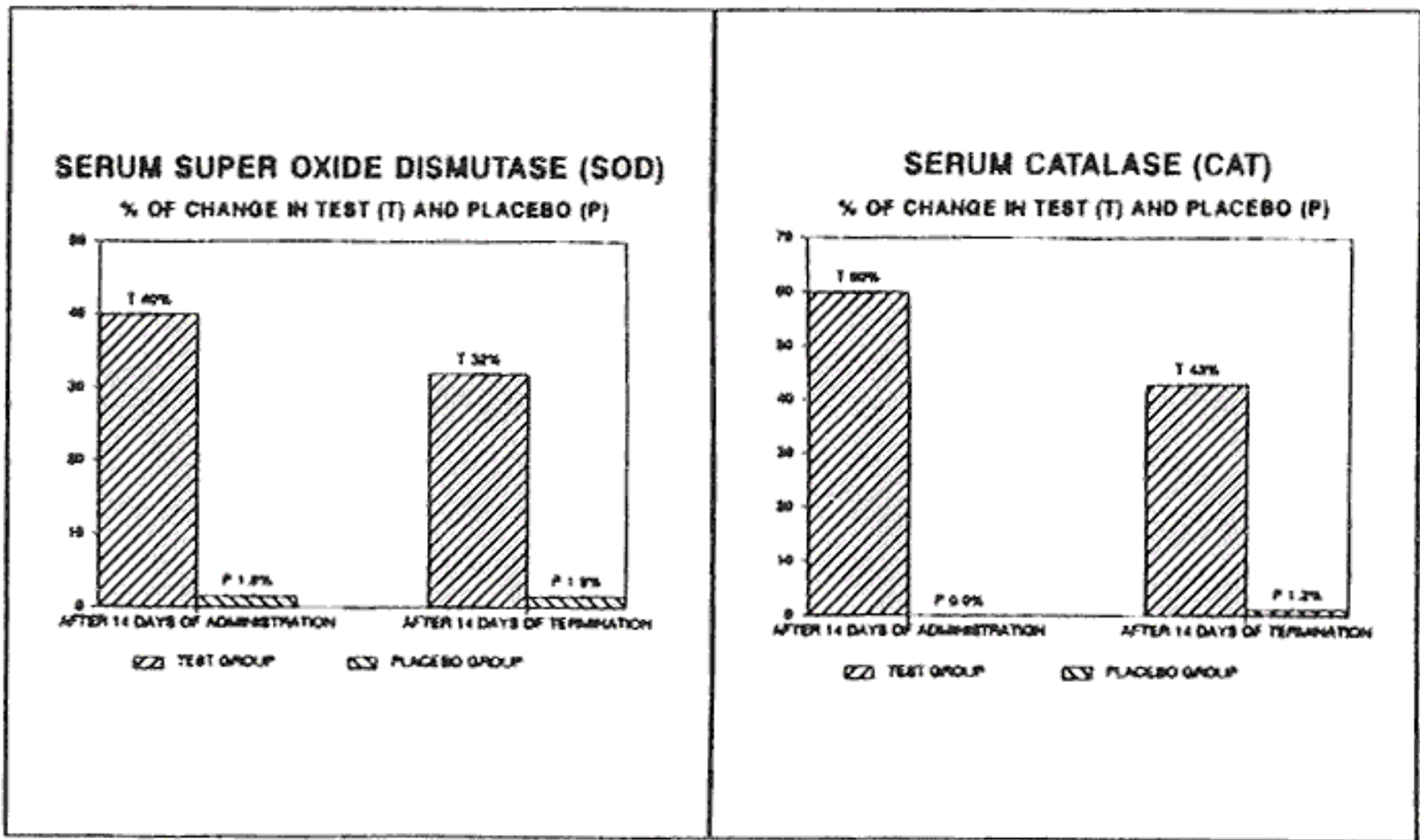


Fig. 4
Results of serum superoxide dismutase (SOD) and catalase (CAT) from absorption.

Study with STRESS RELEASE (SOD/CAT)tm by Fahey Pharms, Ordonez, L., Rothchild, P., Academia de Medicina, Francisco Villa 18, Las Palmas, Matamoros, Tamaulipas, Mexico, 1988. Testing procedures involved Fluorescence Fading Time and are described in detail by Rigo, A., Rotillo, G., Determination of Superoxide Dismutase and Catalase in Biological Materials by Polarography, Anal. Biochem., 81 (1) 157-661/ 1977 Jul/1MD

The absorption of enzymes and other complex proteins (i.e. peptides) is easily the most controversial issue when regarding supplementation designed to increase antioxidant enzyme activity in the body. It is generally believed that all complex proteins are completely broken down by the acids in the stomach and, therefore, supplementation of either enzymes or peptides is supposedly worthless at best. These ideas are based on research mostly performed over 50 years ago and - despite a large volume of recent scientific studies, including the one mentioned above, which demonstrate that some active peptides and compounds do effectively bypass stomach acids and are being absorbed into the intestines - the established scientific community has been reluctant to change its mind. Recently published articles have taken this issue to task and, ".....there is irrefutable evidence that small amounts of intact peptides and proteins do enter the circulation under normal circumstances." (See reference 3)

While biological results of increased enzyme activity, such as the study mentioned above, do not necessarily prove absorption of enzymes or peptides in the intestines, the fact that the active or unheated product did create an increase in enzyme activity, while the heated product - used as a placebo - did not, demonstrates that some complex enzyme(s) or peptide(s) within the product was indeed responsible for the result.

Physicians and veterinarians utilizing whole food supersprout concentrates to improve the nutritional status of

their patients, report a long list of positive benefits that can only be related to an improved nutritional standard. These benefits include diminished joint pains and inflammation, more energy, better circulation, and, most importantly, significantly reduced recovery time after surgery and other types of convalescence after severe stress conditions such as physical trauma. Clearly, the degree to which a patient is well nourished does affect their ability to cope with stress. Apparently, whole food sprout concentrates supply the right nutrition for these circumstances. Due to the growing understanding of antioxidant enzymes, pharmaceutical companies are also pursuing the development of new compounds including SOD. These products, unlike whole foods, contain isolated enzymes and could potentially create imbalances. Such new products will, of course, be regulated as drugs and require prescriptions. Fortunately, we have whole food 'supersprout' concentrates at our disposal to naturally assist our body's maintenance of adequate antioxidant enzymes.

Individuals utilizing whole food 'supersprout' concentrates in their supplement programs report more energy, better mental clarity, reduced allergic reactions to environmental pollution, diminished joint pains and inflammation, more stamina for extended exercise, and, of course, significantly reduced recovery time when injured or subjected to excessive stress such as a hard workout. Many individuals even report that they effectively feel younger.

All these effects can be easily attributed to the reduction of unnecessary tissue damage caused by excess free radicals and can be afforded by all who intelligently choose whole food supersprout concentrates in their diet and supplement programs.

The all-important balance between free radical activity and antioxidant enzyme supply can be effectively maintained with whole food supersprout concentrates. (Fig. 5)

BALANCE RESTORED

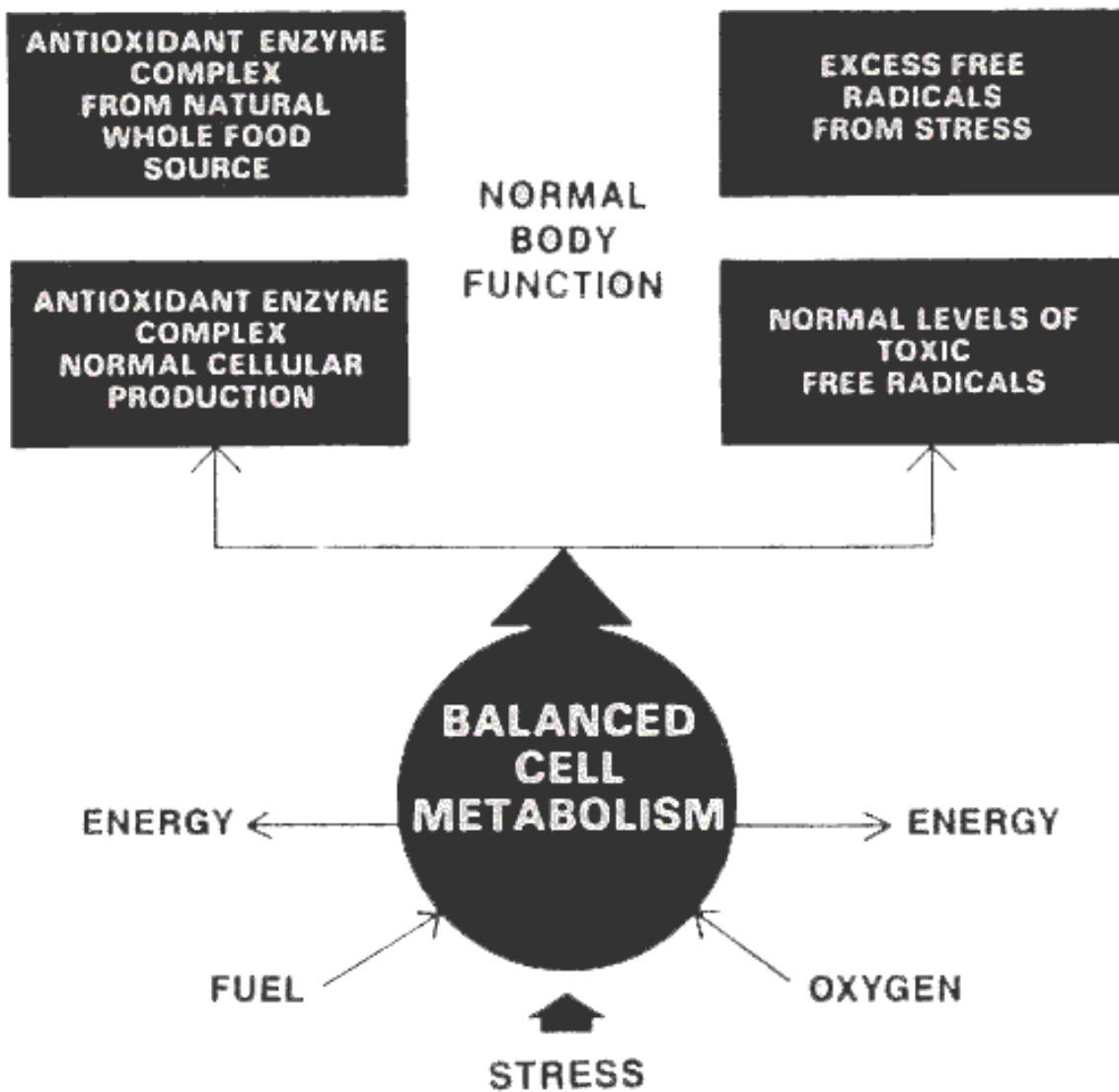


Fig. 5
Balance restored, whole food antioxidant enzymes neutralize excess free radicals from stress conditions.

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REFERENCES AND RESOURCES

- 1) Radiation Protection Manual. Lita Lee, PhD, 2061 Hampton, Redwood City, CA 94061. 415-369-2554.
- 2) Antioxidant Adaption: It's Role in Free Radical Pathology. Stephen Levine, PhD, 400 Preda St., San Leandro, CA 94557.
- 3) Gastrointestinal Absorbption of Intact Protein., Michael L.G. Gardnre, Ann. Rev. Nutr. 8:329-50, 1988.
- 4) Absorbption Study With SOD/CAT tm. Rothchild, P.R., Ordoniz, L., University Labs Press, 1215 Center St., Honolulu, HI 96828.
- 5) Free Radicals in Medicine, I , Chemical Nature and Biological Reactions. P.A. Southorn and G. Powis, Mayo

Clin Proc, 63:381- 389, 1988.

6) Free Radicals in Medicine, II, Involvement in Human Disease. P.A. Southorn and G. Powis, Mayo Clin Proc, 63:390- 408, 1988.

7) Oxygen-Derived Free Radicals: Pathophysiology and Implications. Mark E. Hitt, DVM, Compendium Small Animal, Vol. 10, No. 8 Pg. 939-946. August, 1988.

8) Aspects of the Structure, Function, and Applications of Superoxide Dismutase. J.V. Bannister, W.H. Bannister, G. Rotilio, Critical Reviews in Biochemistry. Vol. 22, No. 2 Pg. 111-180, 1987.

9) Superoxide Dismutase and Glutathione Peroxidase Activities in Erythrocytes as Indices of Oxygen Loading Disease: A survey of One Hundred Cases. L.L. Tho and J.K. Candlish, Biochemical Medicine and Metabolic Biology, 38, 74-80, 1987.

10) Chemical Reactivity and Biological Effects of Superoxide Radicals. C.A. Chuaqui and A. Petkau, Radiat., Phys., chem. Vol. 30. No.5/6 Pg. 365-373, 1987.

11) The Essene Way of Biogenic Living. E.B. Szekely, International Biogenic Society, Apartado 372. Cartago, Costa Rica, Central America. 1978.

12) Free Radical Pathology in Age-Associated Diseases: Treatment With EDTA Chelation, Nutrition, and Antioxidants. Elmer Cranton, MD, James Frackelton, MD, Journal of Holistic Medicine. Vol. 6 No. 1 Spring/ Summer 1984.

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