

The Discovery Of the Superoxide Dismutase – An Enzyme and An Antioxidant

Like many great discoveries, the first antioxidants were discovered by accident.

Joe McCord was looking for the function of a different enzyme when he chanced upon a mysterious enzyme that seemed to be present in every form of life except anaerobic bacteria, bacteria that does not need oxygen to survive. In the beginning, neither McCord nor his mentor, Irwin Fridovich, understood the purpose of this enzyme, which they named superoxide dismutase (SOD), but they were convinced that it was important.

This discovery was the beginning of research into antioxidants and free radicals. In the late sixties, when McCord and Fridovich first published their findings, their research was received with little enthusiasm. Most of their peers did not grasp the importance of antioxidants and their role in human health and vitality. Now, decades later, we know a great deal more about how free radicals are generated and the role antioxidants play in the body to protect against their damage.

What Are Free Radicals?

Free radicals are molecules that are inherently unstable. In an effort to become more stable, free radicals will steal electrons from other molecules in close proximity. This electron theft makes the victimized molecule more unstable, and it in turn will steal electrons from other nearby molecules in order to become more stable, and so on. This chain reaction of robbing Peter to pay Paul can cause a great deal of cell damage, as well as cell death.

Free radicals are all around us; they are not easy or even possible to avoid. Many diseases and injuries create free radicals in the body. Alzheimer's disease, arthritis, asthma, cancer, influenza, sinus infections, and yeast infections all create free radicals. Injuries, even minor ones such as sprains, muscle aches, and strains, all generate free radicals. Toxins generate free radicals and toxins are everywhere – in our food, water, and the air we breathe. Even if our air was perfectly clean, simply taking in oxygen throughout the body generates free radicals.

Unavoidable Free Radicals

Oxygen molecules generate what is collectively known as oxidative stress. Oxygen is actually highly corrosive. Most of us don't think of it that way because we need oxygen to live; without oxygen our cells would quickly die. But taking oxygen into the body generates a free radical superoxide, an unstable form of oxygen. Obviously, there's no way to avoid this. Oxygen is just one of our unavoidable sources of free radicals. Metabolizing our food also creates free radicals. Sunlight, smoking, radiation and even eating burnt food can create free radicals in the body.

So why aren't we all dead yet? That's where antioxidants come in.

How Does SOD Work?

Superoxide dismutase (SOD) is both an enzyme and an antioxidant that protects against the free radical, superoxide. SOD changes this free radical to hydrogen peroxide. Unfortunately, hydrogen peroxide is still a free radical. SOD then works in concert with another antioxidant, catalase, to change hydrogen peroxide from an unstable free radical to water, a stable compound.

SOD is produced in the body from three minerals: copper, zinc, and manganese. Good sources of copper and manganese can be found in whole grains and nuts. Good sources of zinc include egg yolks, milk, oatmeal, nuts, legumes, and meat.

Antioxidant Supplementation

Joe McCord, now a professor of medicine at the University of Colorado Health Sciences Center, thinks we should find ways of supplementing our diet in order to increase the two antioxidants in our bodies that do most of the work: superoxide dismutase (SOD) and catalase. According to McCord, these two enzymes are the antioxidants that neutralize 99% of the free radicals in our bodies. By McCord's reasoning, if we can get the body to produce more of these two antioxidant/enzymes, our bodies would be far more efficient at fighting free radicals.

McCord and his coauthor showed how a supplement containing five plant extracts simultaneously increased the body's production of SOD and catalase and also decreased the markers associated with oxidative, stress-related aging. Their supplement contained green tea, turmeric, milk thistle, ashwagandha (also known as winter cherry), and bacopa.

So when it comes to antioxidants, more is more. Don't megadose on one nutrient; rely on several nutrients to do their work in combination. Joe McCord Ph.D, Lester Packer Ph.D., Sanjay Gupta M.D., and Don Colbert M.D. are among the many experts who believe that antioxidants work best as a team. When these nutrients are used individually, the resulting health benefits are meager, if at all. This is one of the reasons why the public is getting mixed results back from scientists about the effectiveness or ineffectiveness of vitamins in clinical trials. It is speculated by these and other experts that antioxidants are far more effective when they are in our diet (either as a result of supplementation or through our food) in

proportionally combined doses.

Most of the body's antioxidant protection comes from the combined efforts of vitamins A, C, and E, SOD, catalase, and glutathione peroxidase. These antioxidants effectively prevent the majority of the damage that would be done by free radicals.

If we run low on these nutrients, cell damage can occur as a result. When Don Colbert M.D. was experimenting with different fasts for his best-selling book, *Toxic Relief*, he experienced this kind of nutrient shortage firsthand. On day seven of his water only fast, he noticed small white splotches had begun forming on the outside of his skin. Due to his medical training, he immediately knew what had happened; he had exhausted his body's catalase, and his system was no longer able to convert hydrogen peroxide to water. Of course, he broke the fast immediately.

Antioxidants work synergistically. Increasing some antioxidants will help your body increase others. Take glutathione, for instance. Glutathione can both detoxify the body and neutralize free radicals. The liver manufactures glutathione from three amino acids: cysteine, glutamic acid, and glycine.

Glutathione can also be consumed in foods such as fruits, vegetables, fish, and meats. However, the amount of glutathione produced can be increased by increasing Vitamin C and N-acetylcysteine in the diet. The previously mentioned herb, milk thistle (one of the five plant extracts in McCord's study that was shown to increase SOD production) can encourage the liver's output of glutathione by as much as 35%!

Vitamin C and vitamin E are well known antioxidants. Vitamin C can protect the water soluble interior of the cell, and Vitamin E can protect the cell's fatty outer membrane. These nutrients can get pretty complicated. For instance, there are

eight different kinds of vitamin E. High doses of vitamin C, or any other nutrient, wouldn't offer this kind of protection without the combined help from other antioxidants.

Many people believe supplemented forms of antioxidants will do them some good, but they don't often understand that when it comes to supplemented antioxidants quality really matters, and it isn't possible to get everything you need from pills alone. Some vitamins that also act as antioxidants are of such poor quality that they are of no benefit and may be actually harmful. Many of these detrimental vitamins are derived from petroleum. For example, a common synthetic form of vitamin E is dl-alpha-tocopherol or dl-alpha-tocopheryl. This form of vitamin E is actually more harmful than going without any vitamin E supplementation at all.

Conclusion

Antioxidants (and many other nutrients) are naturally found in many foods. Antioxidants (the ones that scientists have discovered so far) are especially high in the following foods: artichokes, apples, blueberries, blackberries, black beans, red beans, kidney beans, carrots, cherries, cruciferous vegetables, citrus fruits, cantaloupes, watermelon, pecans, romaine lettuce, spinach, tomatoes, garlic, onions, leeks, pumpkin, cabbage, green tea, and milk thistle tea.

The healthiest diet is an 80% Raw Food Diet. When 80% of your diet is comprised of raw, fresh, organic produce (more vegetables than fruits) your body receives the benefit of nutrient dense foods loaded with antioxidant vitamins and enzymes. To increase nutrition, you may want to add Doc Shillington's Total Nutrition Formula to your diet. Here's the recipe to make your own.

Sources:

The Seven Pillars of Health by Don Colbert M.D.

Chasing Life by Sanjay Gupta M.D.