



The Antioxidant Enzymes

The antioxidant enzymes are a powerful force for longevity and we'll learn all about them in this chapter. We'll also explore a couple of the most promising new age-defying antioxidants: coenzyme Q10 and melatonin

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Human beings are among the most long-lived of animals (only some kinds of turtles and perhaps a few whales outlive us). Humans also have very high levels of antioxidant enzymes, higher than just about any other animal. The link between long life and high levels of antioxidant enzymes is not coincidental.

SOD, CATALASE, AND GLUTATHIONE

The antioxidant enzyme superoxide dismutase, or SOD, works hand in hand with catalase and glutathione to quickly disarm the most dangerous free radicals. Here's how the two enzymes interact: When normal metabolism inside your mitochondria makes superoxide free radicals, SOD quickly converts them into oxygen and hydrogen peroxide. There's a problem with that, though. When a

superoxide free radical meets hydrogen peroxide, it forms the very reactive free radical known as hydroxyl. Of all the free radicals, hydroxyl is the biggest vandal, the one that does the most damage in your body. You need to quench it instantly, as soon as it's produced. Unfortunately your body doesn't make an enzyme that can quench the hydroxyl radical (although, as I'll discuss later in this chapter, you do have other defenses). That's where catalase comes in.

Catalase grabs the hydrogen peroxide and breaks it up into oxygen and plain water before it can form a hydroxyl radical. The oxygen and water then get reused by your cells as part of normal metabolism.

Catalase has one big limitation: It works only in the watery parts of your cells. It can't protect the fatty parts of a cell, like the cell membrane, from lipid peroxides the free radicals

that are formed when hydrogen peroxide attacks lipids. That's where glutathione comes in. Glutathione is the most abundant antioxidant enzyme in your body. It's everywhere inside and outside of your cells, constantly patrolling your cells and looking for any molecules of hydrogen peroxide your catalase has missed. Glutathione also protects your cell membranes against lipid peroxidation. Simply put, lipid peroxidation happens whenever any free radical steals an electron from the delicate fatty membrane of a cell. Lipid peroxidation, like all free radical damage, is a chain reaction that keeps going until something – in this case- glutathione peroxidase- stops it. Without the glutathione, the damage would continue, weakening the cell membrane further and further until finally the cell is irretrievably damaged and dies. If the lipid peroxides are quenched quickly, however, your body can repair the cell membrane and get things working properly again.

RAISING YOUR ENZYME LEVELS

Since your antioxidant enzymes are manufactured inside your cells by your body as you need them, is there anything you can do to raise their levels? Yes, at least to some degree.

Like all the proteins in your body, enzymes are assembled in your cells, following directions given by the DNA in the nucleus of every cell, from building blocks called amino acids.

You also need vitamins such as vitamin C and the B vitamins and trace amounts of some minerals, such as copper, zinc, manganese and iron, to help the proteins fit together properly.

If you give your cells enough of all the building blocks, they'll be able to put together the antioxidant enzymes just as quickly as you need them. Starve your cells of what they need, however, and the enzymes won't be assembled quickly enough. Even worse, without a regular supply of essential ingredients, your antioxidant enzymes could get out of balance. If you make enough SOD but not enough catalase, for instance, the all important balance between the two is thrown off. They won't be able to work in tandem to protect you.

Think back to what I said earlier about amino acids as the building blocks of protein. Where do you get amino acids from? Your food. But not all foods are equal when it comes to aminos. To get what nutritionists call high-quality or complete protein, you need to eat animal foods such as meat, eggs, fish, and dairy products.



EAT YOUR EGGS

And of all those high-quality proteins, which one is the very best? If you've read my other books, you already know. For those of you who haven't yet, the answer is the egg. In fact, the egg is the standard nutritionist use to measure the quality of other proteins.

If eggs are such good source of the essential amino acids, why does your conventional doctor tell you to eat them only occasionally? Because he or she thinks eggs raise your cholesterol level. As with so much of the other cholesterol misinformation you're given, this particular myth is the gospel as preached by the American Heart Association. The AHA says you should take in only 300mg a day of dietary cholesterol.

Therefore, you shouldn't eat eggs, because one egg has about 215mg of cholesterol (more than most other foods have for the same number of calories). As anyone who's ever read one of my books or heard one of my radio broadcasts know, however, there's very little connection between the cholesterol you eat and the cholesterol in your blood. I could cite dozens of studies that show the opposite of the AHA position : that eating eggs actually improves your blood cholesterol profile. Here's just one good example. In a 1994 study, twenty-four adults added two eggs a day to their usual diets for six weeks. At the end of this period, their total cholesterol levels had increased by 4 percent. Their all-important HDL levels, however, were up a very desirable 10 percent.

I'm glad to say that some members of the conventional medical world are finally starting to think for themselves. In 1999, the National Institutes of Health funded a major study that showed that eating an egg a day doesn't increase the risk of heart disease or stroke for healthy adults. Many of the patients who first come to me at Centro de Medicina Complementaria have eliminated eggs from their diet, in the mistaken belief that they're doing something positive for their health.

One of the first things I recommend to them is to start eating eggs again, at least two a day.

ENZYME SUPPLEMENTS

Because SOD and catalase are meant to exit within cells and are unstable inside the intestinal tract, you can't expect to take them as oral supplements and thereby boost your levels. A few manufactures do make SOD tablets, but I don't think they will do much.

Oral glutathione supplements are used more often. Proponents feel that because glutathione is a tripeptide a very short string of just three amino acids it may avoid being broken down further by the digestive system. Instead, you can absorb it whole into the bloodstream. Most studies show rather disappointing elevations of serum glutathione after it is taken by mouth.



The far better way to raise your glutathione level is to raise your level of cysteine, an amino acid that's fundamental to manufacturing glutathione. We know that your blood levels of glutathione you make. And what's one of the very best dietary sources of cysteine? You guessed it –eggs. There are 146mg of cysteine in one egg, most of it in the yolk. To raise glutathione levels more directly, I usually give my patients supplements of N- acetyl-cysteine, because the acetylated form leads to a higher glutathione level.

VITAMINS AND MINERALS

To make the antioxidant enzymes, you also need to have adequate supplies of the trace minerals, zinc, manganese, copper, sulfur, and selenium. Manganese, copper, and zinc are particularly important for making SOD inside your mitochondria, where most of your free radicals are produced. Selenium and sulfur are crucial for forming glutathione. So in addition to making sure you're getting enough high-quality protein every day you need to get enough of the important trace minerals.

Finally, you need a goodly supply of vitamins, especially vitamin C and the B complex, to make the antioxidant enzymes. Vitamin C stimulates your body to produce extra catalase, for example. Without enough vitamin B6 (pyridoxine), you can't make glutathione.



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