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Some Good Things to Say About Free Radicals

Commentary by Jack Challem, Editor & Publisher

I've been taking vitamin supplements since 1969—26 years—and writing about them for health magazines since 1974. I interview some of the best "vitamin docs" in the world, read medical journals and nutrition books, and have even written a couple, too. Though I succumb to an occasional cheeseburger, my diet has been generally good, with the overall emphasis on good, wholesome foods.

I also take a lot of vitamin supplements. Until a year ago, I included in my daily regimen 1,600 IU of vitamin E, 100,000 IU of mixed beta- and alpha-carotene, and about 15 grams of vitamin C. High doses—but after all, I should know what I'm doing. Right?

Not necessarily. Taking all these vitamins should have left me feeling absolutely energized. That's what the research says. And what the advertising for antioxidant supplements often suggests. But over the past 10 years or so, I've felt far more fatigued than I should have. Tired in the morning. Tired in the afternoon. Tired in the evening but, I should note, not suffering from crippling Chronic Fatigue Syndrome.

To my surprise, I discovered that I was doing *too good* of a job quenching those dangerous free radicals we all hear about. *I was taking too many antioxidants*. I imagined myself at a meeting of Antioxidants Anonymous and confessing, "My name is Jack C. and I began taking antioxidants at the age of nineteen..."

With all the talk about the anti-aging and anti-disease benefits of antioxidants, we too easily forget about the *essential* role of free radicals. That's right—free radicals *are* essential for health. Of course, one could reasonably argue that most people are exposed to far too many free radicals and need to boost their antioxidant intake for protection. But there are dangers, I found, in simplifying the issue of free radicals and antioxidants to one of a biochemical gunfight at the OK Corral.

Free radicals are atoms with unpaired electrons aggressively looking for a mate. Oxygen free radicals are particularly dangerous because they react most readily with other molecules. When they bump into a mate—just about anything will do—they can oxidize cell membranes and cholesterol and disrupt deoxyribonucleic acid (DNA) in ways that accelerate aging and lead to cancer.

Cigarette smoke, air pollution, exposure to sunlight, radiation, pesticides, some drugs, and chemotherapeutic agents produce free radicals. So do polyunsaturated fats. If you live at a high altitude or fly frequently, you have to deal with large numbers of free radicals because of the higher levels of gamma-ray radiation. (Thicker air at lower altitudes absorbs the radiation and reduces exposure.) Even over-exercising generates extra free radicals.

But the biggest source of free radicals is our own bodies. Why on Earth would we produce the very seeds of our destruction? There are some very good reasons that you generally don't hear about. White blood cells use free radicals to destroy bacteria and virus-infected cells. According to Bruce Ames, PhD, of the University of California, Berkeley, these free radicals prevent immediate death from infection. In addition, with the help of other free radicals, the liver's cytochrome P-450 enzymes detoxify harmful chemicals, again, protecting us from a quick death.

Free radicals are also a normal byproduct of everyday respiration—breathing—in which our bodies use oxygen and generate energy. The process of respiration—known to biochemists as the Krebs cycle, reduction/oxidation, or redox—is reminicent of the childhood game "hot potato." The Krebs cycle passes molecules around in a circle, trying to keep the good ones and getting rid of the bad ones.

The sheer scale of this activity is a mind-blower. Ames has estimated that *each cell* in the body suffers 10,000 free radicals "hits" each day. The body's own antioxidants, such as superoxide dismutase and glutathione, form the foundation of an exquisite defense against free radicals. But this defense isn't perfect. That's why free radical damage accumulates. It turns good cholesterol bad, causes cataracts, contributes to Alzheimer's disease, and leads to cancerous changes in cells. Underscoring all of these changes, free radicals age us, sometimes gracefully, sometimes not.

Last summer, I learned that the relationship between free radicals and antioxidants was really one of balance. I had been curious about the origins of the free radical theory of aging and tracked down the scientist, Denham Harman, MD, PhD, who conceived the theory back in November 1954. Now "retired" and professor emeritus of medicine at the University of Nebraska, Omaha, Harman spends at least five full days each week in his office and regularly publishes articles in medical journals. He has a lot of energy for a man of 79.

Harman's scientific papers are a joy to read, and he can explain complex processes clearly to nonscientists. His early scientific papers on free radicals and antioxidants

have an almost religious or metaphysical quality. Harman was, after all, discussing life and death, though on molecular and cellular levels. He also pointed out that free radical chemical reactions likely led to the first life on Earth and, subsequently, to the evolution of species by prompting DNA mutations. Pretty heady stuff.

In one of our phone conversations, I asked Harman which supplements *he* took. Unlike a lot of doctors who don't want to go on record revealing this information, Harman was forthright: 200-400 IU of vitamin E, 2,000 mg vitamin C, 100 mcg. selenium, and 30 mg coenzyme Q_{10} each day and 25,000 IU of beta-carotene every other day.

"I'd take more," he said, "but I can't afford to be fatigued."

My ears perked up. "Fatigued?" I asked.

Harman explained that *excessive* antioxidants could cause fatigue and muscle weakness. Several years ago, in an experiment, Harman and his colleagues found that large amounts of butylated hydroxytoluene (BHT), a synthetic antioxidant, interfered with the ability of mice to produce energy. Although the amount of BHT was equivalent to 7.5 pounds in a human adult, Harman feels that people can still overdo antioxidants.

"Too many antioxidants can leave you feeling very weak," Harman said. "BHT decreases ATP and mitochondria function." ATP, or adenosine triphosphate, is essential for energy production in the mitochondria, the part of the cell that biologists describe as the "energy factory."

I asked Harman whether too many *natural* antioxidants could also cause fatigue. I was thinking about the 1,600 IU of vitamin E and 100,000 IU of beta-carotene I had been taking for at least 10 years.

Harman was unequivocal. Just as some experiments have shown that vitamin E supplements increase stamina, there's a point of diminishing returns. And I had apparently hit that point.

Over the years I had upped my vitamin E and beta-carotene intake a little at a time. Like other people, I don't relish the thought of cancer and I want to do everything reasonably possible to protect myself. Antioxidants provide some of that protection. I also knew that our bodies become less efficient metabolically as we age and that our need for micronutrients might increase as a result.

But after weighing what Harman told me, I decided to reduce my vitamin E supplements from 1,600 IU to 800 IU daily and my mix of beta- and alpha-carotene from 100,000 IU to 50,000 IU. Within a day or two, my energy levels were up—way up—an almost anti-climactic ending to my story. I still don't like getting up in the morning, but I do get up without feeling fatigued. Nor do I usually need a nap in the afternoon or early evening.

Now that I've sacrileged the shrine of antioxidants, the inevitable questions arise. First, should you take antioxidants? Unquestionably, yes. How much vitamin E and other antioxidants should *you* take? There's no simple answer. The traditional, and low, Recommended Dietary Allowances (RDAs) are in a state of flux and will probably be revised upward. Last year, the nonprofit Alliance for Aging Research, based in Washington, D.C., recommended that generally healthy people take 100-400 IU of E, 200-1,000 mg of vitamin C, and 17,500-50,000 IU of beta-carotene daily to prevent many degenerative diseases. Ultimately, you have to listen to your body and determine the dose you feel better at, or worse, and adjust it accordingly.

The key, as I learned from Harman, is to take enough antioxidants to slow the aging process and stave off degenerative diseases, but not so much that you're fatigued. To a certain extent, you have to trust that what you're doing is right because the consequences of *not* taking antioxidants may take years to appear. It's sort of like brushing your teeth; you do it because you don't want to face the consequences of not brushing.

There are other important lessons here, and they relate to how antioxidants have become the 20th century's embodiment of the age-old fountain of youth. From time to time, I think of a conversation I had with Hal Huggins, DDS, a nutritionally oriented dentist in Colorado Springs, Colo. In the early 1980s, after interviewing him for a magazine article, I asked him to comment on a blood analysis obtained by my regular doctor. Based on my cholesterol level, the computerized analysis stated that I had a 6 percent risk of dying from heart disease over the next few years. Huggins looked at the risk assessment and though for a moment. "You know, Jack, there's no way you're going to get out of this life alive," he said. "Odds are that you'll eventually die of heart disease or cancer. But you're going to die of something."

Some of the ads for antioxidants may leave you thinking that you'll manage to get out of this life alive. Antioxidants can help you live longer and healthier—Harman, Ames, and many other scientists are convinced of this. But antioxidants won't grant you immortality. And very high intake of antioxidants, apparently, can sometimes sap enough energy to prevent you from enjoying those extra years.

At 45, I now have more energy than I've had in years. Striking a balance between free radicals and antioxidants has made good sense for my health. It has also helped me recognize my fundamental mortality. It's an important lesson. □

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