Image Awareness Healthletter

Immune Enhancing Carotenoids

May 2002

This newsletter is written to provide information and should not be used as a substitute for the recommendations of your medical doctor. The reader is urged to review this information with a qualified health professional because each individual and medical situation are unique. You should not consider this information the practice of medicine or to replace consultation with a physician or other qualified healthcare provider.

What Are Carotenoids?

The approximately 600 members of the carotenoid family get their name from carrots. Actually, carrots have only a small sampling of the total spectrum of carotenoids found in nature.

Few Americans consume adequate carotenoids on a daily basis. Only about 9 percent of the American population consumes the recommended minimum intake of 5 servings of fruits and vegetables on any given day. Many of our favorite fruits and vegetables have little in the way of carotenoids. Commonly eaten fruits and vegetables with little in the way of carotenoids include the following: potato, apple, banana, lettuce, and cucumber.

The carotenoid most people are familiar with is beta-carotene. This carotenoid consists of two vitamin A molecules linked together. The body can sometimes use beta-carotene for its vitamin A needs.

Free Radicals

The carotenoid family was more or less ignored until it was discovered that they protect plants from free radical oxygen and the radiation of the sun. Carotenoids are well known for their ability to increase tolerance to sunlight.

Free radical oxygen is increasingly recognized as a major health threat. This active oxygen has lost an electron and become unstable.

Breathing

Free radical oxygen is found in the air we breathe. This is what makes metal rust or a cut apple turn brown.

Energy Production

Free radical oxygen is also a product of the digestion and utilization of the food we eat. Just as a car uses oxygen to burn gasoline, so the body uses oxygen to burn the food we eat for energy. The more food we eat, the greater the production of free radicals in the body.

Underfeeding animals has repeatedly been shown to dramatically increase lifespan. Many researchers feel that one of the ways undereating prolongs life is by decreasing the number of free radicals generated in the body as the result of eating.

Just eating increases free radical production. Exercise increases it still further. The more we exercise, the more free radicals we will produce within the cells. Rigorous exercise has been observed to increase free radical production ten times levels found in resting individuals!

If appropriate supplementation does not take place, the athlete may find his immune system compromised by his athletic activity. A sudden illness can appear as if out of nowhere. This can result in loss of training time deteriorating overall athletic performance. Carotenoids and other antioxidants can be the athlete's best friend.

Immune Activity

The immune system also uses free radicals to destroy bacteria, viruses, and allergens. These free radicals can be likened to clorox and hydrogen peroxide. They are very powerful substances. An overly active immune system can increase requirements for antioxidants, including the carotenoids. If carotenoids are lacking in the diet, the immune system's production of free radicals can be self damaging.

Free radical oxygen readily combines with DNA which can contribute to the development of cancer. It

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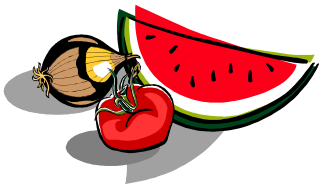
can also combine with the fats in the cell wall. When a free radical interacts with the fats in a cell wall, the cell wall hardens. Red blood cells with hardened cell walls can have difficulty passing through tiny capillaries and nourishing the tissues of the body. White blood cells need a fluid cell wall in order to be able to reproduce more immune defenders. Researcher Adrianne Benedich points out that "Carotenoids can protect lipids from oxidation and may decrease immuno-suppressive peroxides and maintain cell membrane fluidity. Lymphocyte (white blood cell) membranes must be fluid to undergo proliferative responses (reproduce)."[1]

Roy Walford offers the following explanation of this complicated area of nutrition: "…free radicals are highly reactive chemical substances with an unpaired electron whirling around a superactivated oxygen atom. They attack membranes, DNA, and other parts of tissues…The free radicals within us may originate partially from the environment but are mainly produced spontaneously like sparks from the metabolic machine…All the ingredients for massive free radical oxidation are present in living cells. Cells are impregnated with iron and other metal complexes, drenched in oxygen, enveloped in and shot through with highly unsaturated fats and oils. We would instantly set solid if these became saturated, as they do and we do in rigor mortis, and as we would do if we were not protected by our (antioxidant) scavangers. Without our scavengers we would plasticize. In fact free radical technology forms the basis of the plastics and polymer industry."[2]

Carotenoids make free radical oxygen harmless in an interesting way. The free radical or singlet oxygen has lost an electron. Carotenoids carry around an extra electron which they can donate to the agitated oxygen molecule. The oxygen is satisfied and heat is released as a result of the reaction which takes place. Some people notice a warm feeling when they first begin to supplement with carotenoids.

Footnotes:

1. *Clinical Nutrition* 1988;7:114.
2. Walford, Roy, *Maximum Lifespan*, New York: W. W. Norton & Co., 1983, pp. 135-136.



Red, Green and Orange

Carotenoids are primarily found in red, green and orange foods. The different types of carotenoids in these foods perform very different functions in the human body.

Red foods contain lycopene. A six-year study of 48,000 doctors, dentists and other health professionals found that men who consume 10 servings of tomatoes a week reduce their risk of prostate cancer by nearly half. Man's best friend may not be the dog, but the tomato![1]

Green foods contain carotenoids with names like xanthophylls and lutein. "A recent study in the Journal of the American Medical Association found that eating one serving of spinach or collard greens at least once a week cut by 39 percent the risk of age-related macular degeneration, which causes vision loss in 1 out of 20 people over 75. The more they ate the greater the protection." [2]

Richard Young, professor emeritus at UCLA and member of the Jules Stein Eye Institute, writes, "…lutein and zeaxanthin are found in relatively large amounts, concentrated in the yellow spot (macula lutea) directly in the center of the retina, where visual acuity is greatest. This is precisely the region of degeneration and visual loss in AMD (age related macular degeneration)."

"The xanthophylls appear to have the triple function of (1) absorbing violet/blue light before it can damage the visual cells and retinal pigment epithelium (the cells which deteriorate in AMD), (2) acting as retinal antioxidants, and (3) being situated in just the right place for protection against AMD—front and center in the retina." [3]

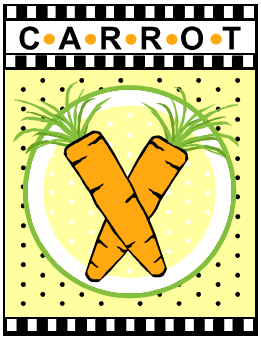
Other carotenoids like lycopene and beta-carotene are present in only trace amounts in the retina. They do little to protect from this form of blindness.

Orange foods, like the carrot, contain not only beta-carotene, but also other carotenes like alpha-carotene. At least one study has shown that alpha-carotene may have more to do with prevention of cancer than beta-carotene.

Science News reports, "…Japanese scientists working with cultured human cancer cells report data suggesting that at least some of these nontoxic pigments fight cancers by effectively putting malignant cells to sleep and suppressing the expression of a gene that might otherwise foster tumor growth."

"Cancer involves rapid and unregulated proliferation of cells….Alpha-carotene shut down cell growth at concentrations as low as 2 to 5 micromoles…and proved toxic at 10 micromoles. Beta-carotene showed similar effects at concentrations 10 times greater."

"…alpha-carotene apparently inhibits cancer growth by locking malignant cells into the rest phase of their growth cycle. And they remain in this sort of suspended animation until the effects of the carotenoid begin wearing off."[4]



One of the most important sites in the human body is the mitochondria where energy is produced. This energy is used for everything from everyday movement to the energizing of the immune system. Recent studies have shown that a carotenoid named astaxanthin provides a remarkable degree of protection for these energy factories of the cells.[5]

The point of this discussion is that different carotenoids perform different roles in the human body. Lycopene can not do what lutein does. Nor can alpha-carotene do what lycopene does. We will be best served if we obtain a broad spectrum of carotenoids as they are found in foods. Nature knows best! We have only begun to scratch the surface of what we need to know in this area.

Footnoes:

1. Newsweek, December 18, 1995, p. 61.

2. "Greens over carrots for vision," *U.S. News & World Report*, November 21, 1994, p. 97.

3. Personal communication.

4. J. Raloff, "Carotenoids: Colorful cancer protection," *Science News*, Nov. 4, 1989.

5. Kurashige, M. et al., "Inhibition of oxidative injury of biological membranes by astaxanthin," *Physiological Chemistry and Physics and Medical Nmr,* 1990, 22(1):27-38.

Natural or Synthetic

Great care should be taken when deciding whether to supplement with natural carotenoids or with synthetic products. The focus on synthetic beta-carotene as a cancer preventative was largely based on a 1981 article in *Nature* that theorized such an effect. Experimental studies have stunned scientists by indicating that synthetic beta-carotene does not prevent cancer and may even be harmful to smokers and heavy drinkers!

The results of studies with synthetic beta-carotene tell us nothing about the natural carotenoids. The negative findings on synthetic beta-carotene (made from acetylene gas) may seem puzzling until one realizes that there are 272 forms (or what are called steroisomers) of beta-carotene. The synthetic product does not even exist in nature.

A letter in the New England Journal of Medicine was amazed at the blindness of the research community. The writer said, "how a particular beta carotene came to be selected for world-wide testing is neither hard to understand nor easy to forgive."[1]

The point here is that what is economical to produce and market will always have research dollars and advertising dollars behind its promotion. Mother nature's formula will have one megaphone: that the product actually works.

Research leaves no doubt that natural forms of carotenoids do provide a variety of health benefits including reducing the risk of cancer. Werbach writes, "...there is now considerable evidence to suggest the advantage of supplementing carotenoids in more natural forms."[1]

1. Werbach, Melvyn, "Are Natural Food Supplements Superior to Synthetic Nutrients?" *Townsend Letter for Doctors and Patients*, February/March 2000, p. 172.

Protecting Carotenoids

Carotenoids are strongly bound to fiber in foods. As little as one percent of the carotenoids in a raw carrot may be absorbed for this reason. Cooking actually breaks down the fiber and improves absorption.

When carotenoids are exposed to oxygen or light, they are readily destroyed. Carotenoids are also fat soluble and are much better absorbed in fat than in water solutions.

A USDA Study

When researchers at the USDA put subjects on a low-carotenoid diet the immune system collapsed in 20 days. There was actually a 27% drop in the effectiveness of the immune system.

This is an experiment which many people conduct on themselves each year. In the winter months fresh produce is difficult to find. Decreased consumption of carotenoid rich fruits and vegetables may contribute to the epidemics of colds and flu which spread across the country in the winter and spring.

The USDA requested GNLD Carotenoid Complex capsules for testing because scientific studies showed that the product was well absorbed.

Their research showed that Carotenoid Complex could increase immune function as measured by lymphocyte proliferation by 37 percent in 20 days. Lymphocyte proliferation is the ability of the white blood cells to reproduce themselves. Since these are our immune defenders, we would be in trouble if they didn't reproduce properly.

The USDA study also found that natural killer cells increased by 20 percent in 20 days. These cells protect us against cancer—they are our tumor surveillance network.

The USDA study noted a reason to believe Carotenoid Complex would **reduce the risk of heart dis-**

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ease. Antioxidants in LDL cholesterol increased five-fold.

In this study, oxidative damage to cells decreased by 44 percent. **This type of protection would tend to slow the rate at which we age and delay the onset of degenerative diseases.** Most remarkably, all of these results were accomplished with the intake of only three capsules a day—the recommended intake.

The GNLD Carotenoid Complex consists of a black gelatin capsule filled with olive oil in which carotenoids are suspended. This is the most effective means of absorption. Carotenoids are fat soluble and are best absorbed in this form. The dark capsule protects from light.

The product is encapsulated in a nitrogen environment. This is called the NutriMax process. It assures that the carotenoids will not be destroyed by exposure to oxygen.

Why Not Juice?

Juicing has benefits but it also has problems associated with it. Studies have shown that the large amounts of sugar in juices can inhibit immune function negating or reducing one of the major benefits of the carotenoids in the juice. The Carotenoid Complex has the protective carotenoids not only separated from fiber (as happens with juicing), but also they are separated from the high carbohydrate load associated with something like carrot juice. Nutritional recommendations are increasingly moving in the direction of reducing ingestion of rapidly absorbed carbohydrates such as fruit juices which not only inhibit immune function, but also promote weight gain and increase the risk of diabetes and heart disease.

Key Concepts

Cancer

"…**carotenoid-enhanced intercellular communication** provides a mechanistic basis for the cancer chemopreventative action of carotenoids."

Zhang, LX; Cooney RV, and Bertram, JS, "Carotenoids enhance gap junctional comunication and inhibit lipid peroxidation in C3H/10T1/2 cells: relationship to their cancer chemo-preventative action," *Carcinogenesis*, 1991, Nov. 12,(11):2109-14.

Comment: Cancer incidence has increased greatly in the United States in the last few decades. Carotenoids and flavonoids offer the best hope for reversing this ugly trend.

One finds a 20-50% reduction in cancers in the portion of the population consuming the highest amounts of fruits and vegetables with carotenoids.

Aging

Well-known aging researcher, Richard Cutler, found "a positive correlation in the tissue concentration of specific antioxidants with life span of mammals." The two antioxidants he singles out are vitamin E and carotenoids. These are the two primary fat-soluble antioxidants in the human body which **work powerfully to slow the aging process and keep us young longer!**

Cutler, R., "Antioxidants and Aging," *American Journal of Clinical Nutrition*, 53:373S-80S (1991).