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About Krill and Salmon

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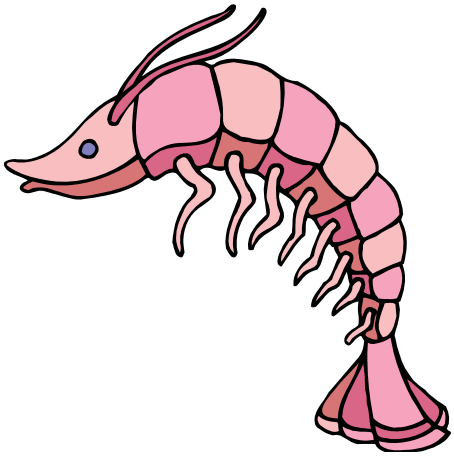
Krill Carotenoid

I am often asked why GNLD does not use krill as a source of omega-3 fatty acids. The argument goes that krill is a high source of omega-3 and also contains astaxanthin, a valuable carotenoid antioxidant. In studying the astaxanthin content of krill I learned a good while back that it has a different chemical structure than the astaxanthin in salmon. Nutrients can exist in different forms called stereoisomers in nature. (Synthesis of nutrients in test tubes almost always produces a different form or stereoisomer of nutrients than one finds in nature.) One researcher wrote the following:

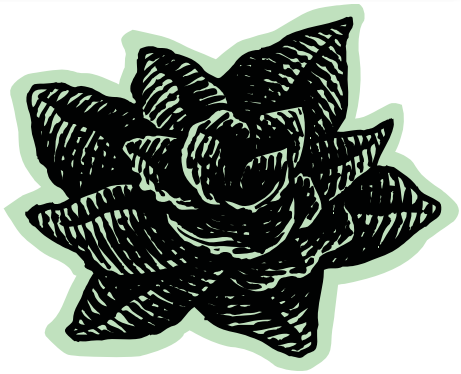
"In summary then, astaxanthin occurs in several different forms which can be classified according to stereoisomers, geometric isomers, and free or esterified forms. All of these forms are found in various natural sources. For example, the predominant stereoisomer of astaxanthin found in krill...a shrimp-like marine animal is 3R,3'R(Bernhard 1990), and the majority of this is esterified (Foss et al., 1987). In wild salmon, the predominant stereoisomer is3S,3'S: in salmon flesh the astaxanthin occurs as the free xanthophyll (Bernhard 1990)." http://www.astaxanthin.org/chemforms.htm



My concern about using krill as a source of carotenoids is based upon a couple of observations. The first which I have elaborated is that the form of astaxanthin in krill is different from that in wild salmon. Different forms of astaxanthin have an affinity for different tissues. Carotenoids have a specificity of action dependent upon their chemical structure. The natural food chain of man contains the form of astaxanthin in salmon.

Secondly, krill have very high levels of astaxanthin which appears to be ideally suited to sea dwelling creatures. High levels of one carotenoid have the potential, however, to decrease absorption of other carotenoids. This has been referred to as competitive absorption.

Humans require lutein and xanthophylls to prevent macular degeneration. This is not an issue with sea creatures that spend a good deal of their time underwater where their eyes are not exposed to sunlight. By contrast, land dwelling creature's eyes are exposed to sunlight for a lifetime. The leafy green foods like spinach and kale provide the carotenoids (lutein



and zeaxanthin) which are optimal for protecting eyes from direct sunlight.

Stephan Christen at U.C. Berkley has demonstrated that intake of high quantities of one form of vitamin E (alpha tocopherol) prevented absorption of another form of the vitamin (gamma tocopherol). The result was increased risk of cancer resulting from inability to detoxify nitrogen-based carcinogens—a function of gamma tocopherol. This type of competitive absorption appears to function with carotenoids as well as vitamin E. High intake of astaxanthin might depress levels of other carotenoids of nutritional significance such as lutein, zeaxanthin, lycopene, or alpha-carotene.

In my opinion our bodies are adapted to certain forms of nutrients and alterations in structure or forms of ingestion can potentially create problems. At this point in time, I am not willing to put my trust in krill as a source of the carotenoids I need to maintain optimal health.

Whole Foods and Krill

GNLD considered krill as a source of omega-3 many years ago. The idea was rejected for a number of reasons including potency, sustainability, and environmental appropriateness.

Large scale krill harvesting is a disaster in the making. We do not eat krill, but we do eat other things that eat krill.What is going to happen to these creatures if we rob them of their food supply. Their populations will collapse and the creatures may even die out. Ocean populations of fish and mammals need a source of omega-3 fatty acids as much as we do. We have other options than krill, many of these other species do not.

Whole Foods grocery stores recently discontinued sales of krill oil products and posted the following in their stores: "Krill is an important source of food for marine animals including penguins, seals and whales in the Antarctic. Declines of some predator populations in the areas where the krill fishery operates suggests that fishery management needs to better understand how to evaluate the prey requirements of other marine species in order to set sustainable catch levels for krill. Consequently, at present we are choosing to discontinue the sale of krill oil supplements as we continue to evaluate emerging research." Whole Foods is not unique in this decision.

The primary reason for promoting krill as a source of omega-3 fatty acids is cost. Krill are cheap to harvest which allows for a high profit margin on the supplements manufactured from them. There is certainly nothing natural about the human consumption of krill or krill oil. There is no human tradition of consumption of krill.

Jacques Cousteau

Krill are not part of nature's blueprint for human nutrition. We are supposed to eat things that eat krill. You might think this is nitpicking, but consider the following pertinent quote from the autobiography of Jacques Cousteau, "While we were diving in the Antarctic, dazzled by the variety of strange creatures we filmed above and below the surface of the sea, I thought that perhaps the last continent explored my man could be the first continent we would not plunder. I was wrong. Already the trawlers have arrived. Krill catches burst from 3,300 tons taken in 1976 to 530,000 tons in 1982--most of which were landed by Japan and the Soviet Union, the two last major whaling nations, which, having reduced the whales to a non-profitable level, could now preclude the creatures' return by harvesting their food. Fishery spokesmen wax ecstatic: With krill we can triple our catch; with krill we can feed the hungry. *Good luck to them. In the Antarctic we caught fresh krill, fried them, ate them, and instantly suffered diarrhea*."

Finally, data for the bioavailability, utilization, and beneficial effects of krill oil have very poor scientific support. Human bioavailability for Salmon Oil Plus is well-established. Testing has established uptake into cell membranes, displacement of inflammatory fatty acids, reduction of the inflammatory index, improvement of the omega-3 index, improvement of cell membrane fluidity, production of anti-inflammatory factors 'resolvins and protectins', support for healthy immune response and promotion of the natural healing processes. No such data is available for krill oil.

GNLD has examined krill oil and found that the products are strongly biased in favor of only DHA and EPA. GNLD Salmon Oil Plus is standardized for all 8 members of the omega-3 family.

Reference:

Cousteau, Jacques, and Schiefelbein, Susan, *The Human, the Orchid, and the Octopus*, New York: Bloomsbury, 2007, 176.

Omega-3 and Pellagra

Omega-3 fatty acids appear to be critical for proper functioning of the B complex vitamins. Donald Rudin wrote about this in the 1980's. The abstract of his article reads, "Pellagra was once a major cause of three behaviorally different mental disorders--schizophreniform, manic-depressive-like, and phobic neurotic--plus drying dermatoses, autonomic neuropathies, tinnitus, and fatigue. In this preliminary study all three of the corresponding present-day mental diseases are found to exhibit statistically, the same pellagraform physical disorders but to ameliorate not so much with vitamins as with supplements of a newly discovered trace omega-3 essential fatty acid (w3-EFA), which provides the substrate upon which niacin and other B vitamin holoenzymes act uniquely

to form the prostaglandin 3 series tissue hormones regulating neurocircuits en block. Since present day refining and food selection patterns, as well as pure corn diets, deplete both the B vitamins and w3-EFA, the existence of therapeutically cross-reacting homologous catalyst and substrate deficiency forms of pellagra are postulated, the first contributing to the B vitamin deficiency epidemics of 50-100 years ago, the second to the more recent endemic 'Diseases of Western Civilization' which express certain genetic subgroups as the major mental illnesses of today."

One of the great tragedies of modern medicine is the focus on SSRI medications to treat the kinds of problems discussed by Rudin, rather than paying attention to the nutritional adequacy of B complex vitamins and omega-3 fatty acids. The medications have been shown to make problems worse over time, while the supplementation of these two categories of nutrients has repeatedly been shown to benefit those with mental issues.

The brain is one of the most biochemically complex and energy demanding structures in the human body. It should not be surprising that malnutrition can compromise both intellectual functioning and mood states.

Dr. Rudin observed that phobias, manic-depressive symptoms, and also schizophrenia often responded to a combination of omega-3 fatty acids and B complex vitamins.

Abram Hoffer, M.D., demonstrated for years that he could improve these same types of symptoms with B complex vitamins, especially B3 and B6, and vitamin C. He had to use massive amounts of these nutrients in order to obtain his improvements. A possible explanation for this in at least some of the patients and perhaps most of them were also deficient in omega-3 fatty acids.

Abram Hoffer's success rate with schizophrenics, the most difficult group to help, was remarkable considering the fact that the average number of patients who improve is about 10 percent. Hoffer saw much improvement in 25% of patients who had been in a mental hospital for over 5 years, 50% improvement in those out of a mental hospital, 75% improvement in those who had been sick 2-5 years, and 90% improvement in patients sick one year.

Donald Rudin added omega-3 fatty acids to Hoffer's nutrient mix. Rudin found that the amount of vitamin B3 necessary to create a flushing effect for one patient (case 3) was one thousand milligrams of the vitamin. When she was supplemented with optimal levels of omega-3 fatty acids the intensity of the flush caused by niacin increased to such a degree that she reduced her dose of niacin from one thousand milligrams three times a day to 100 milligrams.

Rudin's original work was done with flax oil. The high levels of flax oil he used with some patients created problems. The use of fish oils which are more effective at lower doses might have prevented these problems.

Andrew Stoll, M.D., Director of the Psychopharmacology Research Laboratory at McLean Hospital and Assistant Professor of Psychiatry at Harvard Medical School documented his work with fish oils for the treatment of postpartum depression, major depression, bipolar disorder, attention deficit, schizophrenia, memory and cognition. Stoll recognized the importance of supplementing with

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antioxidants when using fish oils. This was overlooked by Rudin. Unfortunately, Stoll did not experiment with the addition of generous quantities of the B complex vitamins which had proven so important for Abram Hoffer. Both Hoffer and Rudin did their major work prior to the awareness of just how important the omega-3 fatty acids, and particularly EPA and DHA, are for the healthy structure and functioning of brain tissue.

More recent work overlooks the importance of the B complex vitamins for brain and nerve function. Hoffer's work was rejected by the psychiatric establishment which has chosen to focus on pharmaceuticals rather than nutrients. It is not indexed by the standard medical search engines--this is how the flow of medical information is controlled by the powers that be. It is unfortunate that the pharmaceutical industry has so much control of what physicians and psychiatrists learn and practice in the course of their medical careers.

FOOTNOTES:

Rudin, Donald O., The major psychoses and neuroses as omega-3 essential fatty acid deficiency syndrome: Substrate pellagra, *Biological Psychiatry*, Vol. 16, No. 9, 1981, 837, 843.

Hoffer, Abram, *Healing Schizophrenia*, Toronto, CCNM Press, 2008, 169.

Stoll, Andrew L., *The Omega-3 Connection*, New York: Simon & Schuster, 2001.

COMMENTARY

Quality is as important in the choice of the nutritionally important essential fatty acids as it is in vitamins and minerals. There are eight primary fats in the omega-3 family. GNLD Salmon Oil Plus is the only supplement I am aware of which is standardized for all eight of the master molecules of the omega-3 family. It is derived from foods that have been part of the human food chain for thousands of years. Salmon Oil Plus is also tested for over 200 different potential contaminants making it a product of unparalleled purity.

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