

# The Facts About Astaxanthin

## What is Astaxanthin?

**Astaxanthin** is the main **carotenoid** pigment found in aquatic animals.<sup>1</sup> This red-orange pigment is closely related to other well-known carotenoids such as beta-carotene or lutein, but has a stronger antioxidant activity (10 times higher than beta-carotene). Studies suggest that astaxanthin as a antioxidant, can be more than 1,000 times more effective than vitamin E.<sup>7</sup> In many of the aquatic animals where it can be found, astaxanthin has a number of essential biological functions, ranging from protection against oxidation of essential polyunsaturated fatty acids, protection against UV-light effects, pro-vitamin A activity and vision, immune response, pigmentation, and communication, to reproductive behavior and improved reproduction.<sup>2</sup> In species such as salmon or shrimp, astaxanthin is even considered as essential to normal growth and survival, and has been attributed vitamin-like properties.<sup>2</sup>

Research on the potential benefits of dietary astaxanthin is very recent. Studies in humans, animals, and laboratory cultures of human and animal cells are revealing remarkable properties of this unique substance.

Consider these findings. **Astaxanthin:**

- ◆ **Has an antioxidant potency 1,000 times greater than Vitamin E and 10 times greater than any known carotenoid.**
- ◆ **Stimulates and improves the immune response.** Astaxanthin enhances immunoglobulin production in human blood cells.
- ◆ **Enhances production of high-density-lipoprotein (HDL),** the "good" cholesterol.
- ◆ **Prevents oxidation of low-density-lipoprotein (LDL)** in human subjects.
- ◆ **Prevents cancer** in mice and rats, in the bladder, oral cavity, and colon.
- ◆ **Crosses the blood-brain barrier,** unlike related compounds such as beta-carotene.
- ◆ **Increases the anti-inflammatory effect of aspirin.** This is true for astaxanthin di-esters - abundant in *Haematococcus*, but absent in synthetic astaxanthin.
- ◆ **Prevents *Helicobacter* infections** in the mammalian gastrointestinal tract.

If you read the medical research literature, you will find suggestions that astaxanthin could also play a preventive and/or therapeutic role in:

- Alzheimer's, Parkinson's, and other neurodegenerative diseases
- Macular degeneration (the leading cause of age-related blindness)
- Cholesterol disease
- Stroke
- Cancer

**Studies continue to demonstrate the unique properties of this substance. A summary of a representative sample of the scientific literature supporting these findings follow below:**

# **Astaxanthin and Health**

## **Astaxanthin as a general biological antioxidant**

Astaxanthin has been shown to be a powerful quencher of singlet oxygen activity in vitro studies (DiMascio et al. 1990; Miki 1991), and is a strong scavenger of oxygen free radicals, at least ten times stronger than beta-carotene (Miki 1991). Experiments with red blood cells and mitochondria from rats have shown that Astaxanthin is 100 times more effective at inhibiting lipid peroxidation than is vitamin E (Miki 1991). The results of these in vitro studies were confirmed in vivo with rats given dietary supplements of Astaxanthin and subjected to oxidizing agents (Miki 1991). The antioxidative properties of Astaxanthin have been demonstrated in a number of different biological membranes (Kurashige et al. 1990; Palozza and Krinsky 1992; Oshima et al. 1993; Nakagawa et al. 1997). Other tests have shown that astaxanthin is up to 1000 times more powerful than Vitamin E (Tso, 1996).

## **Astaxanthin as an anti-cancer agent**

Studies of the cancer-preventative properties of Astaxanthin have been carried out on rats and mice by Takuji Tanaka and colleagues at the Gifu University School of Medicine. Dietary administration of Astaxanthin proved to significantly inhibit carcinogenesis in the mouse urinary bladder (Tanaka et al. 1994), rat oral cavity (Tanaka et al. 1995a), and rat colon (Tanaka et al. 1995b). In addition, Astaxanthin has been shown to induce xenobiotic-metabolizing enzymes in rat liver, a process that may help prevent carcinogenesis (Gradelet et al. 1996).

## **Astaxanthin for support of the immune system**

Astaxanthin has been shown to significantly influence immune function in a number of in vitro and in vivo assays using animal models. The majority of this work has been carried out by Harumi Jyonouchi and colleagues at the University of Minnesota. Astaxanthin enhances in vitro antibody production by mouse spleen cells stimulated with sheep red blood cells (Jyonouchi et al. 1991), at least in part by exerting actions on T-cells, especially T-helper cells (Jyonouchi et al. 1993). Astaxanthin can also partially restore decreased humoral immune responses in old mice (Jyonouchi et al. 1994). These immunomodulating properties are not related to provitamin-A activity, because Astaxanthin, unlike beta-carotene, does not have such activity (Jyonouchi et al. 1991). Studies on human blood cells in vitro have demonstrated enhancement by Astaxanthin of immunoglobulin production in response to T-dependent stimuli (Jyonouchi et al. 1995a). Other supporting data on Astaxanthin and immune function, including studies on the mechanisms of action involved, may be found in Jyonouchi et al. (1995b), Jyonouchi et al. (1996), Okai & Higashi-Okai (1996), and Tomita et al. (1993)

## **Astaxanthin for treatment of infections**

Astaxanthin may be effective as a prophylactic and/or therapeutic treatment of Helicobacter infections of the mammalian gastrointestinal tract, and an oral preparation has been developed for this purpose (Alejung and Wadstroem 1998).

## **Astaxanthin for prevention of arteriosclerosis and related diseases**

Astaxanthin has been shown in both in vitro experiments and in a study with human subjects to be effective for the prevention of the oxidation of low-density lipoprotein (Miki et al. 1998). This

suggests that it could be used as a preventative for arteriosclerosis, coronary artery disease, and ischemic brain damage; a number of astaxanthin-containing health products are under development based on these findings (Miki et al. 1998). Astaxanthin has also been shown to enhance production of LDL and especially HDL cholesterol in the bloodstream of rats (Murillo 1992).

### **Astaxanthin in anti-inflammatory preparations**

Astaxanthin diesters appear to exert a synergistic effect on anti-inflammatory agents, increasing the effectiveness of aspirin when the two are administered together (Yamashita 1995).

### **Safety of Astaxanthin for human consumption**

A study on rats designed to test the toxicity of Astaxanthin failed to find any harmful effects of a diet containing 400 ppm Astaxanthin after 41 days of feeding (Nishikawa et al. 1997). Furthermore, no mutagenicity of Astaxanthin was detected in an *in vitro* study (Miki et al. 1998).

### **References**

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