



## AstaReal® Astaxanthin Supports a Robust and Balanced Immune Response.

The immune system protects the body against infection using multiple approaches. Similarly, nutritional support for a healthy immune system should take a multifaceted approach that includes natural astaxanthin - a nutrient with antioxidant, anti-inflammatory, and immunomodulating properties.

### AstaReal® Astaxanthin Modulates Immune Activity

The effectiveness of immune cells can be tested by challenging them with antigens and measuring their activity level and how well they multiply. Natural astaxanthin has been shown in a clinical study to boost B and T cell proliferation and NK cell activity.

### AstaReal® Astaxanthin and Healthy Inflammation

Immune cells fight infection using inflammation signaling molecules (cytokines) that trigger increased blood flow, and call on more immune cells to selectively destroy infected cells. However, acute inflammation signaling must end once the infection has been cleared. In some cases, an unchecked immune response may persist, causing chronic inflammation that can attack healthy tissue. Numerous studies have shown that natural astaxanthin has anti-inflammatory properties that may support a balanced inflammation response.

### AstaReal® Astaxanthin and Antioxidant Balance

In addition to cytokines, immune activation releases highly reactive free radicals that kill pathogens, but can also damage host tissues. The immune response can elevate free radicals to a degree that overwhelms the body's antioxidant capacity. Dietary antioxidants may serve as a supplement to the body's own antioxidant defense in times of need.

Studies indicate that natural astaxanthin is nature's most powerful dietary antioxidant, with anti-inflammatory properties, and immunomodulating activity. The study summarized below showed the effect of natural astaxanthin on immune response, oxidative stress, and inflammation markers in humans.

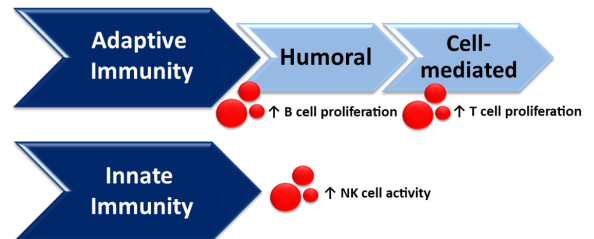
## Natural Astaxanthin Boosts Immune Response.

Healthy college students received 0 mg, 2 mg, or 8 mg natural astaxanthin daily for 8 weeks in a double blind, placebo-controlled study. The study examined the effect of natural astaxanthin on both adaptive and innate immune responses.

### Increased B Cell and T Cell Proliferation:

The antigens used in this study were plant proteins known to activate B and T cell proliferation. After 8 weeks of supplementation with 8 mg/day natural astaxanthin, each of 3 antigens tested resulted in approximately 25-28% more proliferation compared to placebo ( $p < 0.05$ ). This suggests that natural astaxanthin supports a healthy adaptive immune response at a dose of 8 mg/day.

## Natural Astaxanthin Supports a Robust Immune Response



**The Effect of Natural Astaxanthin on Modulating Immune Response:** Adaptive immunity targets specific antigens using humoral and cell-mediated responses. Natural astaxanthin increased proliferation of B cells, which produce antibodies, and are primarily involved in the humoral immunity. Astaxanthin also increased proliferation of T cells, which release cytokines, and are mainly involved in cell-mediated immunity (CMI). The activity of NK cells, predominantly involved in innate immunity, also increased with astaxanthin.

### Increased Natural Killer Cell Activity:

Natural Killer (NK) cells are lymphocytes predominantly involved in innate immunity. Higher NK cell activity was seen with 8 mg/day natural astaxanthin supplementation by week 8 ( $p < 0.05$ ). This suggested that the astaxanthin group may have had a more robust innate immune response as an effect of supplementation.

### Modulation of Cytokines and Oxidative Stress:

Adaptive cytokines, IFN- $\gamma$  and IL-6, increased with 8 mg/day astaxanthin supplementation by week 8 ( $p < 0.05$ ). These cytokines are important modulators of immunity and may act either as pro- or anti-inflammatory signals in a context dependent manner.

The chronic inflammation marker, CRP, decreased with 2 mg/day natural astaxanthin by week 4 compared to placebo ( $p < 0.05$ ). Concentration of the oxidative stress marker, 8-OHdG, was lower with both 2 mg/day and 8mg/day natural astaxanthin at week 4 compared to placebo ( $p < 0.01$ ).

These results are consistent with previous studies that have demonstrated the anti-inflammatory and antioxidant activities of natural astaxanthin.

## AstaReal® Astaxanthin Has You Covered When You need It Most.

**AstaReal® Astaxanthin provides immune health support and promotes a healthy inflammation response at 8 mg/day, making this nutrient an important addition to immune formulations. To help find the AstaReal® product right for you, contact us today!**

### References:

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2. M.Si-Tahar *et.al.* Clinical and Experimental Immunology. 2009.
3. S.J. Lee *et.al.* Mol. Cells. 2003.
4. R.Y. Shih *et.al.* Molecular Science. 2015.