

Improve Muscle Endurance with AstaReal®

Benefits of natural astaxanthin for muscle performance



Boost Muscle Endurance & Performance

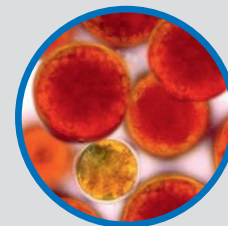
Intense physical activity increases the production of free radicals and reactive oxygen species (ROS) in the body. These highly reactive molecules cause an imbalance in the body's natural antioxidant system, known as oxidative stress. Oxidative stress can damage proteins, lipids and DNA in muscle cells and can also cause inflammation. This can result in several damaging effects including muscle fatigue and soreness and activation of inflammatory pathways that have negative impact on muscle performance.

"Mitochondria are cellular organelles known as the "powerhouse" of all cells. They play a crucial role in muscle performance, where they are responsible for generating energy in the form of ATP-Adenosine Tri Phosphate, through the utilization of carbohydrates and fats. Muscle cells have the highest content of mitochondria than any other cell due to their high level of cellular activity."

Mitochondria generate a significant number of ROS during cellular activity, making them susceptible to high levels of oxidative stress. This can lead to an imbalance in the redox of energy utilization and can cause mitochondrial dysfunction.

What is Natural Astaxanthin?

It is a naturally occurring carotenoid which is derived from the microalgae *Haematococcus pluvialis*. As well as being the most powerful antioxidant known to science, it also has potent anti-inflammatory properties. Natural astaxanthin's distinct advantage in comparison to other antioxidants, is its ability to span the entire lipid bilayer of the cell membrane, thus providing superior protection from the inside out. Studies have shown that natural astaxanthin may provide significant protection to the mitochondria, thus preventing muscle damage.



Research & Key Findings

In a model study by Park *et al.* (2012), ATP production was assessed in 2 groups; a group supplemented with astaxanthin vs control. The study found that ATP production increased in the astaxanthin group compared to the control, indicating higher mitochondrial activity in the astaxanthin group.

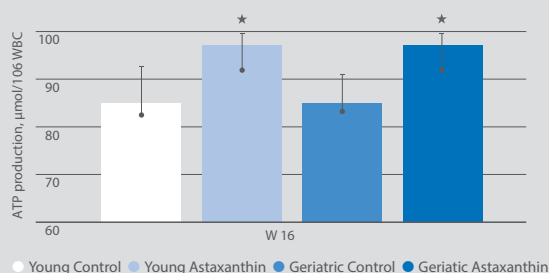


Figure 1:
A model study showing a significant increase in ATP production in the groups supplemented with astaxanthin after 16 weeks.

During and after physical activity, the muscles are subjected to high levels of inflammation due to the increased levels of ROS. Inflammation stimulates the release of several pro-inflammatory markers. In a recent double blind placebo study, Baralic *et al.* (2015) investigated the anti-inflammatory and antioxidant effects of AstaReal® astaxanthin. A group of 40 young soccer players were divided into 2 groups (astaxanthin vs. placebo) and tested for the inflammatory marker CRP after 90 days. The results concluded that astaxanthin supplementation combined with physical training significantly decreased the expression of the pro-inflammatory marker CRP. This was accompanied by an improvement in the prooxidant/antioxidant balance in the blood plasma.



Other clinical studies have shown that AstaReal® astaxanthin improves muscle performance. In a 2011 study, Earnest *et al.* investigated astaxanthin efficacy on muscle performance. 14 competitive cyclists performed a 20 km maximal cycling test after a 2 hour pre-exhaustion ride. The test was carried out 28 days before and after supplementation of 4mg/d of AstaReal® astaxanthin or placebo. The results showed significant improvement in the group treated with AstaReal® astaxanthin, who performed 121 seconds faster after the treatment period compared to the placebo group.

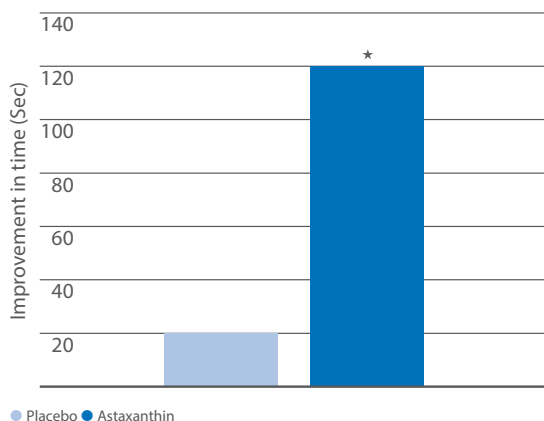


Figure 2:
Improvement in time on 20 km biking test in cyclists supplemented with 4 mg/day of AstaReal® astaxanthin or placebo during 28 days. (* $p < 0,05$ compared with placebo) (21).

Furthermore, astaxanthin was shown to improve muscle endurance by enhancing muscle lipid metabolism thus increasing aerobic endurance. A 2007 study by Aoi *et al.* demonstrated that astaxanthin enhanced lipid metabolism in muscles by protecting the mitochondrial proteins that are responsible for fatty acid regulation.

Benefits of Natural Astaxanthin for Muscle Performance:

- 1 Boosts muscle endurance and recovery
- 2 Lowers lactic acid and fatigue
- 3 Reduces muscle damage and inflammation
- 4 Protects mitochondria and enhances fat metabolism by improving mitochondrial functions

AstaReal® – The Most Studied Brand

There are over 400 peer-reviewed studies on astaxanthin and AstaReal® has been featured in the vast majority of these studies. The clinical database for AstaReal® contains over 50 human studies including 23 double-blind, placebo-controlled trials with more than 1,400 participants undergoing treatments lasting from 2 weeks to 6 months.

Superior Product Range

AstaReal AB offers a range of bulk products to fit different formats, allowing for the development of innovative products that add astaxanthin's unsurpassed antioxidant power.

In addition, AstaReal AB has developed a range of finished formulations containing AstaReal® natural astaxanthin, each expertly developed to support a number of health areas.



References & Selected Publications

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