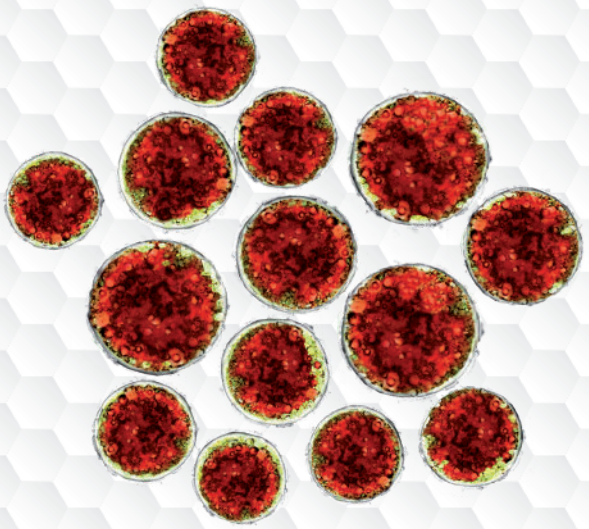
Natural Astaxanthin

The positive effects of algae-based astaxanthin on your cardio health



Executive summary

A supplementary diet with astaxanthin, derived from the microalgae *Haematococcus pluvialis,* has proven several positive effects in human clinical studies. Due to its ability to reduce oxidative and inflammatory processes which are known risk factors for the development of cardiovascular diseases, astaxanthin is suggested to have respective protective effects. Because of its antioxidant potential, astaxanthin can lower markers of lipid peroxidation, inflammation and thrombosis. Furthermore, astaxanthin does not act as pro-oxidant, not even at high concentrations. Supplementation over prolonged periods may reduce lipid and protein oxidation and further protect against the development of arterial stiffness and atherosclerosis.[2]

Benefits of natural astaxanthin for the human cardio system:

- Reduces oxidative stress
- Increases accumulation of HDL cholesterol
- Decreases triglyceride concentration in blood plasma
- Decreases inflammation levels and improves inflammation status

Introduction

Cardiovascular diseases (CVD) are diseases that involve the heart or blood vessels, like heart attack, stroke and heart failure. According to WHO, it is globally the number one cause of death. Recent studies suggest that due to the beneficial effects of astaxanthin on oxidative stress, inflammation and lipid metabolism, a supplementary diet with astaxanthin might be capable of decreasing the risk of CVD. These benefits lead to a potential protection against atherosclerosis, which is the leading cause for CVD. Atherosclerosis "is the hardening and narrowing of arteries that consequently reduce the flood and delivery of blood and oxygen throughout the body."[3] These atherosclerosis plaque formations in the inner coronary artery walls can, hence, result in the described CVDs.[3, 4]

In the following, recent studies are presented on potential benefits of an astaxanthin-supplemented diet for the human cardio system.

What is the power of natural astaxanthin

Astaxanthin is a naturally occurring pigment that gives the reddish color to marine organisms such as crabs, shrimps and salmons. Chemically, astaxanthin belongs to the carotenoid group, specifically to the xanthophylls. In natural surroundings, it can be found in photosynthetic organisms like bacteria, algae and yeasts. The highest concentrations of natural astaxanthin can be accumulated from the sweet water microalga *Haematococcus pluvialis*. Due to its unique molecular structure, astaxanthin contains both lipophilic and hydrophilic properties, and it can combine with cell membranes from inside and outside.[1]

Natural astaxanthin has great anti-inflammatory effects. Furthermore, it is considered to be the most powerful antioxidant and highly effective at counteracting reactive oxygen species (ROS). It neutralizes harmful free radicals in a way that does not harm somatic cells. Unlike other antioxidants, astaxanthin does not become a pro-oxidant which can harm the body. Compared to other well-established synthetic or natural antioxidants, natural astaxanthin has been proven to be significantly more effective. Therefore, it is also called the "diamond of radical scavengers" (for details, see our dossier "Natural astaxanthin – nature's most powerful antioxidant").

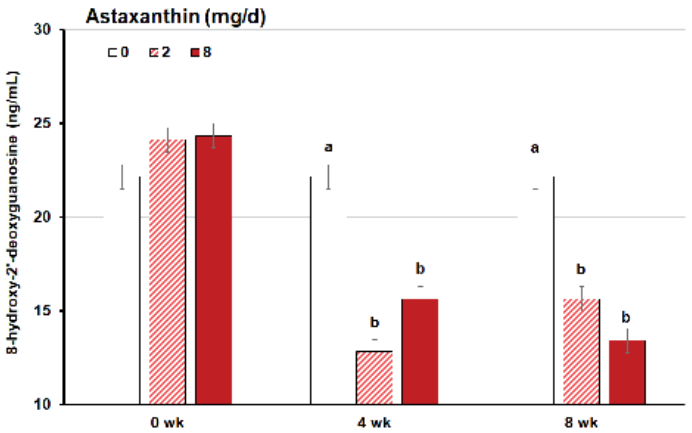
Natural astaxanthin is classified as a novel food in the European Union and was considered safe by the United States Food and Drug Administration (FDA) with GRAS (generally recognized as safe) status. Numerous scientific studies have demonstrated the positive effects of natural astaxanthin on human health.

Oxidative damage

Oxidative stress is an imbalance between production and accumulation of reactive oxygen species (ROS) also known as free radicals. Although ROS are vital for several functions of the human body, an imbalance can cause oxidative stress and is one of the main risk factors for CVD.[3, 5]

The randomized, double-blind and placebo-controlled study by *Park et al.* from 2010 tested the effect of astaxanthin on oxidative damage to DNA by using a DNA biomarker (8-OHdG).[6] The biomarker concentration was significantly lower in both astaxanthin groups compared to the control group (figure 1).

Another study from 2011 on overweight and obese (which are also high-risk factors for CVD) women showed similar significant effects by decreasing oxidative stress biomarkers.[7]



These cells are responsible for defending the human body against outside and inside threats such as viruses or bacteria (T/B cells) and tumors (NK cell).

The population of T and B cells was higher in the group given 8mg compared to the control group and the group given 2mg.

Figure 1: Reduction of oxidative stress, concentrations of plasma 8-OHdG in human subjects given 0, 2 or 8mg astaxanthin daily over 8 weeks.[6]

a, b: different letters represent significant treatment differences ($P<0.05$) as analyzed by protected LSD test. Values are means ± overall standard error.

Cholesterol

High LDL cholesterol, also known as "bad" cholesterol, is closely linked to an increased risk of CVD, especially when paired with low levels of HDL cholesterol ("good" cholesterol). LDL cholesterol plays a significant role in the formation of plaque in the arteries whereas HDL cholesterol helps prevent the former.

The human clinical study from 2010 by *Yoshida et al.* was a randomized, double-blind and placebo-controlled study. Over a period of 12 weeks, 61 subjects divided into 4 groups took either 0, 6, 12 or 18mg of astaxanthin each day.

The study shows significant increase in HDL cholesterol (figure 2) compared to the control group as well as a decrease of triglyceride (figure 3). The study authors therefore concluded that "*astaxanthin can improve the serum lipid profile in humans, including an increase in HDL cholesterol, a robust negative risk factor for atherosclerotic CVD.*"[8]

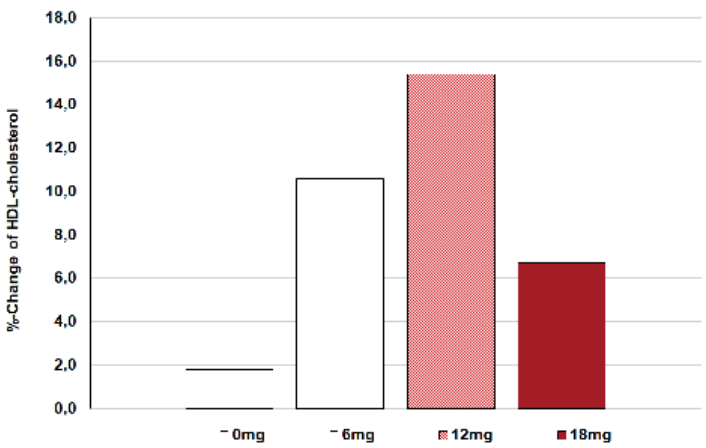


Figure 2: Average percentage changes of HDL cholesterol after 12 weeks of astaxanthin supplementation compared to the values at baseline. Data represent the mean ±SD.[8]

A prior and smaller study from 2004 on postmenopausal women by *Kim et al.* shows similar results by concluding, *"it would be helpful for postmenopausal women with common cardiovascular disease to use astaxanthin as a dietary antioxidant."* [9]

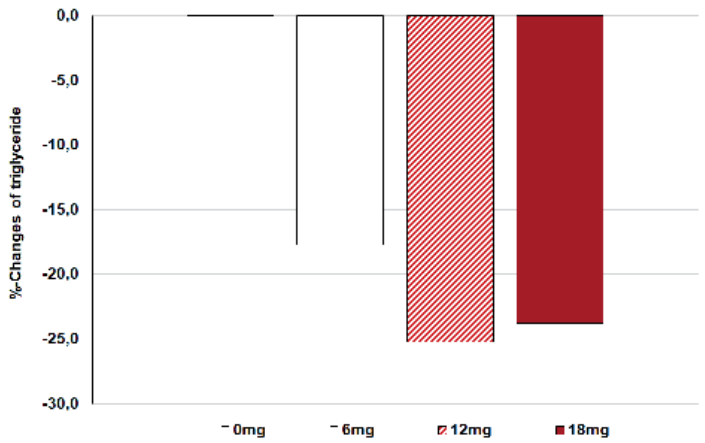


Figure 3: Average percentage changes of triglyceride after 12 weeks of astaxanthin supplementation compared to the values at baseline. Data represent the mean ±SD.[8]

Inflammation

Chronic inflammation is another main factor to cause atherosclerosis or many other diseases. The randomized, double-blind and placebo-controlled study by *Park et al.* from 2010 measured the effect of astaxanthin on the inflammatory status by using C-reactive protein in plasma as a biomarker. The concentration of the biomarker was significantly lower in both groups at week 4 and had been kept lower compared to the control group until week 8 (figure 4).[4, 6]

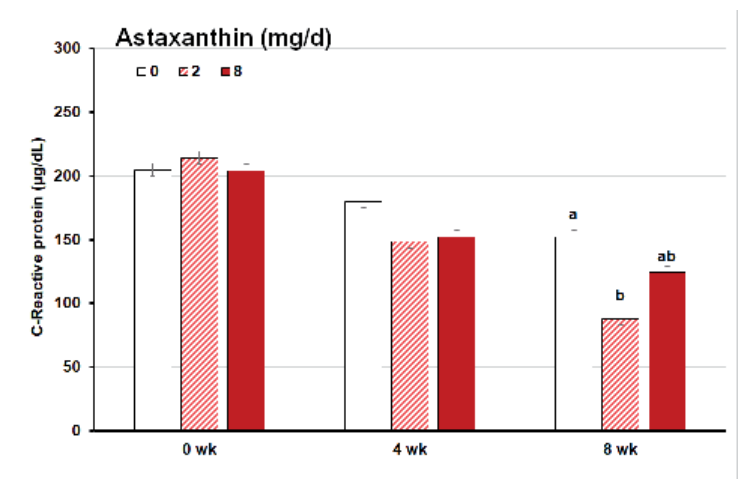


Figure 4: Plasma concentrations of plasma C-reactive protein in human subjects given 0, 2 or 8mg astaxanthin daily over 8 weeks. a, b: different letters represent significant treatment differences. (P<0.05) as analyzed by protected LSD test. Values are means ± overall standard error.[6]

References

1. Ambati, R. R. et al. (2014). Astaxanthin: Sources, extraction, stability, biological activities and its commercial applications – A review, Marine Drugs, 12(1), pp. 128–152.
2. Fassett, R. G., & Coombes, J. S. (2011). Astaxanthin: A potential therapeutic agent in cardiovascular disease. Marine Drugs, 9(3), pp. 447–465.
3. Cervantes Gracia, K., Llanas-Cornejo, D., & Husi, H. (2017). CVD and Oxidative Stress. Journal of Clinical Medicine. Vol 6(2), pp. 22.
4. Kishimoto, Y., Yoshida, H., & Kondo, K. (2016). Potential anti-atherosclerotic properties of astaxanthin. Marine Drugs. Vol. 14(2). pp. 35,
5. Fassett, R. G., & Coombes, J. S. (2012). Astaxanthin in cardiovascular health and disease. Molecules. Vol. 17(2), pp. 2030-2048.
6. Park, J. S., Chyun, J. H., Kim, Y. K., Line, L. L., & Chew, B. P. (2010). Astaxanthin decreased oxidative stress and inflammation and enhanced immune response in humans. Nutrition and Metabolism. Vol. 7, pp. 18.
7. Choi, H. D., Kim, J. H., Chang, M. J., Kyu-Youn, Y., & Shin, W. G. (2011). Effects of astaxanthin on oxidative stress in overweight and obese adults. Phytotherapy Research. Vol. 25)12), pp. 1813-1818.
8. Yoshida, H., Yanai, H., Ito, K., Tomono, Y., Koikeda, T., Tsukahara, H., & Tada, N. (2010). Administration of natural astaxanthin increases serum HDL-cholesterol and adiponectin in subjects with mild hyperlipidemia. Atherosclerosis. Vol. 209 (2), pp. 520-523.
9. Kim, Y. K., & Chyun, J.-H. (2004). The Effects of Astaxanthin Supplements on Lipid Peroxidation and Antioxidant Status in Post menopausal Women. In Nutr. Sci.2. Vol. 7, Issue 1, pp. 41–46.

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BDI-BioLife Science (BLS) specializes in the development of innovative technologies to produce high-quality algal materials for the life sciences industry.
State-of-the-art in-house research facilities as well as years of cooperation with renowned universities create the basis for BDI's chief knowledge in algal research. Our department of product development turns ideas into finished formulations and supports you along the way from the raw material to the white label product. At the cultivation plant located at the Ökopark in Hartberg/ Austria, BDI-BioLife Science produces algae with the specially developed, closed algae cultivation process to produce natural astaxanthin, tailor-made for the cosmetics (AstaCos®) and food supplement (astafit®) industries.

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