



### Astaxanthin Tech Sheet References

1. [Efficient radical trapping at the surface and inside the phospholipid membrane is responsible for highly potent antiperoxidative activity of the carotenoid astaxanthin.](#) Goto S, Kogure K, Abe K, Kimata Y, Kitahama K, Yamashita E, Terada H. *Biochim Biophys Acta*. 2001 Jun 6;1512(2):251-8.
2. [Astaxanthin inhibits nitric oxide production and inflammatory gene expression by suppressing I\(kappa\)B kinase-dependent NF-kappaB activation.](#) Lee SJ, Bai SK, Lee KS, Namkoong S, Na HJ, Ha KS, Han JA, Yim SV, Chang K, Kwon YG, Lee SK, Kim YM. *Mol Cells*. 2003 Aug 31;16(1):97-105.
3. [Effects of astaxanthin on lipopolysaccharide-induced inflammation in vitro and in vivo.](#) Ohgami K, Shiratori K, Kotake S, Nishida T, Mizuki N, Yazawa K, Ohno S. *Invest Ophthalmol Vis Sci*. 2003 Jun;44(6):2694-701.
4. [Inhibition of low-density lipoprotein oxidation by astaxanthin.](#) Iwamoto T, Hosoda K, Hirano R, Kurata H, Matsumoto A, Miki W, Kamiyama M, Itakura H, Yamamoto S, Kondo K. *J Atheroscler Thromb*. 2000;7(4):216-22. PMID:11521685
5. [Astaxanthin-rich extract from the green alga Haematococcus pluvialis lowers plasma lipid concentrations and enhances antioxidant defense in apolipoprotein E knockout mice.](#) Yang Y, Seo JM, Nguyen A, Pham TX, Park HJ, Park Y, Kim B, Bruno RS, Lee J. *J Nutr*. 2011 Sep;141(9):1611-7. doi: 10.3945/jn.111.142109. Epub 2011 Jul 6. PMID: 21734060
6. [Administration of natural astaxanthin increases serum HDL-cholesterol and adiponectin in subjects with mild hyperlipidemia.](#) Yoshida H, Yanai H, Ito K, Tomono Y, Koikeda T, Tsukahara H, Tada N. *Atherosclerosis*. 2010 Apr;209(2):520-3. doi: 10.1016/j.atherosclerosis.2009.10.012. Epub 2009 Oct 14. PMID: 19892350
7. [Antihypertensive and neuroprotective effects of astaxanthin in experimental animals.](#) Hussein G, Nakamura M, Zhao Q, Iguchi T, Goto H, Sankawa U, Watanabe H. *Biol Pharm Bull*. 2005 Jan;28(1):47-52. PMID: 15635162
8. [Astaxanthin ameliorates features of metabolic syndrome in SHR/NDmcr-cp.](#) Hussein G, Nakagawa T, Goto H, Shimada Y, Matsumoto K, Sankawa U, Watanabe H. *Life Sci*. 2007 Jan 16;80(6):522-9. Epub 2006 Oct 12. PMID:17074368

9. [The supplementation effect of astaxanthin on accommodation and asthenopia.](#) Nagaki Y, Mihara M, Tsukuhara H, Ohno S. *J Clin Therap Med.* 2006 22(1):41-54.
10. [Astaxanthin Attenuates the Apoptosis of Retinal Ganglion Cells in db/db Mice by Inhibition of Oxidative Stress.](#) Dong LY, Jin J, Lu G, Kang XL. *Mar Drugs.* 2013 Mar 21;11(3):960-74. doi: 10.3390/md11030960. PMID: 23519150
11. [Astaxanthin limits exercise-induced skeletal and cardiac muscle damage in mice.](#) Aoi W, Naito Y, Sakuma K, Kuchide M, Tokuda H, Maoka T, Toyokuni S, Oka S, Yasuhara M, Yoshikawa T. *Antioxid Redox Signal.* 2003 Feb;5(1):139-44. PMID: 12626126
12. [Effects of astaxanthin supplementation on exercise-induced fatigue in mice.](#) Ikeuchi M, Koyama T, Takahashi J, Yazawa K. *Biol Pharm Bull.* 2006 Oct;29(10):2106-10. PMID:17015959
13. [Astaxanthin attenuates the UVA-induced up-regulation of matrix-metalloproteinase-1 and skin fibroblast elastase in human dermal fibroblasts.](#) Suganuma K, Nakajima H, Ohtsuki M, Imokawa G. *J Dermatol Sci.* 2010 May;58(2):136-42. doi: 10.1016/j.jdermsci.2010.02.009. Epub 2010 Feb 18.
14. [Astaxanthin modulates age-associated mitochondrial dysfunction in healthy dogs.](#) Park JS, Mathison BD, Hayek MG, Zhang J, Reinhart GA, Chew BP. *J Anim Sci.* 2013 Jan;91(1):268-75. doi: 10.2527/jas.2012-5341. Epub 2012 Oct 16.
15. [Astaxanthin protects mitochondrial redox state and functional integrity against oxidative stress.](#) Wolf AM, Asoh S, Hiranuma H, Ohsawa I, Iio K, Satou A, Ishikura M, Ohta S. *J Nutr Biochem.* 2010 May;21(5):381-9. doi: 10.1016/j.jnutbio.2009.01.011. Epub 2009 May 7.
16. [Treatment of H. pylori infected mice with antioxidant astaxanthin reduces gastric inflammation, bacterial load and modulates cytokine release by splenocytes.](#) Bennedsen M, Wang X, Willén R, Wadström T, Andersen LP. *Immunol Lett.* 1999 Dec 1;70(3):185-9.
17. [Ulcer preventive and antioxidative properties of astaxanthin from Haematococcus pluvialis.](#) Kamath BS, Srikanta BM, Dharmesh SM, Sarada R, Ravishankar GA. *Eur J Pharmacol.* 2008 Aug 20;590(1-3):387-95. doi: 10.1016/j.ejphar.2008.06.042. Epub 2008 Jun 16.

### Additional References

[Antioxidant activities of astaxanthin and related carotenoids.](#) Naguib YM. J Agric Food Chem. 2000 Apr;48(4):1150-4.

[Astaxanthin: a novel potential treatment for oxidative stress and inflammation in cardiovascular disease.](#) Pashkow FJ, Watumull DG, Campbell CL. Am J Cardiol. 2008 May 22;101(10A):58D-68D. doi: 10.1016/j.amjcard.2008.02.010. Review. PMID:18474276

[Positive effects of astaxanthin on lipid profiles and oxidative stress in overweight subjects.](#) Choi HD, Youn YK, Shin WG. Plant Foods Hum Nutr. 2011 Nov;66(4):363-9. doi: 10.1007/s11130-011-0258-9. PMID:21964877

[Astaxanthin prevents loss of insulin signaling and improves glucose metabolism in liver of insulin resistant mice.](#) Bhuvanewari S, Anuradha CV. Can J Physiol Pharmacol. 2012 Nov;90(11):1544-52. doi: 10.1139/y2012-119. Epub 2012 Nov 13. PMID: 23181282

[Astaxanthin, a dietary carotenoid, protects retinal cells against oxidative stress in-vitro and in mice in-vivo.](#) Nakajima Y, Inokuchi Y, Shimazawa M, Otsubo K, Ishibashi T, Hara H. J Pharm Pharmacol. 2008 Oct;60(10):1365-74. doi: 10.1211/jpp/[60.10.0013](#). PMID:18812030