



GLA Decreases Inflammation and Dry Eye Symptoms in Sjogren's

Gamma-linolenic acid (GLA) has been shown to be of benefit in chronic inflammatory disorders, and early pilot studies conducted in the 1980's suggest that GLA may also benefit the ocular status of those with Sjogren's. In this randomized, controlled study, patients with primary Sjogren's received modest amounts of GLA or placebo for 1 month. Supplemental GLA was found to increase tear levels of the anti-inflammatory eicosanoid PGE1. Two weeks after ending supplementation, tear PGE1 declined to near baseline levels. Ocular surface status improved and dry eye symptoms were reduced in the GLA group.

Aragona P et al. Systemic omega-6 essential fatty acid treatment and PGE1 tear content in Sjogren's syndrome patients. *Investigative Ophthalmology Visual Science* 46:4474-9, 2005.

GLA Clinically Improves Ocular Surface and Symptoms in Dry Eye

This randomized, placebo controlled trial evaluated the effect of supplemental GLA and LA on the ocular surface of patients with tear-deficient dry eye. While no differences were seen between active or control groups for tear break up time or Schirmer test, significant changes in symptom scores, lissamine green staining and ocular surface inflammation were seen in the treatment group. Supplemental GLA/LA reduced ocular surface inflammation and improved dry eye symptoms.

Barabino, S et al. Systemic linoleic and gamma-linolenic acid therapy in dry eye syndrome with an inflammatory component. *Cornea* 22:97-102, 2003.

Laser Procedures Reduce Tear Levels of Vitamin C

Biomarkers of oxidative damage have been found to be higher in the tears of people with dry eye. Since corrective laser surgery is known to generate free radicals and cause transitory dry eye, this study measured levels of antioxidant vitamin C in the tears of patients before and after undergoing these procedures. Vitamin C levels declined significantly after all three

surgical procedures. These results suggest that more vitamin C—the major free-radical fighting antioxidant in tears—may be needed to reduce the harmful effect of free radicals generated by excimer laser surgery.

Bilgihan A et al. Ascorbic acid levels in human tears after photoreactive keratectomy (PRK), transepithelial photoreactive keratectomy, and laser in situ keratomileusis (LASIK). *Journal of Cataract Refractive Surgery* 27:585-588, 2001.

HydroEye Blunts Normal Drop in Lactoferrin Post-LASIK

In a series of small studies, the effect of HydroEye on levels of tear lactoferrin (an indicator of ocular surface health) was evaluated in normal patients and those undergoing LASIK. In the first study, HydroEye increased mean lactoferrin by 60% in normals. Additionally, pre-LASIK patients experienced a 40% mean increase after supplementation. In a follow-up study, pre-LASIK lactoferrin levels increased significantly more in a group taking HydroEye compared to controls, and HydroEye blunted the expected post-surgery drop in lactoferrin.

Bucci, F. Omega fatty acid supplements useful strategy before LASIK. *Ophthalmology Times*, Nov 1, 2003.

GLA Shown Clinically Beneficial in Inflammatory Disease

Both articles discuss the value of GLA, a unique n-6 or omega-6 fatty acid, in inflammation. The first article reviews the clinical benefits of GLA and other oils shown in double-blind controlled trials to improve rheumatoid arthritis—a disease characterized by chronic inflammation. GLA, as well as long chain fats from fish, decrease pro-inflammatory markers and free radical production. The second article discusses the effects of GLA and omega-3 fats, both of which can favorably impact compounds involved in the inflammatory response.

Calder PC and Zurier RB. Review. Polyunsaturated fatty acids and rheumatoid arthritis. *Current Opinion Clinical Nutrition Metabolic Care* 4:115-21, 2001; and Harbig LS. Fatty acids, the immune response and autoimmunity: a question of n-6

essentiality and the balance between n-6 and n-3 fatty acids. *Lipids* 38:323-41, 2003.

GLA Favorably Modifies CVD Risk Factors in Humans and Animals

Researchers evaluated the effects of supplemental GLA and LA in animals and subjects with hyperlipidemia. Total and LDL-cholesterol levels were reported to be significantly decreased by the supplements, while HDL levels rose. Platelet aggregation and serum thromboxane B2 decreased both in humans and animals after GLA supplementation. The authors conclude that GLA may favorably modify cardiovascular risk factors in an animal model and in humans.

Guivernau M et al. Clinical and experimental studies on the long-term effects of dietary gamma-linolenic acid on plasma lipids, platelet aggregation, thromboxane formation, and prostacyclin production. *Prostaglandins Leukotrienes and Essential Fatty Acids* 51:311-16, 1994.

GLA with EPA/DHA Decreases Inflammatory Prostaglandins

The results from both of these clinical trials demonstrate the benefits of combining GLA with EPA and DHA. Administering balanced amounts of EPA and DHA together with GLA was shown to increase the membrane content of all three fatty acids, while decreasing the release of inflammatory prostaglandins and eicosanoids from cellular membranes.

Laidlaw M et al. Effects of supplementation with fish oil-derived n-3 fatty acids and gamma-linolenic acid on circulating plasma lipids and fatty acid profiles in women. *American Journal Clinical Nutrition* 77:37-42, 2003; and Barham JB et al. Addition of eicosapentaenoic acid to gamma-linolenic acid-supplemented diets prevents serum arachidonic acid accumulation in humans. *Journal Nutrition* 130:1925-31, 2000.

GLA Increases Tear Production Post-PRK

The effects of GLA and LA on objective measures of dry eye were investigated in PRK patients in this randomized controlled trial. Compared to controls, the treated group had lower symptom scores, greater Schirmer test values and more favorable fluorescein clearance scores. The researchers concluded that oral GLA and LA, the precursors to anti-inflammatory prostaglandins, could be helpful in increasing tear production and clearance after PRK.

Macri et al. The effect of LA and GLA on tear production, tear clearance and on the ocular surface after PRK surgery. *Graefes Archives of Clinical Experimental Ophthalmology* (published first online, 05/27/2003).

Those with Pre-existing Dry Suffer Discomfort Longer Post-LASIK

Temporary dry eye is common post-LASIK, and this study examined whether having dry eye before undergoing this procedure affects visual outcome and complications. Symptoms were significantly more severe for those with existing dry eye compared to controls for up to 12 months after LASIK, with lower tear function and more vital staining. The authors concluded that those who start out with dry eye suffer more discomfort over a longer period—a significant, frequent problem.

Toda I et al. Laser-assisted in situ keratomileusis for patients with dry eye. *Archives of Ophthalmology* 120:1024-28, 2002.

Black Currant Seed Oil (GLA) Clinically Reduces Inflammation, Improves Immunity

An imbalance of pro- to anti-inflammatory prostaglandins is one factor thought to underlie the inflammation commonly seen in dry eye. In this study, researchers measured the effects of black currant seed oil (a concentrated source of GLA) on immune function parameters in healthy older people. The results of this randomized controlled trial demonstrate that black currant seed oil has a moderate immune enhancing effect due to decreasing the production of the pro-inflammatory prostaglandin, PGE2. These results suggest that the oil supports immunity in older individuals, and that it could be of benefit in those with dry eye as well.

Wu D, et al. Effect of dietary supplementation with black current seed oil on the immune response of healthy elderly subjects. *American Journal of Clinical Nutrition* 70:536-543, 1999.