

Dry Eye: Inflammation & Nutrition

Introducing the right nutrients can help combat the disease.

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Scientists have discovered that a host of factors tend to promote chronic or silent inflammation associated with dry eyes. These factors include improper diet, obesity, insulin resistance, sleep deprivation, lack of exercise, stress, aging and prescription drugs. Therefore, lifestyle choices can play a significant role in preventing and treating dry eye syndrome.

While multiple factors are involved, nutrition is one of the key components in preventing or treating dry eye. It does not help that the typical American diet looks as if it were designed to promote chronic inflammation and dry eye syndrome.

In this article, we will discuss some of the inflammation promoters as well as the individual nutritional elements essential in combating dry eye inflammation.

The Physiology of Inflammation

The biggest advance in the understanding of dry eye in the past 10 years has been around the neural reflex communication between the ocular surface and lacrimal gland function.¹ The ocular surface nerves communicate with nerves in the brainstem that stimulate secretion of tear fluid and proteins by the lacrimal glands.

In healthy people, the inflammatory response is well controlled. It is normally activated only when there is a need for protection from infection or tissue injury. However, any internal or external disruption of neural sensitivity involving either the ocular surface or the lacrimal glands creates a self-perpetuating inflammatory cycle produced by lacrimal gland aqueous fluid (tears) heavily infiltrated with immune-response white blood cells and proteins, including T cells and other lymphocytes.¹

Inflammation promoters

Research suggests that processed foods rich in trans-fatty acids from hydrogenated Omega 6 are major inflammation promoters. Vegetable oils, especially corn, safflower, soy, peanut, sunflower and canola oils have these abnormal fatty acids. Margarines, salad dressings, chips and baked goods are just some of the dietary sources of trans-fatty acids. Diets rich in rapidly digested (high glycemic) sugars and starches are proving to dramatically promote chronic inflammation.

When blood sugar is elevated, advanced glycation end products (AGEs) may elevate blood levels of various inflammatory mediators, including C-reactive protein and interleukin-6.² These markers are now associated with inflammatory diseases of the eye.

Necessary Nutrients

The common use of Omega 6 vegetable oils, mostly hydrogenated, has caused a historically unprecedented shift in the diet-induced inflammatory balance. Without appropriate amounts of the necessary nutrient co-factors, including Omega 3 fatty acids, vitamins C, B6 and magnesium to facilitate the delta 6 metabolic process, excessive Omega 6 linoleic acid may either oxidize and become an immediate cellular-destructive pro-oxidant, or convert through the delta 5 desaturase arachidonic acid pathway to cyclo-oxygenase 2 (COX2) to a pro-inflammatory prostaglandin (PGE2).³

The good news is that with the appropriate nutrient co-factors, Omega 6 fatty acids that also include gamma-linolenic-acid (GLA) (think black currant seed oil, or borage oil) quickly metabolize downstream to

an anti-inflammatory site-specific prostaglandin, PGE1, which acts on G protein coupled receptors.³ This activates adenylate cyclase that increases cyclic adenosine monophosphate (cAMP). PGE1 and cAMP have been clinically shown to stimulate aqueous tear production in the dry eye patient.

Here are some nutrients that are needed in fighting dry eye:

► **Essential fatty acids (EFAs).** Omega 3 fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), are vital players in healthy meibomian gland output (oily top layer of the tear film), which is necessary to sustain normal tear break-up time, and necessary for visual acuity.⁴ As noted above, Omega 3 EPA is a natural anti-inflammatory, and DHA prevents loss of meibomian gland permeability, which is particularly important for the maintenance of patent meibomian gland ducts.⁴

► **Curcumin.** A nutrient commonly used to further inhibit the arachidonic acid inflammatory loop by inhibiting COX2 is Curcumin, a dietary compound with diverse antioxidant and anti-inflammatory effects. The strong anti-oxidative activity in curcuminoids, the main yellow pigments in *Curcuma longa* (turmeric) have been used widely in the treatment of chronic inflammation in indigenous medicine. Curcumin is suggested to modify protein thiols (radicals), thereby altering the early cascade signaling activity of inflammatory interleukins, specifically interleukin-1 (IL-1), which is now considered a marker of chronic inflammation.⁵

► **Vitamin C.** This is essential in the support of the body's defense and immune system. It is important in tear film biochemistry and has a primary role in fatty acid metabolism.

► **Vitamin A.** This nutrient is also an important player in dry eye syndrome and is included in almost all nutrient-based dry eye formulations. It is vital for the health of epithelial cells of the cornea and conjunctiva. Vitamin A is also necessary for goblet cell and lacrimal gland production of the large variety of mucins now associated with the innermost, or base layer of the tear film.

► **Vitamin D.** It should be included in all nutraceutical formulations that include Vitamin A due to suggested increased risk of fractures in older patients taking large amounts of supplemental Vitamin A.

► **Vitamin E.** Vitamin E should be included in all fatty acid-based nutraceutical formulations to help prevent or slow lipid oxidation. This particularly includes any formulation that includes flax seed oil or any type of fish oil.

► **Polysaccharides.** Polysaccharides are included in a number of nutraceutical dry eye formulations to stimulate the complex biochemical network of the tear film base-layer mucins which are produced by goblet epithelial cells on the ocular surface as well as aqueous layer mucins produced by the lacrimal gland.

► **Lactoferrin.** The importance of supplemental apolactoferrin, an iron-binding protein, has been underrated in the management of inflammation in dry eye. Adequate levels of tear lactoferrin, naturally produced by the lacrimal gland and neutrophils, are particularly important for the eye surgery or contact lens patient with an increased risk of infection. The replication and biofilm formation of fungi, bacteria and viruses in mucosal tissues, including tears and saliva, are iron-dependent. Growth of these pathogens becomes almost impossible if adequate amounts of iron-binding proteins, particularly lactoferrin, are concentrated in these fluids.²

Nutritional Supplements' Role

Nutritional supplements can play an important role in the management of inflammation associated with dry eye by enhancing the body's natural defense system, and the protection provided by nutritional therapy may be better than after-the-fact treatment by pharmaceuticals.

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