

The Essentials of Essential Fatty Acids

By Larry J. Alexander, O.D.

Patients with AMD, diabetes or dry eye may benefit from Omega-3s.

Editor's Note: This article is part of a year-long series focusing on vitamins and ocular health and is supported by Bausch & Lomb. To view all the articles in this series, go to www.revoptom.com and click on "Ocular Nutrition from A to Z."

General Summary:

Omega-3 and omega-6 polyunsaturated fatty acids are important structural components of cell membranes.¹ Typical Western diets tend to be much lower in omega-3 fatty acids than omega-6 fatty acids. In fact, an estimated 83% of Americans are deficient in omega-3s.

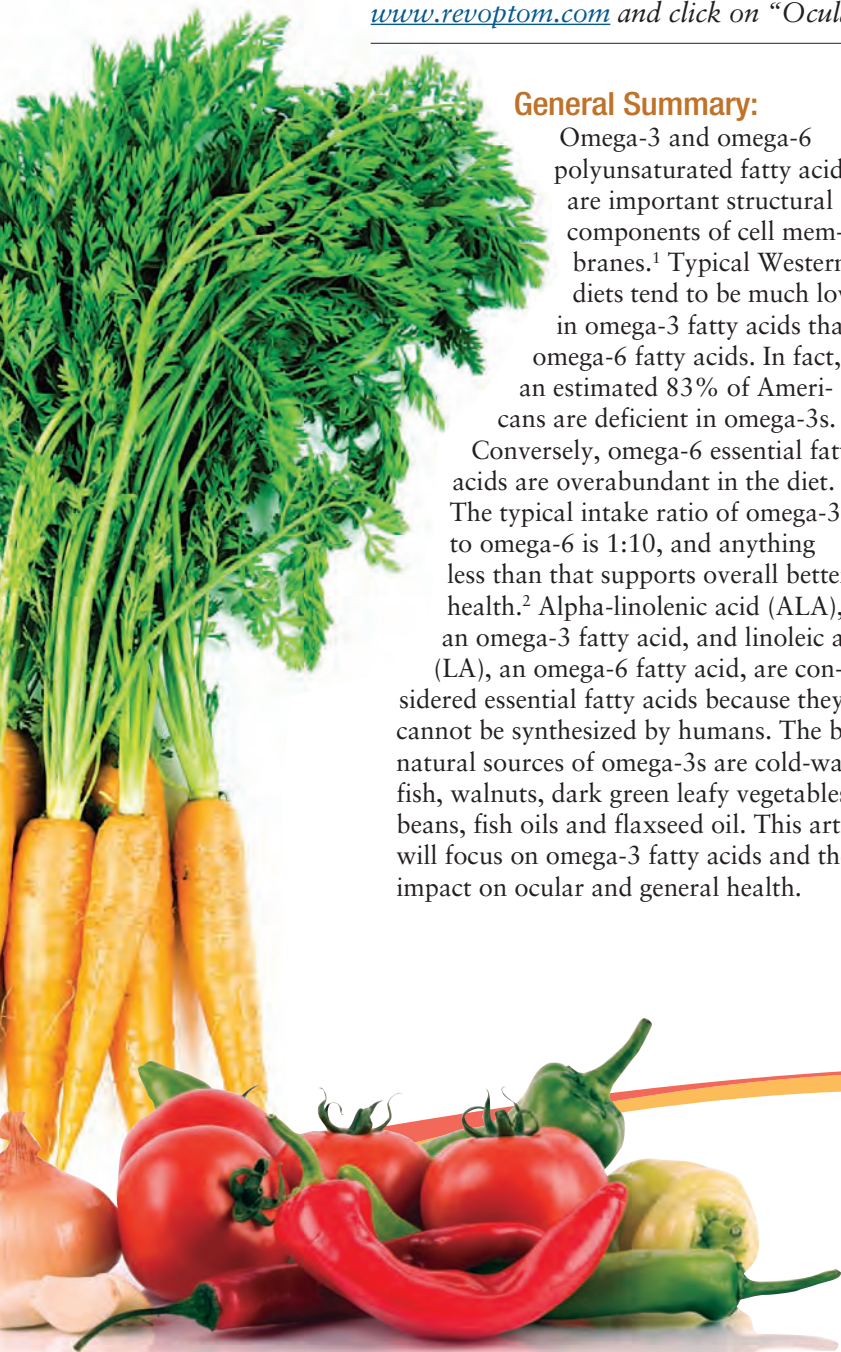
Conversely, omega-6 essential fatty acids are overabundant in the diet. The typical intake ratio of omega-3 to omega-6 is 1:10, and anything less than that supports overall better health.² Alpha-linolenic acid (ALA), an omega-3 fatty acid, and linoleic acid (LA), an omega-6 fatty acid, are considered essential fatty acids because they cannot be synthesized by humans. The best natural sources of omega-3s are cold-water fish, walnuts, dark green leafy vegetables, beans, fish oils and flaxseed oil. This article will focus on omega-3 fatty acids and their impact on ocular and general health.

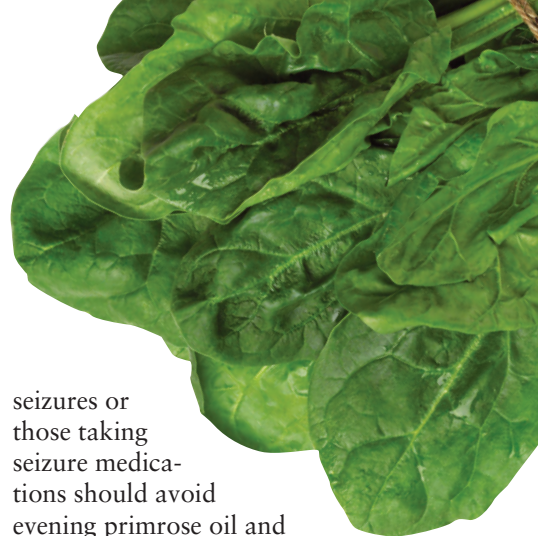
Reasons to Use and Results of Deficiencies

The omega-3 fatty acid DHA (docosahexaenoic acid) is found in very high concentrations in the cell membranes of the retina, which conserves and recycles DHA even when omega-3 fatty acid intake is low.³ DHA plays an important role in the regeneration of the visual pigment rhodopsin.⁴ The phospholipids within the gray matter of the brain contain high proportions of DHA and ARA (arachidonic acid), suggesting importance in central nervous system function.⁵ DHA is a standard additive to milk that facilitates neurological development. Increasing intake of long-chain omega-3 fatty acids (eicosapentaenoic acid-EPA and docosahexaenoic acid-DHA), especially in the form of fish, can decrease the risk of cardiovascular disease.⁶⁻¹⁴ A study that followed more than 43,000 men for 12 years found that those who ate fish at least once monthly had a risk of ischemic stroke that was 43% lower than those who ate fish less than once monthly.¹⁵

The triglyceride-lowering effects of EPA and DHA increase with dose, and clinically meaningful reductions in serum triglyceride concentrations have been demonstrated at larger doses of 2 g/day of EPA and DHA.¹⁶

* The views expressed by this article are those of the authors and not Bausch & Lomb.





Omega-3 fatty acids Eicosapentaenoic acid (EPA), Docosahexaenoic acid (DHA)	
RDI *	1 g / day
consequences of deficiency	None reported
side effect(s) with over dosage	Heartburn, "fish belch," nausea, loose stools, possible potentiation of bleeding, suppression of immune system
dietary source(s)	Herring, salmon, sardines, oysters, tuna and mackerel
supplement form(s)	Specific fish-oil supplements (EPA, DHA)
*Recommended Daily Intake	

Reductions in triglycerides are especially important in patients with diabetes.¹⁷⁻²⁰ The American Diabetes Association recommends that individuals with diabetes increase omega-3 fatty acid consumption by consuming two to three 3-oz servings of fish weekly.²¹ An association also exists with the control of inflammatory bowel disease, ulcerative colitis, Crohn's disease and systemic lupus erythematosus.²²⁻²⁹

Anterior and Posterior Segment Implications

Omega-3 fatty acids modulate intracellular calcium ion release and can improve flow-mediated vasodilation properties, thus offering possible implications for glaucoma and ischemic optic neuropathy.³⁰⁻³²

A regular diet high in Omega-3 polyunsaturated fat, especially from fish, has suggested a protective effect against early and late age-related macular degeneration (AMD) in an older Australian cohort.³³ A recent meta-analysis reports that consumption of fish and foods rich in omega-3 fatty acids may be associated with a lower risk for AMD; however, the results were not strong enough to support that the routine consumption of omega-3s would prevent AMD.³⁴ Eating oily fish at least once a week has been linked to a reduced risk for neovascular AMD. An ongoing study is

further investigating this premise.³⁵

The most common use of essential free fatty acids in eye care is for their anti-inflammatory effects in the management of dysfunctional tear syndrome.

Excesses, Reactions and Interactions

Omega-3 fatty acid supplements can be taken at any time, in full or divided doses, without raising concerns for interactions with any medications.³⁶ Omega-3 fatty acids persist in cell membranes for weeks after consumption, and thus intermittent bolus dosing (i.e., twice weekly intake of fish or fish oil) provides the same benefits as daily consumption of lower doses.³⁶ Alpha-Linolenic Acid in high doses may cause GI disorders and allergic reactions.^{37, 38} Gamma-Linolenic Acid has been associated with gastrointestinal distress in some patients. Contaminants in fish and supplements are a potential issue in essential fatty acid consumption and supplementation.

Fish oil, EPA and DHA supplements have been associated with belch-back, possible potentiation of bleeding and suppression of the immune system.³⁹ Patients taking anticoagulants should be cautioned regarding use of essential fatty acids.⁴⁰

Patients with tendencies toward

seizures or those taking seizure medications should avoid evening primrose oil and other GLA oils.⁴¹⁻⁴³ Finally, Vitamin E should be taken at 0.6 mg of alpha-tocopherol per g of dietary Polyunsaturated Fatty Acid (PUFA) to minimize oxidation.⁴⁴⁻⁴⁷

Bottom Line

Supplementation of omega-3 fatty acids should be considered for patients with various conditions, including AMD, diabetes or dry eye, unless adequate sourcing is taking place through the diet. Supplementation, in usual doses, ranges from 1-2g/day and is unlikely to have negative sequelae although caution must be taken in specific populations, as noted above.

Currently Dr. Alexander serves as the Sr. Director of Education and Professional Relations for Optovue, Inc. He has a lifelong interest in behavioral modification as it applies to ocular and systemic disease. He has published three editions of Primary Care of the Posterior Segment.

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