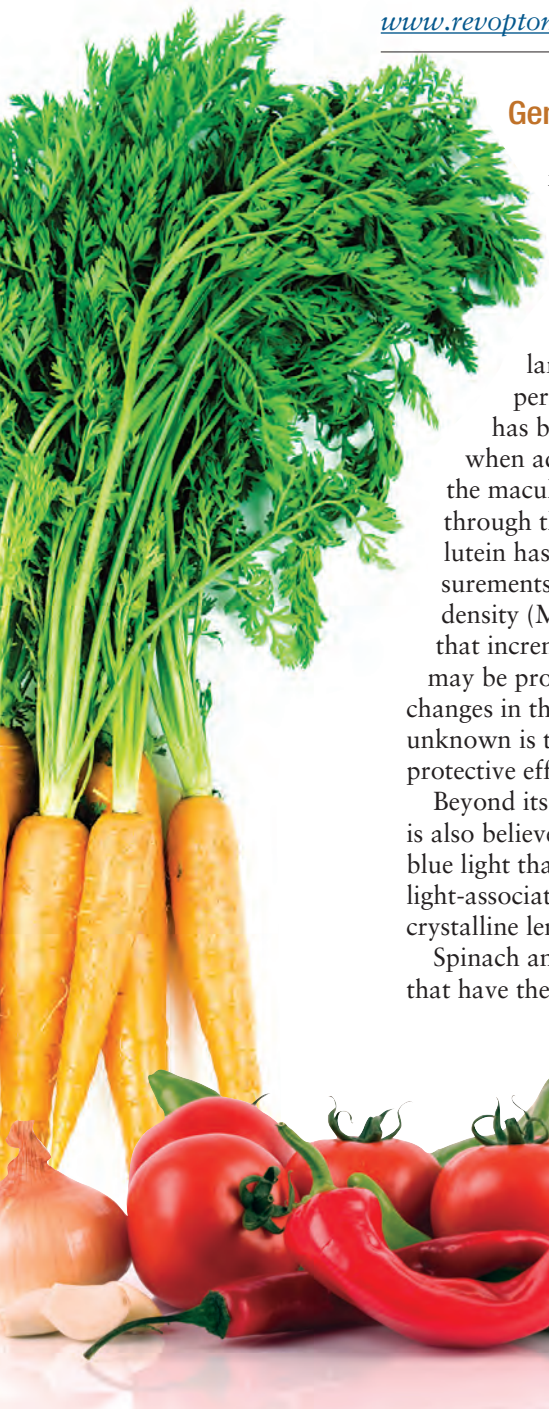
Lutein, the Natural Protector

By Leo Semes, O.D., F.A.A.O.

This carotenoid goes to battle against AMD and other eye diseases.

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

Lutein is a water-soluble member of the carotenoid family, which possesses anti-oxidant properties that may favorably impact ocular health, particularly in the areas of age-related macular degeneration (AMD) and, perhaps, cataract formation. It has been demonstrated that lutein, when administered orally, reaches the macula via intestinal absorption through the blood stream. Intake of lutein has been shown to increase measurements of macular pigment optical density (MPOD).[1] The significance is that incremental increases in MPOD may be protective against undesirable changes in the macula. But, what remains unknown is the disease stage when this protective effect may be important.

Beyond its antioxidant properties, lutein is also believed to absorb short wavelength blue light that enters the eye, thus reducing light-associated damage to the macula and crystalline lens.[2,3]

Spinach and kale are the two foods that have the highest amount of lutein—and its biochemical cousin zeaxanthin.

Reasons to Use

It has been suggested that lutein and zeaxanthin protect against certain eye diseases.[4] Given that lutein and zeaxanthin, along with their metabolites, are carot-enoids found in the retina and lens, and that these tissues are vulnerable to oxidative damage, antioxidant nutrients, such as lutein, may serve a unique role in the protection against selected eye diseases and disorders as noted above.

Anterior Segment

Currently, data is limited on lutein in the etiology of lens opacities. However, one recent study showed an inverse association between cataract and blood antioxidants in an antioxidant-depleted study sample.[5] These limited results may not be specific to lutein, but are encouraging and may suggest another reason to recommend lutein intake.

Posterior Segment

Clinical research has demonstrated short-term visual performance benefits and increases in MPOD in small populations with AMD who took lutein and a combination of lutein and anti-oxidants.[6]

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

Lutein (Carotenoid)

RDI * 6 mg / day	None currently; recommendation based on literature is >/=
consequences of deficiency	None reported
side effect(s) with over dosage	No toxicities have been reported.
dietary source(s)	Spinach, turnips, kale, collard greens, egg yolks, green peas
supplement form(s)	Alone or in multivitamin formulations

*Recommended Daily Intake

It should be noted that not all studies have found an association between serum carotenoids and protection from AMD. For example, a case-control (epidemiological) study that examined the Beaver Dam Eye Study data base found no such association for lutein or zeaxanthin among a small sample.[7]

But, other studies have suggested that dietary deficiencies of macular pigments can be corrected by supplementation of lutein (and zeaxanthin).[6,7] Others have demonstrated specific improvements in selected visual performance measures.[8,9]

Contrast sensitivity, in particular, has been shown to improve with increased macular pigment optical density (MPOD) measures.[10] The theory is that filtering blue light improves contrast; but, this may be at the expense of luminance at the photoreceptors and consequently may not be expected to produce a related improvement in visual acuity.

Deficiency, Excess

Recommended intake of lutein based on literature is between 6 and 20 mg per day. A variety of supplement products containing lutein in amounts of 6–25 mg are available in health food stores. Lutein is currently found in many multi-vitamin supplements in much smaller amounts (0.25 mg). Lutein is water-soluble, despite the fact that it is transported and absorbed via fat-soluble means, so what is not absorbed is excreted (as a precaution, this is not applicable to the entire carotenoid family).

Bottom Line

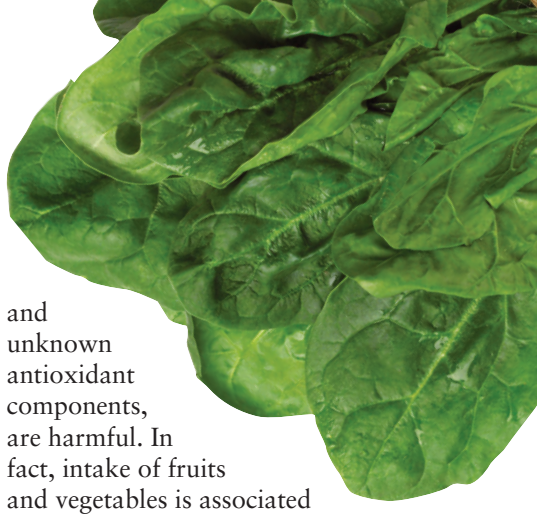
AREDS II is evaluating the potential benefits of the antioxidants lutein/zeaxanthin as well as omega-3 long-chain polyunsaturated fatty acids in delaying progression of vision loss in AMD. The AREDS II trial is a placebo-controlled clinical trial designed to demonstrate potential protective effects.

A diet rich in the carotenoids, lutein and zeaxanthin may be beneficial in protecting retinal and lens tissues. Clearly, results of the AREDS II will clarify the usefulness of nutrient supplementation in prevention of eye disease progression.

Differences are likely in the potential protective effect of antioxidant supplementation depending on disease stage, so future research needs to take into account the stage at which oxidative damage, and therefore antioxidant supplementation, may be important.

In the meantime, a healthy diet with a variety of fresh fruit and vegetables (or in their absence, supplementation) may have multiple benefits.

There is no evidence that nutrient-dense diets high in fruits and vegetables, which provide known



and unknown antioxidant components, are harmful. In fact, intake of fruits and vegetables is associated with reduced risk of death due to cancer, cardiovascular disease, and all other causes.

Thus, recommendations, such as consuming a more nutrient-dense diet (i.e., lower in sweets and fats and higher in fruits and vegetables) may have other benefits despite their unproven efficacy in prevention or slowing disease. When dietary intake is insufficient, supplementation should be recommended.

However, advocating the use of nutrient supplementation must be done with one cautionary note: trials have suggested that supplementation with carotene increase the risk of lung cancer in smokers and workers exposed to asbestos. You should recommend smoking cessation to your patients as well.

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For a detailed list of references and suggested readings for this article, go to www.revoptom.com and click on "Ocular Nutrition from A-Z."