

# Zeaxanthin: A Potentially Potent Antioxidant

This carotenoid may minimize phototoxic stress, which has been associated with a number of ocular and systemic conditions

By Diana Shechtman, O.D.

*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](http://www.revoptom.com) and click on "Ocular Nutrition from A to Z."*

## General Summary:

Zeaxanthin is among the carotenoids, a pigment responsible for the brilliant colors of many fruits and vegetables. Leafy green vegetables (kale, spinach) and corn are excellent sources of zeaxanthin.

The highest source of zeaxanthin is found in goji berries. Average U.S. dietary consumption of carotenoids (including zeaxanthin) is less than 2mg/day. At this time, there are no United States Recommended Daily Allowances' (USRDA) guidelines for zeaxanthin, although the USDA in 1998 included a food database for zeaxanthin.<sup>1</sup>

## Reasons to Use:

There is a growing body of evidence indicating that zeaxanthin as a potent antioxidant, which minimizes phototoxic stress.<sup>2,3</sup> Oxidative stress has been linked to numerous ocular and systemic conditions. Along with ocular benefits, zeaxanthin,

and other carotenoids appear to protect against dementia, skin damage and risk of cancer.<sup>4,5,6</sup> The human body does not synthesize carotenoids (like lutein and zeaxanthin), thus, they are entirely derived from dietary intake.

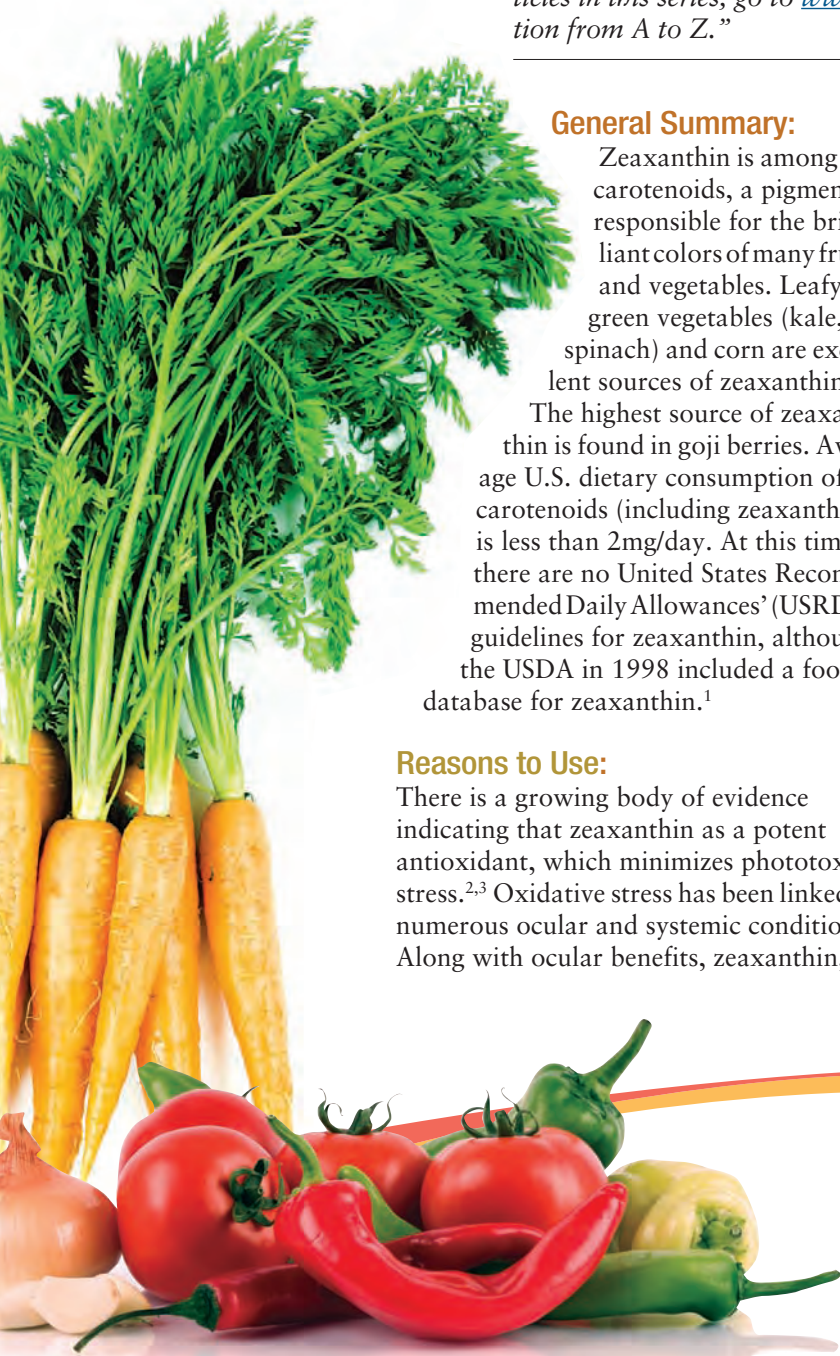
## Anterior Segment:

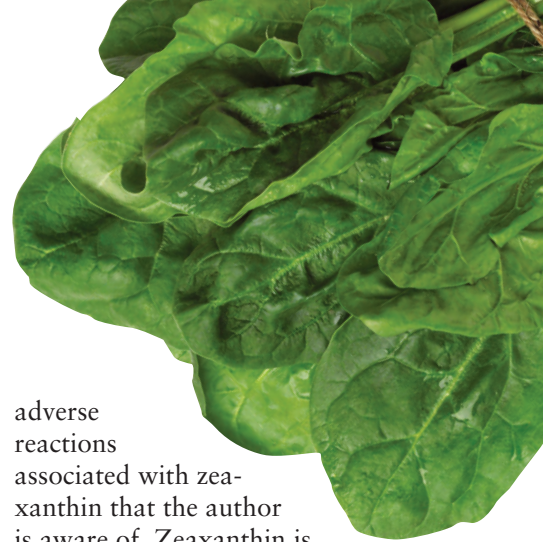
Zeaxanthin, along with lutein, are the only carotenoids present in the lens. Oxidative insult has been thought to contribute to cataract formation, and zeaxanthin may serve a protective role against this oxidative damage. Some studies have established a relationship between zeaxanthin and cataract formation.<sup>7</sup> Increased levels of zeaxanthin have been shown to have a significant correlation with decreased risk of cataracts.<sup>7</sup>

## Posterior Segment:

Although hundreds of carotenoids are found in nature, only two (lutein and zeaxanthin) are selectively accumulated in the human body where the highest level of oxidative stress occurs (the macula). Zeaxanthin and lutein are the main constituents of macular pigment. Although lutein has been a major focus of research in association with age related

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





<b>Zeaxanthin (Naturally Occurring Xanthophyllic Carotenoid)</b>	
RDI *	None established; up to 2mg daily
consequences of deficiency	None reported
side effect(s) with over dosage	None reported
dietary source(s)	Collard, mustard and turnip greens, spinach and kale
supplement form(s)	Alone or multivitamin formulation
*Recommended Daily Intake	

macular degeneration (AMD), evolutionary evidence suggests that zeaxanthin may be more important than lutein—that is, higher levels are present as part of the macular pigment.<sup>8,9,10</sup> The relative concentrations of lutein and zeaxanthin differ in the central macular region, whereby zeaxanthin is preferentially accumulated

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in the central foveal area.<sup>8</sup> Further evidence corroborating the importance of zeaxanthin is the presence of meso-zeaxanthin, which is derived from lutein in the absence of dietary zeaxanthin.<sup>9</sup>

Macular pigment is believed to absorb excess light and quench free radicals, protecting the outer retinal layer/RPE from oxidative damage.<sup>4,11, 12</sup>

Supportive epidemiological case studies have shown an inverse correlation between AMD and macu-

lar pigment.<sup>11, 13, 14</sup> This has led to speculation that increased macular pigment, through the increased dietary intake of zeaxanthin (and lutein), may be associated with reduced risk and progression of macular AMD.<sup>5,9,11,13-16</sup> Additionally, increased macular pigment may provide a functional role, associated with contrast sensitivity improvement and decreased photophobia and glare.<sup>7</sup>

**Deprivation:** Higher dietary intake of zeaxanthin correlates to higher macular pigment density. Currently, there are two commercially available instruments that measure macular pigment optical density (MPOD), helping to detect deficiency of zeaxanthin (and lutein).<sup>11</sup> Recommendation of zeaxanthin supplements should be considered in patients who are at risk of developing macular degeneration, those showing signs of macular degeneration or patients with symptoms attributed to decreased macular density (photophobia, decreased contrast sensitivity, etc).

**Excess:** Since studies involving zeaxanthin are limited, side effects associated with high-dosages of zeaxanthin have not been established. At this time, there have been no reported

adverse reactions associated with zeaxanthin that the author is aware of. Zeaxanthin is considered relatively safe and has been the subject of a FDA petition as part of the “no observed adverse effect level” (NOAEL) guidelines.

**Bottom Line:** Zeaxanthin does not satisfy the criteria of an “essential nutrient” but may fulfill the criteria to be considered a conditional essential nutrient. While there is compelling epidemiological data that zeaxanthin may protect against oxidative stress, results have been inconsistent. The results of the ongoing large, controlled-randomized, multicenter, study (AREDS 2: 2006-2012) may perhaps help us to further understand the true role of carotenoids, like lutein and zeaxanthin.<sup>18</sup>

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