UF IFAS Extension UNIVERSITY of FLORIDA

FCS8935

Carotenoids and Eye Health[1]

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What are carotenoids?

Carotenoids are vitamin A-like compounds found in plants. They have various roles in human health. Some are provitamin A carotenoids that can be converted by our bodies into the active form of vitamin A known as retinol. Beta-carotene is a well-known provitamin A carotenoid.

Figure 1. Normal vision. AMD blurs the central vision, as you can see in the second image of the two boys.
Credits: National Eye Institute, NIH/Wikimedia Commons/Public

Some carotenoids cannot be converted into vitamin A. These non-provitamin A carotenoids are phytochemicals (PCs), compounds in plants that are not essential for life but may have health benefits. Approximately 5,000 PCs have been identified. Thousands more may exist in fruits, vegetables, and other plant foods. Certain PCs help reduce risk for major chronic diseases, such as heart disease, stroke, cancer, and type 2 diabetes. Others impact urinary tract, prostate, or eye health. This fact sheet focuses on non-provitamin A carotenoids that promote eye health.

Figure 2. A scene as it might be viewed by a person with age-related macular degeneration.
Credits: National Eye Institute, NIH/Wikimedia Commons/Public

What is AMD?

AMD stands for age-related macular degeneration. The macula is the center part of the retina. It is the part of the eye that helps us see color and high-resolution images in our central vision. Reactions produced by light within the cells that help us see light and color produce toxic by-products. These waste products are normally cleared by other cells within the retina called retinal pigment epithelium (RPE). In macular degeneration, the RPE cells do not work

1. This document is FCS8935, one of a series of the Department of Family, Youth and Community Sciences, UF/IFAS Extension. Original publication date March 2011. Revised October 2016. Visit the EDIS website at http://edis.ifas.ufl.edu.

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properly. As a result, toxic by-products are deposited into the retina. These deposits are called drusen, and they cause progressive distortion or blurring of the central vision. In the US, AMD is the leading cause of permanent impairment of close-up vision and the ability to read among adults 60 years of age and older. Nearly two million people over the age of 40 in the US have AMD. Another seven million are at high risk for developing the condition.

Exposure to sunlight and free radicals* can harm the macula and cause AMD. It is important to protect our eyes from sunlight by wearing sunglasses when we are outdoors. We can also help protect the macula from free radical damage by having a ready supply of antioxidants in our bodies. The best way to do this is to have a diet rich in colorful fruits and vegetables that provide non-provitamin A carotenoids.

*Free radicals are substances that our bodies produce during everyday chemical reactions. They cause health problems by damaging cell membranes and DNA. Antioxidants, such as vitamin C and carotenoids, keep free radicals under control. We get these antioxidants from the colorful fruits and vegetables that we eat.

What are lutein and zeaxanthin?

Lutein and zeaxanthin are two of the non-provitamin A carotenoids found in fruits and vegetables. They are antioxidants of interest since they are concentrated in the macula of our eyes. Regular consumption of fruits and vegetables that are rich in carotenoids, including lutein and zeaxanthin, may reduce risk for AMD.

Researchers are also studying the effect of nutritional supplements on eye health. Recent studies have found that people at high risk for AMD who took a specially formulated supplement were less likely to develop progression of AMD than those who did not take the supplement. Adding lutein and zeaxanthin to the formulation did not change the effect (Evans & Lawrenson, 2012; AREDS2, 2014). Anyone who is developing AMD should speak with their health care provider before taking any nutritional supplement.

What are other risk factors for AMD?

The major risk factors for AMD are being over 60 years of age and smoking. Having a family history also increases risk. Whites and females are more likely than others to have AMD.

Table 1. Common foods rich in lutein/zeaxanthin.

Food	mcg Lutein/Zeaxanthin per 100 g of Food*
Kale, boiled	18,250
Spinach, raw	12,200
Turnip greens, boiled	8,440
Peas, boiled	2,590
Lettuce, green leaf	1,730
Winter squash, baked	1,415
Brussels sprouts, boiled	1,290
Broccoli, boiled	1,080
Sweet corn, yellow, boiled	910
Carrots, raw	260

*mcg = microgram, g = gram
Source: USDA National Nutrient Database for Standard Reference, Release 28 (2016)

Figure 3. Being white, female, a smoker, and over age 60 are all risk factors for age-related macular degeneration.
Credits: BakiBG/istockphoto.com

What are good sources of lutein and zeaxanthin?

A healthy diet rich in green leafy vegetables and orange vegetables will provide lutein and zeaxanthin as well as other antioxidants that may protect eye health. Table 1 lists several foods that are good-to-rich sources of these carotenoids.

Summary

A diet rich in colorful fruits and vegetables provides a variety of nutrients as well as phytochemicals that can promote health. Lutein and zeaxanthin are two non-provitamin A carotenoids that may be protective against AMD, the leading cause of permanent central vision loss in older adults. A dietary supplement that contains antioxidants may protect persons at high risk for AMD against the condition. Check

with your doctor before taking a dietary supplement for this purpose.

Figure 4. Eating foods rich in carotenoids promotes eye health throughout life.
Credits: ElizabethHoffmann/istockphoto.com

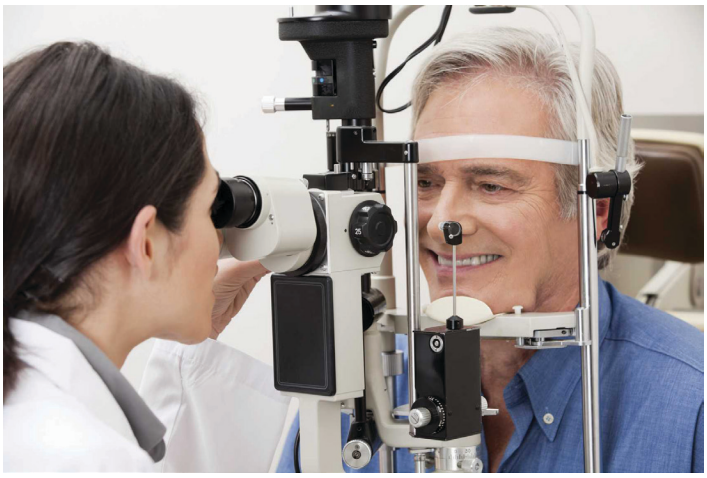

Figure 5. It is important for older adults to have an annual dilated eye exam to check for age-related eye diseases.
Credits: leaf/istockphoto.com

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