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Major cause of blindness in senior citizens may come from thinning pigment

By Toni Baker, Medical College of Georgia email: tbaker@mcg.edu

March 31, 2006 - Whether a tiny yellow pigment is the main thing standing between many older people and macular degeneration is under study at the Medical College of Georgia.

Researchers are measuring this macular pigment that sits on the retina at the fovea, the point of highest vision acuity and best color vision, to better understand what a healthy, normal pigment looks like, says Dr. John Nolan, vision scientist and Fulbright postdoctoral fellow in the MCG Department of Ophthalmology.

The idea is that thinning of this pigment - comprised of yellow antioxidants that come from food or dietary supplements - opens the door for retinal cell destruction, the hallmark of macular degeneration.

The hope is that measuring this protective pigment will one day be part of routine vision screening and macular degeneration will lose its distinction as the leading cause of blindness in people over age 60, says Dr. Nolan.

"This pigment is thought to protect the retina from damage by light and excess oxidation, which over a lifetime can accumulate and contribute to the process of macular degeneration," says Dr. Max Snodderly, MCG vision scientist and Dr. Nolan's sponsor.

The retina receiving too much high-energy blue light - the same light that gives the sky its color - seems to be a major cause of oxidation and cell death.

"So you are kind of rusting as you get old," Dr. Snodderly says. A macular pigment that's thin because of genetics or gets that way because of a poor diet or smoking, enables such rusting.

Dr. Snodderly's studies of monkeys raised on a synthetic diet lacking components of the pigment - lutein and zeaxanthin - showed they also lacked the pigment until the components were added to the diet. "The retina was able to take it up, even though it had never seen it before," he says of the natural pigments found in dark green leafy vegetables such as spinach, turnips and collards, as well as colored fruit and egg yolk.

Studies of more than 800 people age 20-60 with good vision back in Dr. Nolan's homeland of Ireland have parallel findings: that the protective macular pigment can be increased with dietary change and/or dietary supplements of lutein and zeaxanthin. His studies, based at the Waterford Institute of Technology, included a subset of 200 people with healthy vision whose parents had macular degeneration. "This group with perfect vision had significantly lower levels of macular pigment than the control group. This reinforces the macular pigment story," says Dr. Nolan, whose work has indicated a thinning of the macular pigment occurs in most aging adults although other scientists, including Dr. Snodderly, have not seen that consistently.

"It may be that once you go beyond 60, which is the age when macular degeneration typically starts developing, the pigment is depleted for several reasons, including increased oxidative stress and a poor diet, both associated with an increase in age," Dr. Nolan says. "We found that smokers have significantly less macular pigment, both because they tend to have a poorer diet and smoking causes increased oxidative stress.

"It makes biological sense that if you are really deficient in macular pigment that you will get MD," Dr. Nolan says of mounting evidence. But proving it is another matter and is one of the things that brought him to MCG for a year to work with Dr. Snodderly, whose contributions in the field include

helping identify components of the pigment and helping invent a way to measure it. Dr. Nolan's latest study, sponsored by his Fulbright scholarship and Dr. Snodderly's lab, is looking again at 50 people age 20-60 with no major visual problems to precisely measure macular pigment and surrounding anatomy.

Measurements can be taken quickly and painlessly, without even dilating the eyes. Optical coherence tomography or OCT, already used by some eye doctors, provides three-dimensional images and measures of the fovea. The densitometer, which Dr. Snodderly helped develop and largely remains a research tool, enables measurement of the macular pigment. "The long-term goal is that we can screen for people who are deficient in this pigment, and these are the people who should be targeted," says Dr. Nolan. "What we are trying to find out in the meantime is, 'Who are those people'? (And) what is a significantly lower level of macular pigment? We know what the average is, but what is a critically low level and is it different between individuals?"

He notes the solution may be as simple as an improved diet. Longitudinal studies by the National Eye Institute have shown a 25 percent reduction in progression to macular degeneration among those who took antioxidants. Participants in Dr. Nolan's study also are asked questions about diet, smoking and other lifestyle habits. The process takes about one hour. Interested volunteers can reach Dr. Nolan at 706-721-6382 or jnolan@mcg.edu.

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