



## Lutein & Zeaxanthin may Prevent Age-related Macular Degeneration

### OPPORTUNITY

Dietary components lutein and zeaxanthin may prevent age-related macular degeneration (AMD), a major cause of visual impairment and the foremost cause of irreversible blindness in the United States.

### BACKGROUND

Lutein and zeaxanthin are plant pigments that accumulate in the macula, the central region of the retina, of the eye. Known to be blue light filters and potent antioxidants, these nutrients occur naturally in foods such as spinach and kale. The macula contains lutein and zeaxanthin to the exclusion of more than 600 other carotenoids, where their concentration is 500-1000-fold higher than in other tissues.<sup>1-2</sup> Lutein and zeaxanthin may protect the macula against photo-oxidative damage by functioning as antioxidants and/or optical filters.<sup>3-4</sup> The first report of a relationship between dietary lutein, zeaxanthin and AMD risk came from the Eye Disease Case-Control Study Group, which reported that an increased dietary intake of lutein and zeaxanthin was associated with a decreased risk for AMD.<sup>5</sup> In a case-control study of macular pigment in donor eyes with and without AMD, there was an inverse association between risk of AMD and the amounts of lutein and zeaxanthin in the retina.<sup>6</sup>

### POTENTIAL BENEFIT

AMD, a progressive and degenerative disorder, is the leading cause of irreversible blindness among Caucasians over the age of 65 in the US. An estimated 1.75 million Americans have an advanced form of AMD.<sup>7</sup> As the U.S. population ages, this number is expected to increase to 3 million by 2020, and to 6.3 million by 2030.<sup>8</sup> An estimated 8 million Americans have early stage AMD, which is asymptomatic but detectable by an eye exam, and are at risk of progressing to advanced-stage AMD. It is extremely important to identify nutritional preventive solutions for this problem, since treatment options are limited once the disease is established.

In 2004, the total financial cost of AMD to the U.S. was \$575 million, with the cost expected to rise to \$845 million over the next 15 years.<sup>9</sup> Persons with AMD often require assistance with daily living, and an analysis showed that use of paid and unpaid help significantly increased as visual acuity decreased.<sup>10</sup> The most significant indirect cost of AMD is reflected in the loss of quality of life (QOL). Moderate AMD is associated with a 40 percent decrease in QOL; and very severe AMD is associated with a 63 percent decline in QOL, similar to that associated with advanced prostate cancer with uncontrollable pain, or a severe stroke.<sup>11</sup>

## LANDMARK STUDIES

The relation between dietary intake of lutein and prevention of AMD was published in 1994, and the results showed that individuals in the highest quintile, or top 20 percent, of fruit and vegetable intake, specifically those rich in lutein and zeaxanthin, had a 43 percent reduction in the risk of AMD relative to individuals in the lowest quintile of intake.<sup>12</sup>

## PUBLIC HEALTH AND EDUCATION APPLICATION

The public is still unaware of AMD when compared with other eye diseases and chronic diseases. If lutein/zeaxanthin prove to be effective preventive agents against AMD, educational campaigns to prevent this devastating eye disease will be undertaken by the National Eye Institute, the Lions Club of America, the Macular Degeneration Foundation, and the Association for Research and Vision in Ophthalmology.

## GAPS IN KNOWLEDGE AND FUTURE RESEARCH

Clinical trials are required to definitively establish a role for lutein in the prevention of AMD, as well as additional nutrients such as omega-3 fatty acids. The effect of human genetic variation, as well as factors involved in macular pigmentation such as lipoprotein status and body fat, should be thoroughly investigated.

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