ZeaVision EyePromise®
What Your Eyes Need Most

Science Summary

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AMD & Macular Pigments: (Zeaxanthin and Lutein)

AREDS 2 Study

(Chew, MD. et. al.)

- The AREDS 1 formula plus Lutein & Zeaxanthin vs. AREDS 1 & beta-carotene:
  - *18% reduction in the progression to advanced AMD*
  - *22% reduction in the risk of progression to neovascular AMD*

- AREDS formula along with Lutein + Zeaxanthin vs. AREDS formula with no Lutein + Zeaxanthin:
  - *10% additional reduction in the risk of progression to advanced AMD*
  - *11% reduction in the risk of progression to neovascular AMD*
  - *26% reduction to advanced AMD in the lowest quintile – the group with the lowest dietary intake of Lutein and Zeaxanthin, which is more representative of the general population*

Improvement of Retinal Function in Early Age-Related Macular Degeneration After Lutein and Zeaxanthin Supplementation: A Randomized, Double-Masked, Placebo-Controlled Trial

(Ma et. al. - American Journal of Ophthalmology, October 2012 Peking University Eye Center, Beijing, China)

- 108 subjects with early AMD supplemented with 10 mgs Lutein, 10 mgs Lutein & 10 mgs Zeaxanthin, 20 mgs Lutein, or placebo plus 36 age matched controls. (144 subjects)
- Pre and post supplementation multi-focal ERG was measured in 6 concentric annular zones around the macula
- Increased MPOD related positively to increases in N1P1 response density in ring 1 and ring 2 with little effect in ring 3 thru 6
- Improvement of N1P1 response densities was positively associated with MPOD increase, suggesting a causative effect of MPOD on retinal function and health
- Early functional abnormalities of the central retina in the early AMD patients may be improved by Lutein and Zeaxanthin supplementation
- The 10 mgs Lutein/10 mgs dietary Zeaxanthin arm had the greatest ERG documented retinal function increase in ring 1.

POLA Study: Plasma Lutein and Zeaxanthin and Other Carotenoids

(Delcourt, et. al. - Investigative Ophthalmology and Visual Science 2006)

- 899 subjects
- Subjects with high plasma levels of zeaxanthin had a 93% reduction in AMD
- Subjects with high plasma levels of lutein had a 79% reduction in AMD

Rotterdam Study: Reducing the Genetic Risk of AMD

(Lintje Ho, MD et. al - Archives of Ophthalmology 2011)

- 2,167 subjects
- Subjects with genetic AMD risk factors in the highest tertile of dietary zinc, ß-carotene, lutein/zeaxanthin, and EPA/DHA intake had a significant hazard ratio reduction for early AMD of approximately 40%

Serum Carotenoids and Risk of AMD

(Zhou, et. al. - Investigative Ophthalmology and Visual Science 2011)

- 263 Chinese subjects
- Serum levels of carotenoids and retinol were significantly lower in subjects with exudative AMD than in controls.
  - *Zeaxanthin (96% Relative Risk Reduction)*
  - *Lycopene (78% Relative Risk Reduction)*
- No significant associations between serum lutein and subjects with early or exudative AMD were observed

Blue Mountains Eye Study: Dietary Antioxidants and the Long-term Incidence of AMD

(Tan, et. al. - American Academy of Ophthalmology 2008)

- 2,454 subjects
- Higher dietary intake of zeaxanthin and lutein reduced risk of AMD by 65%
- Confirmed protective influence of zinc
- Higher beta-carotene was associated with increased risk of AMD

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AREDS Report 22: The Relationship of Dietary Carotenoid and Vitamin A, E and C Intake with AMD

(Emily Chew, M.D., et. al. - Archives of Ophthalmology 2007)

- 4,757 subjects
- Participants reporting highest intake of zeaxanthin & lutein less likely to have advanced AMD (NV & GA) or intermediate drusen

Gale Study: Lutein and Zeaxanthin Status and Risk of AMD

(Gale, et. al. - Ophthalmology and Visual Science 2003)

- 380 subjects
- Low levels of zeaxanthin in plasma correlated with significantly higher AMD risk
- Did not show similar effect for lutein
- Possible studies that combine zeaxanthin & lutein may obscure protective effect of zeaxanthin

Bone & Landrum: Macular Pigment In Donor Eyes

(Bone, et. al. - Investigative Ophthalmology and Visual Science 2001)

- 112 cadaver donors, 224 eyes
- Lutein and zeaxanthin levels in all three concentric regions of the retina were less, on average, for AMD donors than controls
- Donor eyes in the highest quartile of lutein and zeaxanthin per unit area had an 82% lower prevalence of AMD compared with those in the lowest quartile

Cataract & Lens: (Zeaxanthin and Lutein)

Women's Health Initiative Study

(Moeller, et. al. - Archives of Ophthalmology 2008)

- 1,802 female subjects
- Women with highest quantity of lutein and zeaxanthin had 32% lower incidence of nuclear cataract

POLA Study: Plasma Lutein and Zeaxanthin and Other Carotenoids

(Delcourt, et. al. - Investigative Ophthalmology and Visual Science 2006)

- 899 subjects
- Patients with high plasma levels of zeaxanthin had a 77% reduction of nuclear cataract occurrence

Blue Mountains Eye Study: Dietary Antioxidants and the Long-term Incidence of AMD

(Tan, et. al. - American Journal of Clinical Nutrition 2008)

- 2,454 elderly subjects
- Vitamin C and combined dietary antioxidants reduced nuclear cataracts 50%

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Zeaxanthin & Visual Performance Benefits:

Zeaxanthin and Visual Function (ZVF) Trial

(Richer, Stuart, et. al. - Journal of Optometry November 2011)

- 60 elderly subjects with early to moderate AMD
- Consumed 8 mgs of dietary zeaxanthin per day for 12 months
- Improved high contrast near visual acuity by 8.5 letters or 1.5 lines on an eye chart
- Achieved clearing of central scotomas
- Improved foveal shape discrimination
- Improved night driving skills

Macular Re-pigmentation Enhances Driving in Elderly Adults

(Richer, Stuart, et. al. - Clinical & Experimental Ophthalmology April 2012)

- 60 elderly subjects with early to moderate AMD
- Consumed 8 mgs of dietary zeaxanthin per day for 12 months
- Self-described improvement of driving skills were strongly associated with macular re-pigmentation
- The greatest effect was seen with zeaxanthin
- Older male drivers with AMD are encouraged to have their foveal macular pigment measured annually

The Influence of Dietary Lutein and Zeaxanthin on Visual Performance

(Stringham, Hammond, et. al. - Journal of Food Science 2009)

- Retinal increase of zeaxanthin and lutein reduced glare disability through improved photostress recovery times. Contrast sensitivity also improved
- Glare induced photostress recovery times can be reduced by 5 seconds by increasing macular pigment via supplementation. This equates to 440 ft. of improved reaction time at 60 MPH while driving at night

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Macular Pigment Optical Density (MPOD):

A New Desktop Instrument for Measuring Macular Pigment Optical Density

(Van Der Veen, et al. - Ophthalmology and Physiological Optics 2009)

- MPOD was measured with the QuantifEye device and the method demonstrated good repeatability with (r = 97) and the data are comparable with retinal reflectometry. (r = .78)

Desktop Macular Pigment Optical Density Measurement: A New approach based on Heterochromatic FlickerPhotometry

(Berendschot, et. al. - Eye 2011)

- We found low agreement between test and retest measurements with Macuscope
- We found high agreement between test and retest measurements of QuantifEye (0.02 ± 0.18) and the fundus reflectance method

The Value of Measurement of Macular Carotenoid Pigment Optical Densities and Distributions in Age-Related Macular Degeneration

(Bernstein, et. al. – Vision Research 50, 2010)

- The antioxidant and blue light filtering functions of lutein and zeaxanthin have an impact upon eye health beyond just decreasing the risk of age-related eye disease. Macular pigment has also been shown to influence visual function and comfort
- The panel concluded that it might be possible to identify individuals at reduced, medium, and elevated risk for age-related eye disease based on high, medium, and low central MPOD levels
- The panel members agreed that a central MPOD below 0.2 d.u. should be considered low, between 0.2 d.u. and 0.5 d.u. is mid-range, and levels above 0.5 d.u. as high
- Approximately 43% of the US population has a central MPOD below 0.2 d.u.
- Approximately 78% of the US population has a central MPOD below 0.5 d.u.