

Comments on Enrichment of Macular Pigment Enhances Contrast Sensitivity in Subjects Free of Retinal Disease: CREST - Report 1

We have read the excellent article by Nolan et al.,¹ "Enrichment of Macular Pigment Enhances Contrast Sensitivity in Subjects Free of Retinal Disease: Central Retinal Enrichment Supplementation Trials - Report 1." However, we are concerned about the distribution of the individual macular carotenoids, lutein (L), zeaxanthin (Z), and meso-(R,S)-zeaxanthin (MZ), in the retina, indicated qualitatively in Figure 1 of the article. In particular, L appears in the inset as an annular ring around the fovea. This is a misinterpretation of earlier graphical data, Figure 8 in Landrum and Bone² and Figure 6 in Bone et al.³ These data were obtained from HPLC analysis of carotenoids in annular rings of retinal tissue concentric with the fovea.⁴ Lutein and the combined Z stereoisomers were analyzed in 14 eyes in annuli covering radial distances 0 to 0.75, 0.75 to 1.6, 1.6 to

2.5, 2.5 to 5.8, 5.8 to 8.7, 8.7 to 12.2 mm, and in 12 eyes in a central disk of radius 0.25 mm. Zeaxanthin and MZ were analyzed in 97 eyes in three annuli, 0 to 3.0, 3.0 to 11.0, 11.0 to 21.0 mm. The fourth minor stereoisomer, 3S,3'S-Z, (SSZ) was analyzed in 37 eyes using the same three annuli. Because we used coarser annuli for the analysis of the Z stereoisomers, we applied simple interpolation and extrapolation to arrive at the average distributions shown in Figure 1. The plots have been reflected about a vertical axis to provide a representation of density profiles across the retina (assuming a circular symmetry exists in the carotenoid distributions), and the distances from the fovea have been converted to angular eccentricities. From the plots, it is clear that all four carotenoids peak in the center of the fovea with the order of decreasing dominance being Z, MZ, L and SZ. There is no evidence of an annular ring associated with L. These data clearly contradict the representation shown in Figure 1 of Nolan et al.¹

We await further results from the CREST trials with great interest.

Richard A. Bone¹
John T. Landrum²

¹Department of Physics, Florida International University, Miami, Florida, United States; and the ²Department of Chemistry and Biochemistry, Florida International University, Miami, Florida, United States.

E-mail: bone@fiu.edu

References

1. Nolan J, Power R, Stringham J, et al. Enrichment of macular pigment enhances contrast sensitivity in subjects free of retinal disease: Central Retinal Enrichment Supplementation Trials - Report 1. *Invest Ophthalmol Vis Sci.* 2016;57:3429-3439.
2. Landrum JT, Bone RA. Lutein, zeaxanthin, and the macular pigment. *Arch Biochem Biophys.* 2001;385:28-40.
3. Bone RA, Landrum JT, Friedes LM, et al. Distribution of lutein and zeaxanthin stereoisomers in the human retina. *Exp Eye Res.* 1997;64:211-218.
4. Bone RA, Landrum JT, Fernandez L, Tarsis SL. Analysis of the macular pigment by HPLC: Retinal Distribution and Age Study. *Invest Ophthalmol Vis Sci.* 1988;29:843-849.

Citation: *Invest Ophthalmol Vis Sci.* 2016;57:5415.
doi:10.1167/iavs.16-20295

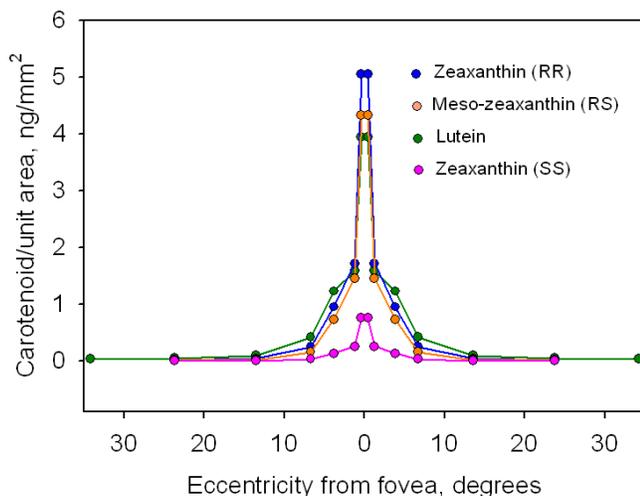


FIGURE 1. Distributions in the human retina of the individual carotenoids that constitute the macular pigment. The plots have been reflected about a vertical axis to provide symmetrical density profiles across the retina.