

Beneficial Effect of Zeaxanthin on Retinal Metabolic Abnormalities in Diabetic Rats

Renu A. Kowluru,¹ Bindu Menon,¹ and Dennis L. Gierhart

PURPOSE. Oxidative damage and growth factors are implicated in the pathogenesis of retinopathy in diabetes. Recent studies have shown that two dietary carotenoids, lutein and zeaxanthin (Zx), that are specifically concentrated within ocular tissues, may play important roles in maintaining their integrity. This study is to evaluate the potential protective effects of Zx against retinal oxidative damage and growth factors in diabetes.

METHODS. A group of rats received normal powdered diet or powdered diet supplemented with 0.02% or 0.1% Zx soon after induction of diabetes. Age-matched normal rats served as control subjects. At 2 months of diabetes, oxidative stress, vascular endothelial cell growth factor (VEGF), and intercellular adhesion molecule (ICAM)-1 were quantified in the retina.

RESULTS. Zx supplementation prevented diabetes-induced increase in retinal damage, and increases in VEGF and ICAM-1. The levels of lipid peroxide, oxidatively modified DNA, electron transport complex III, nitrotyrosine, and mitochondrial superoxide dismutase were similar in the retinas of Zx-treated diabetic rats and normal control rats, and these values were significantly different from those obtained from diabetic rats without any supplementation. In the same rats, Zx also prevented diabetes-induced increases in retinal VEGF and ICAM-1. Both 0.02% and 0.1% Zx had similar effects on diabetes-induced retinal abnormalities, and these effects were achieved without ameliorating the severity of hyperglycemia. However, Zx administration failed to prevent a diabetes-induced decrease in retinal GSH levels.

CONCLUSIONS. Zx significantly inhibits diabetes-induced retinal oxidative damage and elevation in VEGF and adhesion molecule, all abnormalities that are associated with the pathogenesis of diabetic retinopathy. The results suggest that Zx supplementation has the potential to inhibit the development of retinopathy in diabetic patients. (*Invest*

*Ophthalmol Vis Sci.*2008;49:1645–1651) DOI:10.1167/iovs.07-0764