

Color Matching in Diabetes: Optical Density of the Crystalline Lens and Macular Pigments

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PURPOSE: To measure the optical density of the crystalline lens and macular pigments in a group of patients with diabetes mellitus and compare the results with those in a group of control subjects.

METHODS: Color matches were performed using a Wright tristimulus colorimeter. The reference wavelength used was 490 nm, desaturated with 650 nm. Lens optical density was measured by mixing spectral primaries of wavelengths 420, 515, and 650 nm to match the reference. Wavelengths 420 and 515 nm were chosen, because they are absorbed equally by the macular pigment. To measure macular pigment density, two color matches were performed, one foveal and one 5° extrafoveal. The reference stimulus was matched by mixing spectral primaries of 460, 530, and 650 nm. The ratio of the foveal to extrafoveal color match gives the optical density of the macular pigment. Thirty-four diabetic patients and 34 control subjects performed the lens density color match, and of these, 26 diabetic patients and 30 control subjects performed the macular pigment density color matches.

RESULTS: There is a significant increase in the optical density of the lens in diabetes with age in comparison to the control subjects ($P < 0.001$), with a duration dependence of 0.02 log units/year. The mean macular pigment density in the diabetic patients was 0.13 ± 0.20 log units and in the control subjects 0.32 ± 0.24 log units ($P = 0.0015$). Patients with grade 2 maculopathy had significantly lower pigment density than those with no maculopathy ($P = 0.016$).

CONCLUSIONS:

- The ocular media and macular pigment density of diabetic persons are abnormal.
- There is a significant increase in the optical density of the lens in diabetes with age in comparison to control subjects.
- There is reduced macular pigment optical density in diabetes with age in comparison to control subjects.
- Patients with grade 2 maculopathy had significantly lower pigment density than those with no maculopathy.
- The relationship between reduced macular pigment levels with increasing severity of maculopathy may implicate oxidative stress as a causative factor.