

20. RETINAL FLAVOPROTEIN AUTOFLUORESCENCE AS A MEASURE OF RETINAL HEALTH

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Purpose: To establish that increased retinal autofluorescence of mitochondrial flavoproteins, an indicator of mitochondrial oxidative stress, correlates with early retinal cell dysfunction.

Methods: Retinal flavoprotein autofluorescence (FA) was imaged in patients with a fundus camera modified with 467DF8 nm excitation and 535 nm emission filters and a back-illuminated, electron-multiplying, charge-coupled device (EMCCD) camera interfaced with a computer containing customized image analysis software. Multiple digital images, centered on the fovea, were obtained from each eye. Histograms of pixel intensities were analyzed for average intensity (AI) and average curve width (ACW). Adults with diabetes mellitus, age-related macular degeneration (ARMD), central serous retinopathy (CSR), and retinal dystrophies, as well as healthy controls were imaged. Monolayers of cultured normal retinal pigment epithelial (RPE) cells, RPE cells exposed to sublethal concentrations of H₂O₂, and RPE cells exposed to H₂O₂ in the presence of anti-oxidants were imaged for FA using fluorescent photomicroscopy.

Results: Controls demonstrated low levels of retinal FA which increased progressively with age ($p < .05$). Diabetics without visible retinopathy demonstrated increased FA compared to controls ($p < .001$). Diabetics with retinopathy demonstrated significantly higher FA than those without retinopathy ($p < .01$). Patients with ARMD, CSR, or retinal dystrophies also demonstrated significantly increased FA. Compared to control RPE cells, cells oxidatively stressed with H₂O₂ had significantly elevated FA ($p < .05$) that was prevented by anti-oxidants ($p < .05$).

Conclusion: Retinal FA is significantly increased with age and diseases known to be mediated by oxidative stress. Retinal FA imaging may provide a novel, non-invasive method of assessing retinal health and retinal dysfunction prior to retinal cell death.

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