Oxidative Stress Causes the Retina to Degenerate

Photoreceptors are vulnerable to oxidants produced from smoking, exposure to intense lights, and the aging process. This study shows how prolonged, bright light alters the metabolic function of photoreceptors. We explore metabolic function by measuring changes in metabolite content. We hope these analyses will reveal (a) the mechanisms by which photoreceptors die, and (b) potential strategies to target photoreceptor survival.

Oxidative Stress Induces Diverse Morphological Changes in Photoreceptors

Electron microscopy of albino BALB/c mouse retina exposed to 24-hour light damage, sacrificed immediately. Top figure shows mosaic of EM of nearly 500 tiles. Arrows pointing up, down, and left are photoreceptors that have condensed chromatin, formed vacuoles, and normal photoreceptor respectively. The outlined box is enlarged in the figure below. One can see various levels of morphological damage. Müller glia cells (M) are becoming hypertrophic in areas of cell loss.

Stressed Photoreceptors Display dynamic Levels of Metabolites

Taurine (red) and Glutamine (green) Glutamate (blue) composite overlaid on electron microscopy. RGB has an opacity of 50%. Arrows pointing up signify cells that are absent of taurine and glutamate. Arrows pointing down signify absence of taurine and elevated glutamate. Arrows pointing left signify cells that are normal photoreceptor signatures.

Metabolic Signatures Correlate with Distinct Photoreceptor Stress Levels. Refined Theme Map Overlay

Presumed Phenotypes

Normal

Dying Class 2

Stressed Class 2

Stressed Class 1

Dying Class 1

Conclusions:

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