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Understanding photoreceptors

Although the human eye contains several types of tissue, perhaps the most crucial for producing clear images is the retina. The retina is essentially a piece of brain tissue that projects through the back of the eye to receive input from the outside world – in the form of photons. Processing of the photons detected by retinal photoreceptors gives rise to our perception of images and movement.

Over the past 20 years, Andrew Goldberg has received funding and fellowships from the National Science Foundation, the Grass Foundation and National Eye Institute to study the functions of the retina. His laboratory studies the elaborate cellular architecture of retinal photoreceptors — the rods and cones — to understand their fundamental biology, and the cellular and molecular underpinnings for several forms of clinically significant inherited and acquired eye diseases.

The molecular pathologies involved in the great majority of inherited retinal degenerations remain largely unknown despite identification of the genes involved. The laboratory's efforts are focused on understanding disease at the molecular level by studying affected protein structure and function. Ongoing studies address mechanisms of photoreceptor outer segment renewal and stability and may reflect more general principles that guide membranous organelle morphogenesis in eukaryotic cells.

Goldberg's researchers apply a variety of biochemical, biophysical and molecular genetic techniques to the macromolecule/organelle interface of vertebrate photoreceptors to address current questions in cell biology and the molecular pathology of inherited retinal dystrophies.

Goldberg's professional affiliations include the American Society for Biochemistry and Cell Biology, American Society for the Advancement of Science, and the Association for Research in Vision and Ophthalmology.

Representative Recent Publications

1. Goldberg AFX, Ritter LM, Khattree N, Peachey NS, Fariss RN, Dang L, Yu M, Bottrell AR. 2007. An intramembrane glutamic acid governs peripherin/rds function for photoreceptor disk morphogenesis. *Invest Ophthalmol Vis Sci* 48:2975-2986.

2. Goldberg AFX. 2006. Role of peripherin/rds in vertebrate photoreceptor architecture and inherited retinal degenerations. *Int Rev Cytol* 253:131-175.

3. Stanton JB, Goldberg AFX, Hoppe G, Marmorstein LY, Marmorstein AD. 2006. Hydrodynamic properties of porcine bestrophin-1 in Triton X-100. *Biochim Biophys Acta* 1758:241-247.

4. Ritter LM, Arakawa T, Goldberg AFX. 2005. Predicted and measured disorder in peripherin/rds, a retinal tetraspanin. *Protein and Peptide Letters* 12:677-686.

5. Ding XQ, Nour M, Ritter LM, Goldberg AFX, Fliesler SH, Naash MI. 2004. The R172W mutation in peripherin/rds causes a cone-rod dystrophy in transgenic mice. *Hum Mol Genet* 13:2075-2087.

6. Ritter LM, Boesze-Battaglia K, Tam BM, Moritz OL, Khattree N, Chen SC, Goldberg AFX. 2004. Uncoupling of photoreceptor peripherin/rds fusogenic activity from biosynthesis, subunit assembly, and targeting: A potential mechanism for pathogenic effects. *J Biol Chem* 279:39958-39967.