

Andrea S. Viczian, Ph.D.

Why Retinal Cells Develop

Researchers still don't know what causes some cells of the developing central nervous system to become cells of the eye, others to become cells of the ear, and still others to become brain cells. But Dr. Andrea Viczian is finding out.

Dr. Viczian's research focuses on the retina. She is discovering what molecules and mechanisms cause embryonic cells to become one of seven types of retinal cells—how and why some become rod cells while others become cone cells, for example. Organized into layers in the back of the eye, these seven cell types allow us to see objects and distinguish colors. Dr. Viczian has shown that two retinal proteins, called Otx2 and Otx5b, act together to regulate the differentiation of cells into rods and cones.

By learning what factors control the fate and development of these cells, Dr. Viczian will offer new insight into ways to regenerate damaged retinal cells in patients with blinding diseases.

Like her colleagues at CVR, Dr. Viczian uses the frog as a model to study retinal

development. The frog is particularly well suited for her work because the frog retina develops from a fertilized egg in

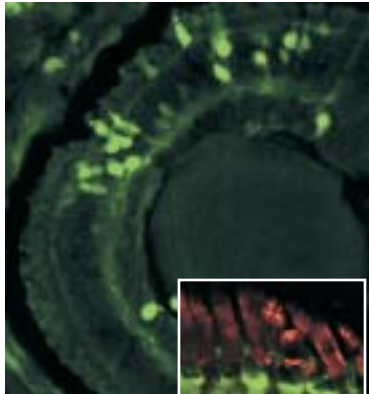
only three days, compared to many weeks for a mouse retina.

Dr. Viczian collaborates with Drs. Knox and Zuber of CVR, as well as scientists at the University of Cambridge, U.K., and the University of California at Los Angeles.

In addition to retinal proteins, Dr. Viczian is identifying factors that control the expression of retinal

genes. For example, she has identified and described a small fragment of human DNA that directs reporter gene expression to cone photoreceptors in the retina of the frog. (A reporter gene has an easily observed phenotype.) That DNA from a human can control how genes express themselves in the retinal cells in a frog suggests that the same system operates in humans and animals, and that this system has existed for millions of years.

For the future, Dr. Viczian plans to identify proteins that regulate differentiation of cells into retinal cells other than rods and cones. This information may reveal a new mechanism that specifies the fate of developing retinal cells.



Retinal cells (green) can be identified by their distinct morphology and location within a retinal section.

(Inset) Frog cone (green) and rod (red) photoreceptor cells.



The eye of a young tadpole expresses a green fluorescent "reporter" gene using a segment of human DNA inserted into the frog genome. The green fluorescence proves that the human DNA has "instructed" the frog's eye to express the reporter gene.

"I hope my research will provide new insights on how a damaged retina might be repaired or replaced as a treatment for patients suffering from blinding diseases or retinal injury."

Dr. Viczian's research is published in *Development*, *Genomics*, *Gene*, and *Experimental Eye Research* scientific journals. She has co-authored chapters in two textbooks and received a National Eye Institute's National Research Service Award, Marshall-Sherfield Postdoctoral Fellowship, and Jules Stein Eye Institute Vision Science Fellow Laboratory Research Award at UCLA. She holds or has held memberships in the Society for Neuroscience, Association for Research in Vision and Ophthalmology, and Sigma Xi, The Scientific Research Society.

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