Chemistry and Biology Join Forces to Fight Eye Diseases

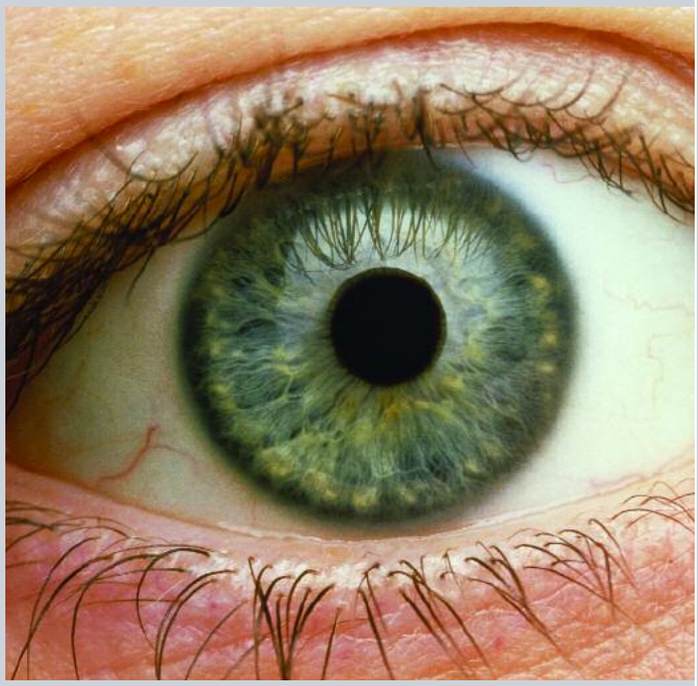
ROBERT G. SALOMON + BELA ANAND-APTE + SANJOY BHATTACHARYA + JOHN W. CRABB + STANLEY L. HAZEN + JOE HOLLYFIELD + VICTOR PEREZ

While oxygen is essential for human life, it also contributes to many disease processes because the building blocks of tissues, organic molecules such as lipids and proteins, are easily damaged by oxygen. **Robert G. Salomon, Ph.D.**, professor of chemistry at the Case College of Arts and Sciences, has been studying the oxidation of lipids for more than three decades. He discovered that many of the products of lipid oxidation are toxins that stick to proteins like glue, interfering with their essential biological functions. To develop new methods for the early detection, prevention, and cure of eye diseases, Dr. Salomon has been assembling an interdisciplinary team that brings together chemistry and biology.

Using the logic of chemistry, Dr. Salomon identified and developed methods for detecting many different lipid-based protein modifications and has devised ways to prepare specific individual oxidized lipids by chemical synthesis to allow studies of their biologically important chemistry and activities. His analytical methods are being applied with Cleveland Clinic researchers **Bela Anand-Apte, M.B.B.S., Ph.D., Sanjoy Bhattacharya, Ph.D., John W. Crabb, Ph.D., Stanley L. Hazen, M.D., Ph.D., Joe Hollyfield, Ph.D.,** and **Victor Perez, M.D.,** to understand the role of lipid oxidation in the progression of eye diseases such as age-related macular degeneration and glaucoma.

Together with Dr. Hazen, Dr. Salomon identified oxidized lipids produced in the eye that induce neighboring cells to "eat" the light-detecting photoreceptor cells of the retina. With Drs. Crabb and Hollyfield, Dr. Salomon showed that some lipid-derived protein modifications, called CEPs, are especially abundant in retinas from victims of age-related macular degeneration. Subsequently, Drs. Anand-Apte and Crabb found that CEPs stimulate the growth of capillaries into the retina—such "neovascularization" is the leading cause of irreversible vision loss of elderly individuals in the western hemisphere.

Drs. Bhattacharya and Crabb found that a type of oxidized lipid, which Dr. Salomon discovered and named isoLGs, modifies proteins in a tissue called the trebecular meshwork (TM). IsoLG-modified TM proteins are especially abundant in the eyes of individuals with glaucoma. Besides avidly binding with proteins, isoLGs cause protein-protein cross linking that may block the flow of fluids from the eye through the TM resulting in the increased pressure in the eye that is associated with glaucoma. The commercial development of these analytical methods by Case and the Cleveland Clinic, as well as their application to finding new therapies, are primary goals of a Biomedical Research Technology Transfer grant recently awarded by the state of Ohio.



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http://www.case.edu/artsci/chem/faculty/salomon/
http://www.clevelandclinic.org/eye/research/