

Hypoxia in Retinal Disease

Robert A. Linsenmeier

Departments of Biomedical Engineering, Neurobiology, and Ophthalmology

Northwestern University

Evanston, IL USA

Retinal hypoxia is a major factor in the pathophysiology of several conditions: among them, retinal arterial and venous occlusions, retinal detachment, retinopathy of prematurity, and proliferative diabetic retinopathy. It has been more difficult to determine the extent to which hypoxia plays a role in background diabetic retinopathy, diabetic macular edema (DME), and age-related macular degeneration (AMD). There is some evidence that hypoxia is involved in these disease states as well, but much of it is indirect. A problem with attributing the major dysfunction to hypoxia in AMD and DME is that the choroid has a very high blood flow rate, and is commonly thought to have a large functional reserve capacity. How could hypoxia be an important issue in AMD and DME if the choroid is so well perfused? One objective of this presentation will be to re-examine PO_2 and flow in the choroid in an attempt to answer this question. The second objective is to highlight the complexity of the hypoxic state whenever it occurs. Even the simplest case of hypoxia, that is, decreasing PO_2 in the inspired gas, may produce retinal changes that do not relate directly to lack of oxygen, but to compensatory changes such as acidosis and glial activation that may have beneficial aspects, but may also be detrimental.