Oxidative Stress in Applied Basic Research and Clinical Practice

Editor-in-Chief
Donald Armstrong

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Note from the Editor-in-Chief

All books in this series illustrate point-of-care testing and critically evaluate the potential of antioxidant supplementation in various medical disorders associated with oxidative stress. Future volumes will be updated as warranted by emerging new technology, or from studies reporting clinical trials.

Donald Armstrong
Editor-in-Chief
Preface

The current state of understanding the roles that oxidative and nitrosative/nitrative stress play in cellular metabolism of the retina as well as in diseases of the retina is the subject of this volume. The extreme complexity of the physiology of the retina in health and in disease has not yet been fully determined, but analysis of this complicated system has been accelerating. More mature is the analysis of the retinal physiology in the healthy retina due mainly to the physiologic similarity between humans and other animals. It is much easier and vastly less expensive to study in vitro systems and animal models than to study human subjects. To answer one prospective question to a desired degree of certainty in human disease treatment requires tens of millions of dollars and years of follow up. As a result, in vitro and animal model studies have advanced rapidly in the academic realm, while human studies lag behind, and are funded more and more by private enterprise whose principal aim is justifiably to secure government approval for a potential therapy. Because of this disparity between basic science and clinical research, there is necessarily an emphasis on basic science, but relevant clinical research is included.

The book begins with three chapters that review the etiologies of AMD, look at the direction of new treatment strategies, review the complement system in AMD, and explain oxidative stress in the pathology of AMD. Detailed explanations of oxygen stress in the lipid metabolism of the retina are given in Chaps. 4–8. Chapter 9 shows the relationship between the antioxidant system of glutathione and α-crystallins that explains the anti-apoptotic activity of the latter. The roles of the mitochondria and the endoplasmic reticulum in oxidative stress and retinal dysfunction are discussed in Chaps. 10 and 11.

The role of iron in retinal disease, the mechanisms of pathological VEGF expression, and the role of NAPDH oxidase are the subjects of Chaps. 12–14. Chapters 15–18 discuss the role of oxidative stress in oxidized lipoproteins, hepatocyte growth factor, the Ccl2−/−/Cx3cr1−/− mouse model of AMD, and the systemic changes in AMD. Cerium oxide nanoparticle reduction of oxidative stress in the retina is the topic of Chap. 19.
Chapters 20 and 25 discuss the role of progenitor cells in the cause and treatment of retinal disease including AMD and diabetes. An exhaustive look at natural compounds used in the prevention and treatment of retinal disease is given in Chap. 21. Chapter 22 discusses serotonin 5-HT$_{1A}$ receptor agonists in oxidative stress and retinal disease. Anti-VEGF treatment strategies for neovascular AMD are examined in Chaps. 23 and 24.

Nitric oxide and inducible nitric oxide synthase in retinal vascular disease are explored in Chap. 26. The effect of lipid hydroperoxide on circulating leukocytes was evaluated by an in vivo technique of acridine orange digital fluorography in Chap. 27. The role of oxidative stress in retinopathy of prematurity is discussed in Chap. 28. VEGF inhibitor-induced oxidative stress in retinal ganglion cells is examined in Chap. 29. With Chaps. 30 and 31, the book ends with a careful look at the role of carotenoids in retinal health and disease.

We thank our authors for their efforts to make this book a timely and thorough review of the advances in understanding the role of oxidative stress in health and disease of the retina. We are sure that readers will gain a better understanding of the pathophysiology and potential treatments of vascular and degenerative diseases of the retina, and hope readers will agree that the future looks bright with effective new treatments and new areas for exploration.

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