

## Book Reviews

**UNDERSTANDING THE PROCESS OF  
AGING – THE ROLES OF MITOCHONDRIA,  
FREE RADICALS, AND ANTIOXIDANTS**  
EDS. ENRIQUE CADENAS AND  
LESTER PACKER  
MARCEL DEKKER INC., NEW YORK,  
366 PP., ILL., 1999

Since the beginning of the century, developed countries have experienced a dramatic increase in human lifespan, with a consequent growth of the elderly population and of the prevalence of several age-related diseases. This has led to the need for a systematic review of existing data regarding potential mechanisms underlying aging and longevity. The volume *Understanding the Process of Aging – The Roles of Mitochondria, Free Radicals, and Antioxidants* falls into this area.

The free radical theory of aging was formulated in 1956, when Denham Harman hypothesized that the aging process was a result of cumulative damage to the organism during free radical reactions. In the introduction and preface of the book, the editors note the substantial stability of the original theory over more than four decades, which has indeed gained raising scientific support from a large body of research including antioxidant supplementation trials, epidemiologic, and cell signaling/gene expression studies.

Through 17 chapters written by world experts on free radical biochemistry, the volume provides a thoughtful overview of studies carried out on the role of mitochondria and oxidative stress during senescence.

The first part of the book focuses on the importance of mitochondria as sources of oxygen radicals in aerobic organisms and on oxygen radical scavenging mechanisms. This initial section also contains an intriguing chapter regarding possible interactions and known relationships between mitochondria and nitrogen-derived radicals. This chapter opens the way to another chapter describing the effects of nitric oxide and oxygen concentration on mitochondrial respiration, on superoxide generation by neutrophils, on apoptosis and on smooth muscle relaxation.

The mechanisms by which the physiological production and scavenging of oxygen radicals during metabolic reactions might become pathological and harmful during senescence are mentioned throughout the text, but the description of mitochondrial damage during aging is especially detailed in the second part of the volume, where also age-associated changes and functions of some enzymatic and non-enzymatic antioxidants are reported. This part includes a stimulating series of studies on apoptosis, on damaging effects of iron accumulation in age-related neurological disorders and in ischemia-reperfusion injury, on

lipofuscinogenesis, on mitochondrial DNA alterations and on mitochondriopathies.

Overall, *Understanding the Process of Aging – The Roles of Mitochondria, Free Radicals, and Anti-oxidants* has many carefully presented chapters that provide important information not available in this form elsewhere. This volume belongs on the shelf of oxidative stress *cognoscenti* and biochemists as well as of biogerontologists.

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#### ANTIOXIDANT FOOD SUPPLEMENTS IN HUMAN HEALTH

EDS. L. PACKER, M. HIRAMATSU  
 AND T. YOSHIKAWA

ACADEMIC PRESS, SAN DIEGO, 1999

This book is devoted to a consideration of natural antioxidants and is loosely based on a symposium "Antioxidant Food Supplements in Human Health" held in Japan in October 1997. The first impressive thing about the book is its attractive cover, showing *Ginkgo biloba* leaves and the French maritime pine tree, the source of pycnogenol. The second is the high quality of many of the contributions. In order of appearance, the Chapters I particularly enjoyed were those on vitamin E and lung cancer prevention, antioxidants protective against damage by cigarette smoke, selenium-containing enzymes in the testis, reaction of ubiquinol with nitric oxide, the effect of carotenoids on intercellular communication, carotenoids as chemoprotective agents against cancer, the metabolism of dietary flavonoids, the flavonoid composition of foods, bioabsorption of phenolics, the history and nomenclature of pine, the uses of *Ginkgo biloba*, antioxidants in herbs and tea and cardiovascular disease. Other chapters, although well-written, I found too repetitive of previously-published

material (e.g. those on vitamin E), irrelevant to the stated purpose of the book (e.g. reactive oxygen species and tyrosine phosphorylation) or unconvincing as to the effects claimed.

Overall, this is a very useful book. I am pleased to own it and will consult it often.

Barry Halliwell  
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#### FREE RADICALS IN BIOLOGY AND MEDICINE (THIRD EDITION, 1999)

BARRY HALLIWELL AND  
 JOHN M.C. GUTTERIDGE  
 OXFORD UNIVERSITY PRESS

When I heard that the new third edition of the previously acclaimed Halliwell and Gutteridge was on the way, I hoped that the authors would have incorporated all the new elements and foci that have emanated from the fast-moving developments in this field over the years since the second edition was published, including reactive nitrogen species and peroxynitrite, biomarkers of oxidative and nitrative stress, apoptosis, caspases, cell and molecular biological implications and oxidative stress in neurodegenerative diseases.

This new tome has exceeded all my expectations. Much of the volume is new and the areas remaining are up-dated in accordance with the advances made over the last 10 years. One of the best features is the provocative style of questions as section headings, making it un-put-downable until one has read through the answer to the question that has caught one's eye: Why should the brain be prone to oxidative stress? Does exercise cause oxidative damage? Are ROS/RNS important signal molecules *in vivo*? How can RNS/ROS contribute to toxicity? Is ascorbate an antioxidant *in vivo*? Why does H<sub>2</sub>O<sub>2</sub> lead to DNA damage? Which iron chelates stimulate lipid peroxidation? What problems does the eye

face? What roles are played by ROS/RNS in atherosclerosis? How important is oxidative stress in diabetes? Does antioxidant protection fail with age? Does not oxidative damage increase with age?

There are extensive new chapters on *Anti-oxidant defences*, and *Oxidative stress and anti-oxidant protection: some special cases* and *Ageing, nutrition, disease and therapy: a role for antioxidants?* Especially timely sections include ergothioneine, thioredoxin and glutathione, peroxidases and glutathione peroxidase mimics, anti-inflammatory drugs as antioxidants, plant phenols such as flavonoids, carotenoids, ascorbate, the tocopherols, lessons from epidemiology and problems of interpretation, protection in erythrocytes, the eye, in reproductive processes, in the skin, in relation to exercise.

The stimulating chapter on *Free radicals, other reactive species and implications in disease* contains a new and particularly well-presented section on oxidative stress and disorders of the nervous system. This starts with general basic principles, traumatic injury, developing through to the role of oxidative stress in Parkinson's disease, Alzheimer's disease, amyotrophic lateral sclerosis, and current approaches to treatment. Thoroughly updated and extended sections focus on atherosclerosis, reviewing the roles of ROS, RNS, LDL oxidation, protection by antioxidants, HDL, lipoprotein a, Diabetes – glycation and glycooxidation, Ischaemia – reperfusion with myocardial stunning, adaptation to hypoxia, ischaemic preconditioning, kidney damage, liver storage for transplantation, intestinal components and chronic inflammatory diseases, cancer and chemotherapy.

The chapter on the *Determination of free radicals and other reactive species, trapping and fingerprinting* extends and considerably develops the previous format of presentation with fingerprinting methods for oxidative DNA damage, lipid peroxidation and protein damage by ROS and RNS. The accompanying critical assessments of methodologies, approaches to *in vivo* measurements and the warnings of procedure and interpretation

of findings are added bonuses. The chapter on *Reactive species as useful biomolecules* is much extended and comprehensively presented, the section on peroxidase enzymes being particularly informative. The *Oxidative stress: adaptation, damage, repair and death* chapter not only builds on and extends that in the previous volume concerning changes in cell behaviour and mechanisms of cell injury, but also introduces the concepts of oxidative stress in relation to repair, adaptation/redox regulation, stress-induced proteins, chaperones, haem oxygenase, cytokines, apoptosis, necrosis, caspases etc.

The authors have maintained their readable format, referenced major statements (a welcome modification to the previous volumes) and included the titles within the reference citations.

*Free Radicals in Biology and Medicine* (previous editions published in 1985 and 1989 respectively) has always been compulsive reading for all in this area of research whether undergraduate, post-graduate undertaking a PhD programme, clinician, or scientist and a very popular text for teachers and students alike. It has provided an excellent overview of the vast arena of ideas and principles underlying the background to this interdisciplinary field, as well as specifically exploring selected areas of clinical, biochemical, chemical, nutritional and pharmaceutical relevance. The new volume not only continues this tradition, it is also a superb triumph of a textbook from two eminent leaders in the field and a must for the pocket of both novices in the research area and the knowledgeable. This book is ideal for anyone wanting to come to grips with the diverse area of free radical research and its relevance to biology and human disease, or for experts to bring themselves up to date with the areas that they do not normally focus on.

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