

Book Review

Handbook of Oxidants and Antioxidants in Exercise, edited by Chandan K. Sen, Lester Packer, and Osmo Hänninen. Elsevier Science B.V., Amsterdam, First edition 2000, Hardbound (ISBN: 0-444-82650-5, Price: 294.96 €; 330.—US\$)

THIS BOOK is a considerably extended new edition of *Exercise and Oxygen Toxicity*, which was first published in 1994 by the same editors. During the course of the past decade, interest in the relations between oxidative stress and strenuous exercise has grown enormously. This fact prompted the editors to enlarge their volume to a handbook that is now over twice the size (1,218 pages).

It has been suggested from numerous studies with human subjects and with laboratory animals that strenuous physical activity causes oxidative stress, in particular when the exercise is exhaustive. Plasma parameters indicating lipid peroxidation or other oxidative modifications *in vivo* were described to be immediately elevated, returning to normal after a recovery period. Prolonged training counteracts the exercise-induced oxidative stress by several mechanisms up-regulating a number of antioxidative systems of the organism. The latter effect may pinpoint a beneficial effect of continuous physical activity for preserving health. However, strenuous exercise proves to be a double-edged sword, because it may produce detrimental effects on the subjects. Whereas in trained subjects continuous exercise protects against reactions of oxidative stress, in predominantly sedentary subjects occasional strenuous exercise causes signs of oxidative stress that may be hazardous to health. For this reason, a deeper insight into the relations between exercise and oxidative stress in man is important for the practicing physician to identify the adequate balance of including physical activities in preventive and therapeutic measures. Of course, this topic is also of special interest for sports medicine and training methodology. Here, one basic issue is whether intervention in oxidative stress-related free radical reactions (*e.g.*, by supplementation of dietary antioxidants) would enhance performance and duration of muscular activity, which is however apparently not the case. Food science is another discipline confronted with this topic.

The handbook comprises 40 chapters arranged in 11 parts dealing with different aspects of this multidisciplinary field. The introductory chapter is devoted to the chemistry of free radicals, the complexity of which is probably not easy to understand for biologists and physicians. The second part describes the formation and actions of free radicals produced at the tissue level (muscle and vasculature) under the conditions

of strenuous exercise. The next two parts, as well as part VI, deal with the mode of actions of the prooxidant and antioxidant systems of the organism and their modulation by exercise. Part V contains some nutritional aspects. It deals mainly with vitamin E and carotenoids, whereas nonessential dietary antioxidants such as flavonoids and other polyphenols are only marginally treated. The analytical methods to recognize oxidative stress reactions are reviewed in part VII. In many published studies, the assay on thiobarbituric acid-reactive substances (TBARS) was used, the limitations and disadvantages of which are emphasized by several authors in this handbook. Unfortunately, one of the more recent approaches to assess lipid peroxidation—the determination of isoprostanes in plasma and urine—is only marginally mentioned and not even listed in the subject index. Part VIII is devoted to the interactions of important environmental factors such as ozone, nitrogen dioxide, and ultraviolet light, as well as high-altitude conditions. The last three parts consisting of one half of all chapters deal with medical aspects (skeletal muscle and heart functions, central nervous system, aging, diseases). In particular, the last part devoted to diseases of high incidence with a significant component of damage by oxidative stress (cancer, atherosclerosis, diabetes mellitus, chronic obstructive pulmonary disease, claudication and rheumatoid arthritis, as well as the effects of alcohol abuse, cigarette smoking, and drug metabolism) provides valuable information to the physician whether it is wise to include controlled physical activity in a therapy program.

To our knowledge, this handbook is the only comprehensive treatment of this topic. Owing to its multidisciplinary orientation, it is a useful source of information for a wide circle of readers. After having read some chapters of this book, it becomes clear that despite numerous careful experimental and clinical studies conducted, this field is still in its infancy; many important issues are far from clear yet. One of these is whether and how oxidative stress is substantially linked to exercise; current methods are still ambiguous. These aspects may challenge researchers to intensify their efforts. A problem is also the rapidly growing literature on this topic. The reference list of some chapters ends already in 1997 or even earlier. It appears obvious, therefore, that a further new edition is likely to appear in the near future.

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