

BOOK REVIEWS

Monograph on Free Radical Reactions

(Environmental Health Perspectives, vol. 64, December 1985).

This useful monograph largely consists of a series of articles, in most cases by scientists expert in the field, devoted to reviewing the recent literature on the free radicals that can be generated from a wide range of drugs, carcinogens, and toxins generally, including cigarettes. Compounds considered include adriamycin, bleomycin, aminofluorene, aminopyrene, halogenated hydrocarbons (CCl₄, CHCl₃, halothane), 3-methylindole, benz(a)pyrene, chlorpromazine, sulphite, paracetamol, benzidine, metronidazole, hydrazines and catecholamines. There is a welcome emphasis on chemistry — the detection of radicals by such techniques as spin trapping, and the chemical mechanisms of their formation, are given detailed attention. However, several of the authors made considerably less effort to answer the difficult question “have the radicals that can be formed anything to do with the biological activity of the compound under study?”

The monograph also contains chapters on the generation of radicals by sonication of aqueous solutions, on the role of a tyrosyl radical in ribonucleoside diphosphate reductase and on the esr detection of oxygen radicals produced by activated neutrophils or macrophages.

Some of the articles in the monograph closely resemble other review articles recently published elsewhere (e.g. those on halogenated hydrocarbons and cigarette smoke), but there is enough novel material to make this monograph a welcome addition to the free radical literature. I am pleased to have it on my bookshelf.

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Free Radicals, Aging, and Degenerative Diseases

Modern Aging Research, Vol. 8, Eds. J.E. Johnson, Jr., R. Walford, D. Harman and J. Miquel, (Alan R. Liss, Inc., New York, 1986) 588 Pages. £93.00 p.

This is Volume 8 in the series *Modern Aging Research* and deals with the role of free radicals in aging and degenerative diseases. The book has four sections. The first covers *Theoretical Concepts*. It includes a masterful exposition of the free radical theory of aging by Denham Harman, who also develops the concept of free radical diseases. His argument is particularly convincing for atherosclerosis. Additionally, Jaime Miquel and James Fleming discuss novel implications of the concept of free

radical damage in relation to senescent impairment of the mitochondrial genome. It will be recalled that Denham Harman first proposed the free radical theory of aging in 1955. Like the free radical theory of aging in 1955. Like the free radical theory of oxygen toxicity of Rebeca Gershman, it was an inspired spin-off from radiation chemistry and biology. Since then there has been a veritable revolution in free radical biology, particularly in recent years, and the authoritative reviews of this section are highly topical and welcome.

The second section deals predictably with *Free Radical Processes* and is virtually a short monograph in itself on free radicals in biology. It discusses oxygen radical production in mitochondria (in relation to aging); oxygen radical production and damaging mechanisms in biological systems; lipid peroxidation in biological membranes (with much physicochemical insight); radiation-induced aging; and nutritional factors and influences in aging phenomena.

The third section is concerned with *Relationships To Diseases*. It considers the potential of superoxide dismutase in the treatment of free radical diseases, and also deals in detail with Batten's disease (ceroid-lipofuscinosis); autoimmune diseases; carcinogenesis; and sickle cell disease. The thrust of the arguments here is the involvement of free radicals in these (degenerative) conditions, and practical consequences for therapeutic approaches.

The last section deals specifically with *Protection Against Free Radical Damage*. The topics considered include antioxidants and the immune response (which presents an extended concept of oxygen radicals and therefore antioxidants as modulators of physiological signals); barbiturates as free radical scavengers in the brain (a moot question); protection and repair of irradiated biological membranes; intracellular and the less well-known extracellular superoxide dismutase; and radiation protection of DNA by free radical scavengers (with indication of problem areas).

Herman Melville's prescription for writing "a mighty book" was to choose "a mighty theme". It is clear from the preface that the editors were conscious of having chosen "a mighty theme". Whether "a mighty book" has resulted perhaps not everyone will agree. In recent years free radicals have generated an avalanche of ideas and experimentation in the life sciences, as this journal, for instance, bears full witness. Pathologists, biochemists, physiologists, cell biologists, gerontologists, and neurobiologists are intended to benefit from this book. The contributors have put together a vast amount of valuable information. The book is well produced, and for a multiauthor work it is one of uniformly high standard not only in content but also in presentation. Perhaps not many will read the book in its entirety, but many will find it a very useful reference work.

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"CRC Handbook of Methods for Oxygen Radical Research"

Robert A. Greenwald, editor, CRC Press, Boca Raton, Florida, 1985. (447 pp)

The transformation in free radical biology is so remarkable as to be almost unbelievable. Imagine! Less than fifteen years ago people thought free radicals could not exist in biological systems, and the number of persons interested in free radical chemistry was quite small. Today free radical biology is so popular that "how to do it" books are necessary. In 1984, Lester Packer edited *Methods in Enzymology* Volume 105, subtitled "Oxygen Radicals in Biological Systems", the first book that presented detailed protocols for experimental procedures in free radical biology. The book under review here is an additional volume of this same type. Because persons attempting to perform an analytical procedure for the first time need all the help they can get (!), two books at this time are quite welcome. Since similar chapters in the two books tend to be written by different authors, the approaches are generally different enough so that it is wise to consult both before tackling a new procedure.

Most of the contributions in this volume are very short, in general no longer than five pages, and there are approximately sixty-five such contributions. Since each is written by a different author or set of authors, their quality varies. Some authors have provided a reasonably detailed introduction and very specific directions on performing a particular assay or technique; other authors do not give as good an introduction or not quite as detailed directions. However, in general, the chapters in this volume are of a very high quality.

The techniques that are described vary from the biological to the chemical. For example, isolation and purification of superoxide dismutase, of glutathione peroxidase, and of low-molecular-weight copper complexes are described. Oxygen-radical generating systems of a variety of types are described, ranging from xanthine oxidase and the Fenton reaction through the use of chloroplasts, hemoglobin, and polymer-bound rose bengal (for the production of singlet oxygen).

In general, well-known scientists have been recruited to write the various chapters. For example, H.J. Forman and A.B. Fisher have written a chapter on antioxidants in the lung; H.M. Hassan has written on superoxide dismutase levels in prokaryotes; J.M.C. Gutteridge has written on ceruloplasmin; P.C. Andrews and N.I. Krinsky have written on myeloperoxidase; R.F. Del Maestro and W. McDonald have written on tissue homogenates; W.A. Gunzler and L. Flohe have written on glutathione peroxidase; C.C. Winterborn has written on superoxide dismutase levels; and S.L. Markland has written a chapter on detection of superoxide. Other well known authors that have contributed to this volume include C. Auclair, S.D. Aust, J.V. Bannister, W.H. Bannister, B.H.J. Bielski, W. Bors, G.R. Buettner, E. Cadenas, W.S. Caughey, A.I. Cederbaum, G. Cohen, L.W. Oberley, G. Rotillio, M. Saran, D.T. Sawyer, H. Sies, A. Wendel, G.W. Winston, and many others.

A variety of analytical techniques are given for the detection of superoxide, the hydroxyl radical, and other free radicals. I found many of these chapters to be quite excellent. A large number of techniques are described for the quantitation of superoxide dismutase either in simple chemical systems or in tissue samples. A number of useful methods for measuring phenomena related to free radical biology are described. For example, techniques of measuring oxygen consumption are described in considerable detail. Phagocyte activity as measured by chemiluminescence is described. I found the chapter on techniques for measuring anti-

oxidant enzymes in the lung to be useful. Production of superoxide by macrophages and the isolation and use of endothelial cell cultures are described.

The techniques described are listed as chapter headings and the contributors are listed in an alphabetical list, but with no page references to their contributions. For some reason the authors of each chapter are not identified in the table of contents. There also is no author index. Thus, if you wish to find a contribution by a particular author, you either must know the title or you must leaf through the entire volume to find it. The subject index, however, does appear to be adequate.

As can be seen from the brief list of chapters and authors given here, this book is an absolute must for any laboratory conducting research in the field of free radical biology.

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