

Methods in Enzymology

Volume 105

*Oxygen Radicals in
Biological Systems*

EDITED BY

Lester Packer

Advisory Board

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MEMBRANE BIOENERGETICS GROUP
UNIVERSITY OF CALIFORNIA
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Contributors to Volume 105

Article numbers are in parentheses following the names of contributors.
Affiliations listed are current.

- B. ABAKERLI (3)**, *Industrias, Monsanto, Estrada Municipal, PLN 393 Paulinia, São Paulo, Brazil*
- HUGO AEBI (13)**, *Medizinisch-chemisches Institut, Universität Bern, CH-3000 Bern 9, Switzerland*
- THEO P. M. AKERBOOM (59)**, *Institut für Physiologische Chemie I, Universität Düsseldorf, D-4000 Düsseldorf, Federal Republic of Germany*
- BRUCE N. AMES (29, 44)**, *Department of Biochemistry, University of California, Berkeley, California 94720*
- PATRICIA C. ANDREWS (45)**, *Department of Medicine, Tufts-New England Medical Center, Boston, Massachusetts 02111*
- KOZI ASADA (56)**, *The Research Institute for Food Science, Kyoto University, Uji, Kyoto 611, Japan*
- KLAUS-DIETER ASMUS (20)**, *Hahn-Meitner-Institut Berlin, Bereich Strahlenchemie, D-1000 Berlin 39, Federal Republic of Germany*
- BERNARD M. BABIOR (45)**, *Department of Medicine, Tufts-New England Medical Center, Boston, Massachusetts 02111*
- J. V. BANNISTER (9)**, *Inorganic Chemistry Laboratory, University of Oxford, Oxford OX1 3QR, England*
- W. H. BANNISTER (9)**, *Nuffield Department of Clinical Biochemistry, Radcliffe Infirmary, University of Oxford, Oxford OX2 6HE, England*
- BENON H. J. BIELSKI (8)**, *Department of Chemistry, Brookhaven National Laboratory, Upton, New York 11973*
- R. P. BIRD (35)**, *Ludwig Institute for Cancer Research, Toronto, Ontario M4Y 2L4, Canada*
- CARMIA BOREK (62)**, *Radiological Research Laboratory, Cancer Center, Institute of Cancer Research, Columbia University, College of Physicians and Surgeons, New York, New York 10032*
- ALBERTO BOVERIS (57)**, *Departamento de Química Biológica, Facultad de Farmacia y Bioquímica, Universidad de Buenos Aires, 1113 Buenos Aires, Argentina*
- M. BRUNORI (2)**, *Department of Biochemistry, Biological Sciences, and Experimental Medicine, II University of Rome, Rome 00100, Italy*
- JUDITH L. BUTTRISS (15)**, *Department of Biochemistry, Guy's Hospital Medical School, London SE1 9RT, England*
- ENRIQUE CADENAS (26)**, *Institut für Physiologische Chemie I, Universität Düsseldorf, D-4000 Düsseldorf, Federal Republic of Germany*
- LAWRENCE CASTLE (34)**, *Department of Chemistry, Louisiana State University, Baton Rouge, Louisiana 70803*
- RICHARD CATHCART (44)**, *Department of Biochemistry, University of California, Berkeley, California 94720*
- ARTHUR I. CEDERBAUM (68)**, *Department of Biochemistry, Mount Sinai School of Medicine, New York, New York 10029*
- MICHAEL F. CHRISTMAN (29)**, *Department of Biochemistry, University of California, Berkeley, California 94720*
- DENNIS P. CLIFFORD (51)**, *Webb-Waring Lung Institute, University of Colorado Medical Center, Denver, Colorado 80262*
- GERALD COHEN (36, 67, 68)**, *Department of Neurology, Mount Sinai School of Medicine, New York, New York 10029*
- GIDON CZAPSKI (24)**, *Department of Physical Chemistry, Hebrew University of Jerusalem, Jerusalem 91904, Israel*
- ROLANDO DEL MAESTRO (49)**, *Brain Research Laboratory, Department of Clinical*

- cal Neurological Sciences, Victoria Hospital, London, Ontario N6A 4G5, Canada
- INDRAJIT D. DESAI (16), *Division of Human Nutrition, University of British Columbia, Vancouver, British Columbia V6T 1W5, Canada*
- CORA J. DILLARD (41), *Department of Food Science and Technology, University of California, Davis, California 95616*
- ANTHONY T. DIPLOCK (15), *Department of Biochemistry, Guy's Hospital Medical School, London SE1 9RT, England*
- THOMAS A. DIX (43), *Department of Chemistry, Pennsylvania State University, State College, Pennsylvania 16802*
- H. H. DRAPER (35), *Department of Nutrition, University of Guelph, Guelph, Ontario N1G 2W1, Canada*
- HERMANN ESTERBAUER (38), *Institute of Biochemistry, University of Graz, A-8010 Graz, Austria*
- L. FLOHÉ (10, 12), *Grünenthal GmbH, Center of Research, D-5100 Aachen, Federal Republic of Germany*
- ROBERT A. FLOYD (27), *Biomembrane Research Program, Oklahoma Medical Research Foundation, Oklahoma City, Oklahoma 73104*
- CHRISTOPHER S. FOOTE (3), *Department of Chemistry, University of California, Los Angeles, California 90024*
- L. G. FORNI (21), *Department of Biochemistry, Brunel University, Uxbridge UB8 3PH, England*
- IRWIN FRIDOVICH (5), *Department of Biochemistry, Duke University Medical Center, Durham, North Carolina 27710*
- CHERYL A. FURTEK (31), *Laboratories of Molecular Biology and Genetics, University of Wisconsin, Madison, Wisconsin 53706*
- BRUCE L. GELLER (11), *Department of Biological Chemistry, UCLA School of Medicine, Los Angeles, California 90024*
- ERIC A. GLENDE, JR. (40), *Department of Physiology, School of Medicine, Case Western Reserve University, Cleveland, Ohio 44106*
- MONIKA J. GREEN (1), *Inorganic Chemistry Laboratory, University of Oxford, Oxford OX1 3QR, England*
- WOLFGANG A. GÜNZLER (12), *Grünenthal GmbH, Center of Research, D-5100 Aachen, Federal Republic of Germany*
- JOHN M. C. GUTTERIDGE (4), *National Institute for Biological Standards, Hampstead, London HW3 6RB, England*
- BARRY HALLIWELL (4), *Department of Biochemistry, King's College, University of London, London WC2R 2LS, England*
- HOSNI M. HASSAN (30, 53, 69), *Departments of Food Science and Microbiology, North Carolina State University, Raleigh, North Carolina 27650*
- LINDA HATCH (19), *Institute for Toxicology, University of Southern California, Los Angeles, California 90033*
- OSAMU HAYAISHI (6), *Osaka Medical College, Takatsuki 569, Japan*
- RICHARD E. HEIKKILÄ (67), *Department of Neurology, Rutgers Medical School, Piscataway, New Jersey 08854*
- H. ALLEN O. HILL (1), *Inorganic Chemistry Laboratory, University of Oxford, Oxford OX1 3QR, England*
- PAUL HOCHSTEIN (19), *Institute for Toxicology, University of Southern California, Los Angeles, California 90033*
- MONICA HOLLSTEIN (29), *Department of Biochemistry, University of California, Berkeley, California 94720*
- SATORU IKENOYA (17), *Development Division, Eisai Co., Ltd., 4-6-10 Koishikawa, Bunkyo-ku, Tokyo, Japan*
- KENDALL A. ITOKU (42), *Medical School, Health Science Center, University of Missouri, Columbia, Missouri 65211*
- HARRY S. JACOB (48), *Division of Hematology, Mayo Memorial Building, University of Minnesota Hospitals, Minneapolis, Minnesota 55455*
- EDWARD G. JANZEN (22), *Guelph-Waterloo*

- Center for Graduate Work in Chemistry, Department of Chemistry and Biochemistry, University of Guelph, Guelph, Ontario N1G 2W1, Canada*
- RICHARD B. JOHNSTON, JR. (46), *Department of Pediatrics, National Jewish Hospital and Research Center, and University of Colorado School of Medicine, Denver, Colorado 80206*
- HAROLD P. JONES (50), *Department of Biochemistry, University of South Alabama, Mobile, Alabama 36688*
- KOICHI KATAYAMA (17), *Tsukuba Research Laboratories, Eisai Co., Ltd., Tokodai, Toyosato-machi, Tsukuba-gun, Ibaragi 300-26, Japan*
- SEYMOUR J. KLEBANOFF (52), *Department of Medicine, University of Washington School of Medicine, Seattle, Washington 98195*
- NORMAN I. KRINSKY (18), *Department of Biochemistry and Pharmacology, Tufts University School of Medicine, Boston, Massachusetts 02111*
- SIMO LAAKSO (14), *Department of Biochemistry, University of Turku, SF-20500 Turku 50, Finland*
- JOHANNA LANG (38), *Institute of Biochemistry, University of Graz, A-8010 Graz, Austria*
- GLEN D. LAWRENCE (36), *Institute of Human Nutrition, Columbia University College of Physicians and Surgeons, New York, New York 10032*
- STEPHEN A. LESKO (71), *Division of Biophysics, The Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland 21205*
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- C. ANN LEWIS (27), *Department of Biochemistry and Microbiology, University of St. Andrews, St. Andrews Fife KY16 9AL, Scotland*
- ESA-MATTI LILIUS (14), *Department of Biochemistry, University of Turku, SF-20500 Turku 50, Finland*
- W. LOHMANN (60), *Institut für Biophysik, Justus-Liebig-Universität, D-6300 Gießen, Federal Republic of Germany*
- J. WILLIAM LOWN (70), *Department of Chemistry, University of Alberta, Edmonton, Alberta T6G 2G2, Canada*
- MICHÈLE MARKERT (45), *Laboratoire Central de Chimie Clinique, Centre Hospitalier Universitaire Vaudois, 1011 Lausanne, Switzerland*
- LAWRENCE J. MARNETT (43, 54), *Department of Chemistry, Wayne State University, Detroit, Michigan 48202*
- RONALD P. MASON (55), *Laboratory of Molecular Biophysics, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina 27709*
- JOE M. MCCORD (50), *Department of Biochemistry, University of South Alabama, Mobile, Alabama 36688*
- ROLF J. MEHLHORN (25), *Membrane Bioenergetics Group, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720*
- ANDREW R. MIKSZTAL (7), *Department of Chemistry and Biochemistry and Molecular Biology Institute, University of California, Los Angeles, California 90024*
- GREGORY V. MILLER (42), *Medical School, Health Science Center, University of Missouri, Columbia, Missouri 65211*
- CHARLES F. MOLDOW (48), *Department of Medicine, Veterans Administration Medical Center, Minneapolis, Minnesota 55417*
- CARMELLA S. MOODY (30), *Department of Microbiology, North Carolina State University, Raleigh, North Carolina 27650*
- ARMIN MÜLLER (37), *Institut für Physiologische Chemie I, Universität Düsseldorf, D-4000 Düsseldorf, Federal Republic of Germany*
- KENNETH D. MUNKRES (31), *Laboratories*

- of Molecular Biology and Genetics, University of Wisconsin, Madison, Wisconsin 53706
- H. NEUBACHER (60), *Institut für Biophysik, Justus-Liebig-Universität, D-6300 Gießen, Federal Republic of Germany*
- LARRY W. OBERLEY (61), *Radiation Research Laboratory, Department of Radiology, The University of Iowa, Iowa City, Iowa 52242*
- PETER J. O'BRIEN (47), *Department of Biochemistry, Memorial University of Newfoundland, St. John's, Newfoundland A1B 3X9, Canada*
- STEN ORRENIUS (66), *Department of Forensic Medicine, Karolinska Institutet, S-104 01 Stockholm, Sweden*
- F. ÖTTING (10), *Grünenthal GmbH, Center of Research, D-5100 Aachen, Federal Republic of Germany*
- LESTER PACKER (25), *Membrane Bioenergetics Group, University of California, Berkeley, California 94720*
- RONALD PETHIG (28), *School of Electronic Engineering Science, University College of North Wales, Bangor, Gwynedd LL57 1UT, Wales*
- NED A. PORTER (32), *Department of Chemistry, Duke University, Durham, North Carolina 27706*
- WILLIAM A. PRYOR (34), *Departments of Chemistry and Biochemistry, Louisiana State University, Baton Rouge, Louisiana 70803*
- ELMER J. RAUCKMAN (23), *Department of Surgery, Duke University Medical Center, Durham, North Carolina 27710*
- RICHARD O. RECKNAGEL (40), *Department of Physiology, School of Medicine, Case Western Reserve University, Cleveland, Ohio 44106*
- J. LESLIE REDPATH (65), *Division of Radiation Oncology, Department of Radiological Sciences, California College of Medicine, University of California, Irvine, California 92717*
- JOHN E. REPINE (51), *Webb-Waring Lung Institute, University of Colorado Medical Center, Denver, Colorado 80262*
- CHRISTOPH RICHTER (58), *Laboratory of Biochemistry I, Swiss Federal Institute of Technology, CH-8092 Zürich, Switzerland*
- GERALD M. ROSEN (23), *Department of Pharmacology, Duke University Medical Center, Durham, North Carolina 27710*
- HENRY ROSEN (52), *Department of Medicine, University of Washington School of Medicine, Seattle, Washington 98195*
- G. ROTILIO (2), *Department of Biology, Faculty of Sciences, II University of Rome, Rome 00100, Italy*
- DONALD T. SAWYER (7), *Department of Chemistry, University of California, Riverside, Riverside, California 92521*
- ELIZABETH SCHWIERS (44), *Department of Biochemistry, University of California, Berkeley, California 94720*
- ROGER C. SEALY (63), *National Biomedical ESR Center, Medical College of Wisconsin, Milwaukee, Wisconsin 53226*
- ALEX SEVANIAN (19), *Institute for Toxicology, University of Southern California, Los Angeles, California 90033*
- F. C. SHOOK (3), *Pilot Chemical Company, Santa Fe Springs, California 90670*
- PAUL H. SIEDLIK (54), *Pharmacology Department, Warner Lambert-Parke Davis, Ann Arbor, Michigan 48105*
- HELMUT SIES (26, 37, 59), *Institut für Physiologische Chemie I, Universität Düsseldorf, D-4000 Düsseldorf, Federal Republic of Germany*
- T. F. SLATER (33, 38), *Department of Biochemistry, Brunel University, Uxbridge, Middlesex UB8 3PH, England*
- MARTYN T. SMITH (66), *Department of Biomedical and Environmental Health Sciences, University of California, Berkeley, California 94720*
- R. S. SOHAL (64), *Department of Biology, Southern Methodist University, Dallas, Texas 75275*
- DOUGLAS R. SPITZ (61), *Radiation Re-*

- search Laboratory, Department of Radiology, The University of Iowa, Iowa City, Iowa 52242*
- WILLIAM S. STARK (42), *Division of Biological Sciences, University of Missouri, Columbia, Missouri 65211*
- MASAHIRO TAKADA (17), *Tsukuba Research Laboratories, Eisai Co., Ltd., Tokodai, Toyosato-machi, Tsukuba-gun, Ibaragi 300-26, Japan*
- AL L. TAPPEL (41), *Department of Food Science and Technology, University of California, Davis, California 95616*
- HJÖRDIS THOR (66), *Department of Forensic Medicine, Karolinska Institutet, S-104 01 Stockholm, Sweden*
- PEKKA TURUNEN (14), *Wallac Biochemical Laboratory, SF-20101 Turku 10, Finland*
- JOAN S. VALENTINE (7), *Department of Chemistry and Biochemistry and Molecular Biology Institute, University of California, Los Angeles, California 90024*
- ANN M. WALTERSDORPH (52), *Department of Medicine, University of Washington School of Medicine, Seattle, Washington 98195*
- SUDHAKAR WELANKIWAR (18), *Department of Biochemistry and Pharmacology, Tufts University School of Medicine, Boston, Massachusetts 02111*
- R. L. WILLSON (21), *Department of Biochemistry, Brunel University, Uxbridge UB8 3PH, England*
- DENNIS R. WINGE (11), *Departments of Biochemistry and Medicine, University of Utah, Salt Lake City, Utah 84132*
- PETER K. WONG (27), *Biomembrane Research Program, Oklahoma Medical Research Foundation, Oklahoma City, Oklahoma 73104*
- KUNIO YAGI (39), *Institute of Applied Biochemistry, Yagi Memorial Park, Mitake, Gifu 505-1, Japan*
- RYOTARO YOSHIDA (6), *Department of Medical Chemistry, Kyoto University Faculty of Medicine, Kyoto 606, Japan*
- TERUAKI YUZURIHA (17), *Tsukuba Research Laboratories, Eisai Co., Ltd., Tokodai, Toyosato-machi, Tsukuba-gun, Ibaragi 300-26, Japan*
- SYLVIA ZADRAVEC (38), *Institute of Biochemistry, University of Graz, A-8010 Graz, Austria*

Preface

Increasingly, researchers and clinicians are recognizing that biological damage mediated by reactive species of oxygen is an important factor in disease and aging. Oxygen radical damage has been implicated in inflammation, arthritis, adult respiratory distress syndrome, myocardial infarction, pulmonary dysfunction in hemodialized patients, Purtscher's syndrome, Bloom's syndrome, systemic lupus erythematosus, mutagenicity and carcinogenicity, and other pathologies. While more experimental data to support the involvement of oxygen radicals in these conditions are needed, the explosive interest of many investigators in the field more than warrants a volume that covers the most current methods used in studying the role of oxygen radicals in biological systems.

Much of the recent progress in research concerning the role of oxygen radicals in disease has been due to the discovery and utilization of antioxidant substances. Since the discovery by McCord and Fridovich that the plasma protein, erythrocuprein, functions to dismutate the superoxide anion radical, this oxygen radical, as well as other oxygen radical species and products derived therefrom, have received a great deal of attention. These other compounds include hydrogen peroxide, hydroxyl radical ($\text{OH}\cdot$), and singlet oxygen ($^1\text{O}_2$). The study of oxygen radical reactions in simple chemical and biochemical systems has defined parameters governing the initiation, propagation, and termination of destructive free radical chain reactions, and this understanding has suggested oxygen radical involvement in a remarkably diverse and extensive array of pathological states.

Dramatic therapeutic effects of antioxidant substances, such as vitamin E and selenium, in clinical settings have provided further support for the involvement of oxygen radicals in certain disease conditions. Recent research results of chemists, biologists, clinicians, and epidemiologists have created a new multidisciplinary field considered by some to be among the most exciting and important areas of biological research.

As with most research, progress is frequently accelerated by the publication of a single volume that contains all of the state-of-the-art methodologies used in the field. The major emphasis of this volume is on the methods and on the basic chemistry and biochemistry of oxygen radicals and their effects in biological systems. Such a volume, it is hoped, will stimulate new research, heighten awareness of recent discoveries in basic research, and focus attention on their implications for human health.

In preparing this volume, I would be remiss in not pointing out the very great benefit derived from the active participation of the advisory

board (Bruce Ames, Anthony Diplock, Lars Ernster, Irwin Fridovich, Rolf J. Mehlhorn, William A. Pryor, and Trevor Slater) and Al L. Tappel in the selection of the methods to be included and in identifying the leading investigators to make these contributions to the volume. Also I acknowledge the valuable editorial and administrative assistance provided by Mr. John Hazlett who worked closely with me in bringing this volume to fruition.

LESTER PACKER

METHODS IN ENZYMOLOGY

EDITED BY

Sidney P. Colowick and Nathan O. Kaplan

VANDERBILT UNIVERSITY
SCHOOL OF MEDICINE
NASHVILLE, TENNESSEE

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CALIFORNIA
AT SAN DIEGO
LA JOLLA, CALIFORNIA

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- II. Preparation and Assay of Enzymes
- III. Preparation and Assay of Substrates
- IV. Special Techniques for the Enzymologist
- V. Preparation and Assay of Enzymes
- VI. Preparation and Assay of Enzymes (*Continued*)
Preparation and Assay of Substrates
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