
Preface

This book entitled *Free Radicals in Human Health and Diseases* is our collaborative effort to combine approaches and ideas from different experts working on oxidative stress. The advent of oxidative hypothesis of pathogenesis led to a paradigm shift in how we understand the disease mechanism today. The oxidative stress caused by free radical generation in cells and its environment is implicated in a plethora of human diseases as well as in health and has become an area of intense research globally. Free radicals and reactive oxygen species (ROS), synthesized as metabolic by-products, are essential for a number of biochemical and physiological processes. Environmental stress drastically increases the levels of free radicals inside and around cells, thereby disturbing the equilibrium between free radical production and inbuilt antioxidant capabilities. When cellular production of ROS overwhelms its antioxidant capacity, it causes damage to cellular macromolecules such as lipids, protein, and DNA. ROS that are generated in all aerobic cells are in balance with biochemical antioxidants, and an imbalance due to excessive ROS may lead to degradation of antioxidant capacity of cells. Increased ROS can result in age-related diseases like Alzheimer and Parkinson disease, cancer and metastasis, cardiovascular diseases like atherosclerosis and cardiomyopathy, diabetic complications, and other inflammatory disorders like rheumatoid arthritis as well as reproductive deficiencies like polycystic ovary syndrome and loss of sperm motility. For scientists working in the field of oxidative stress, it is imperative to understand several aspects involved in the regulation and maintenance of oxidative balance. The defined methodology and techniques are required to estimate the dysregulation of this imbalance. Additionally, it is essential to understand the upstream as well as downstream regulators of this imbalance in a specific disorder. Therefore, an in-depth knowledge and understanding would help in designing new strategies to address specific questions of interest in one's research area.

This book is a consolidated effort of authors working in the field of oxidative stress to provide comprehensive and up-to-date information on it. The book contains a total of 26 chapters divided into 4 distinct parts for better understanding and interpretation. The first part covers the players of oxidative stress which include ROS, free radicals, and other submicroscopic particles. It also talks about the tools and techniques that can be used to measure


oxidative stress and free radicals. The second part gives an in-depth mechanistic outlook of oxidative stress at both molecular and genetic levels. The third part focuses on various disease conditions that emanate from ensuing oxidative stress and due to loss of cellular oxidative balance. The last part discusses the strategies to ameliorate oxidative stress-induced diseases focusing on antioxidative therapies and current approaches in this field.

Although several books on the topic of oxidative stress are available, which is justified from the fact that ROS are implicated in the mediation of a number of pathogenesis, this book presents a comprehensive account of the redox biology including the topics like generation of free radicals, modification of biomolecules by ROS, ROS-induced signaling pathways and their regulations, role in disease development, role in molecular and genetic pathways leading to gene regulation and expression, and suggestions of strategies to prevent and treat oxidative stress pathologies based upon the current research and their future perspectives. This broad coverage of topics enhances the appeal of this book to its readers and thus is of extreme interest to the target audience such as researchers, scientists, pathologists, students, faculties, and the broad scientific community. To enhance and update the understanding of oxidative stress-related research, the authors have presented diverse theories to cover the advancement on this important subject. We hope that by combining these topics and presenting them as a book, we will help a wider section of scientific readers in understanding recent developments in oxidative stress biology, addressing their queries, enhancing inquisitiveness, and generating fruitful research ideas and tools to help direct and progress their own research.

We, as editors of the book, would like to extend our immense gratitude to all the contributors. We would like to especially acknowledge Prof. R. K. Kale, Founding Vice-Chancellor, Central University of Gujarat, and Professor, School of Life Sciences, JNU, New Delhi, for writing a foreword for our book. We would also like to acknowledge and thank our mentors Prof. Shyamal Goswami and Prof. Najma Z. Baquer, School of Life Sciences, JNU, New Delhi, India, and Prof. Satish K. Srivastava, Department of Biochemistry and Molecular Biology, University of Texas Medical Branch (UTMB), Galveston, Texas, USA, for their incessant encouragement and valuable training. In addition, we would like to acknowledge Neha Atale, Research Scholar at Jaypee Institute of Information Technology, Noida, and Shrey Kohli, Research Scholar at Otto von Guericke University (Medical Faculty) Magdeburg, Germany, for their sincere efforts at different stages in preparing the book. We also acknowledge the efforts, time, and patience of our colleagues, students, and family who helped in the various stages during the preparation of the book. We are grateful to the Department of Biotechnology (DBT) and Department of Science and Technology (DST),

Govt. of India. We are highly grateful to the publisher, Springer India (Pvt.) Ltd., for agreeing to publish our book, and to Dr. Mamta Kapila (Editor, Life Sciences, Springer India) for her patience and understanding during the preparation of this book.

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A handwritten signature in black ink, reading "Vibha Rani", with a horizontal line underneath.

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Free Radicals in Human Health and Disease

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2015, XVI, 430 p. 84 illus., 60 illus. in color., Hardcover

ISBN: 978-81-322-2034-3