

Preface

The production of free radicals (ROS) is an unavoidable consequence of life in an aerobic environment. Free radicals produced from the metabolic activities of oxygen attack biological membranes and lipoproteins via oxidation in a process called lipid peroxidation. This attack damages cells and lipids often in a chain reaction with carbon-based molecules such as polyunsaturated fatty acids (PUFA) in a reaction with molecular oxygen. This creates oxidative stress and damage to tissues.

Free radicals also damage chromosomal DNA. It is more likely that damage to DNA occurs from external sources rather than mitochondrial-produced free radicals. Synthetic compounds, pollutants, radiation, xenobiotics (drugs), and food components make up the most likely factors that damage DNA. Proteins are another target of free radicals as proteins and their amino acids can be modified and degraded through free radical mediated reactions. Oxidized proteins then become the target of specialized proteases that turn them into less biologically active smaller peptides and amino acids.

Growing evidence supports a major role of oxidative stress in aging and disease. It has been almost a half century since Denham Harman first proposed the free radical theory in relation to disease. This hypothesis simply states that oxidative stress is the most important determining factor for aging and age-related diseases. Evidence continues to suggest that oxidative stress limits the chronological lifespan which is consistently shortened when there is a reduction of antioxidant enzymes. Furthermore, there is also ample evidence to indicate that reducing oxidative stress is both important and necessary for an extended lifespan. However, even though there appear to be beneficial effects of antioxidant treatment against pathological disease, major preventative clinical trials of dietary antioxidants have failed to prove benefits in increasing longevity. It may be that oxidative stress is more like an active bystander instead of an active component in increasing longevity. No assessment of the free radical theory of aging and pathogenesis of age-related diseases would be complete without an up-to-date account of the major impact oxidative free radicals have in the pathology of disease.

There are various disorders with clear signs of oxidative damage (i.e., paracetamol (Tylenol®) toxicosis, hypoxia reperfusion injury, etc.), and there are some in which oxidative stress is a side effect (i.e., diabetes mellitus, inflammation, liver failure, etc.). Our opinion is that the appropriate way to treat a disorder is multimodular and

antioxidant therapy is one important member among the options. In cases of clear oxidative damages we still have to use other treatment therapies (e.g., fluid therapy, antimicrobial therapy, etc.) with antioxidants. There are also diseases in which oxidative stress is a secondary problem, such as diabetes mellitus where the primary treatment is insulin, but antioxidant therapy appears beneficial as well in improving insulin sensitivity.

The purpose of this book is to inform clinicians, students, and others of the vast effects of free radical damage on various cells, tissues, and organs and in different species of animals. In addition, the effects of oxidative stress are analyzed in aging and various disease states such as diabetes, cognitive dysfunction, and heart disease. Each author presents his or her interpretation of the effects of oxidative damage in disease and in several species and the challenges in controlling oxidative damage with antioxidant therapies. We have compiled ideas and scientific information from scientists, veterinarians, and the medical community from around the world. This is surely a universal effort to promote further understanding of oxidative stress and its effects on various animals and organ systems. We would like to commend the authors for their vision and undertaking such a daunting task.

Largo, FL
Budapest, Hungary

Lester Mandelker
Peter Vajdovich



<http://www.springer.com/978-1-61779-070-6>

Studies on Veterinary Medicine

Mandelker, L.; Vajdovich, P. (Eds.)

2011, X, 260 p., Hardcover

ISBN: 978-1-61779-070-6

A product of Humana Press