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Book Reviews

CELLULAR AND MOLECULAR BIOLOGY OF NITRIC OXIDE

EDS. J.D. LASKIN AND D.L. LASKIN,
MARCEL DEKKER INC., NEW YORK, 1999

According to the back cover, this book aims to provide a detailed description of the latest advances in $NO^{\bullet}$ research – a tall order given the rate of advance in this field and that the book is less than 400 pages long. I am not convinced that it has succeeded, although the high calibre of many of the authors is undeniable. In particular, there are few 1998 and almost no 1999 papers in the reference lists. The book is still a good read, however.

Chapters I particularly enjoyed were (in order of appearance) those on arginine metabolism (although I cannot agree that arginine is the only physiologically significant source of $NO^{\bullet}$ as stated on p. 57: what about NO_2^- in the stomach?), carbon monoxide poisoning (which also contains a good, although not completely up-to-date, summary of $ONOO^-$ biochemistry), the structure–activity relationship of NOS inhibitors, the role of $NO^{\bullet}$ in renal function, $NO^{\bullet}$ in autoimmunity (which has useful discussions both of the ability of *human* cells to make $NO^{\bullet}$, and of the MRL model of autoimmunity), the genotoxic actions of $NO^{\bullet}$ (part of Chapter 10), $NO^{\bullet}$ in the skin (especially the "war and peace" analogy) and the possible biological roles of taurine chloramine.

Overall, a useful and readable book. It does not achieve what it set out to do, but then, who could?

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FUNCTIONAL FOODS: BIOCHEMICAL AND PROCESSING ASPECTS

EDS. G. MAZZA,
TECHNOMIC PUBLISHING CO, INC.,
LANCASTER, PA; 454 pp., 1999

This is a volume of 13 chapters, with 26 contributing authors, the great majority of whom are working in Canada. Twelve of the chapters deal with relatively specific foods while the final contribution by Dr. Alison Stephen of the College of Pharmacy and Nutrition in Saskatchewan surveys regulatory aspects.

"Functional foods" are defined in a foreword by Dr. Clare Hasler of the University of Illinois as foods or isolated food ingredients that deliver specific nonnutritive physiological benefits that may enhance health, and held to be synonymous with "designer foods" and "nutriceuticals". She quotes the US market value as $86 billion, which must work out as many hundreds of dollars per year on a per capita basis, and makes the point

that demand can only increase as aging populations try to stave off chronic health problems by dietary intervention, as a safe and cost effective alternative to drugs. Against this background it is not surprising that allusions to antioxidants and/or free radicals crop up at numerous points, in fact on almost every page. Anybody interested in this aspect of biology and its ramifications in pathophysiology can reap a rich harvest of information from the book – not quite a metaphor this, since harvested plants form most of the subject matter. Thus one of the most interesting sections, by Drs. Girard and Mazza, deals with functional grape and citrus products, and immediately focuses on the anthocyanins, flavanols, and tannins which are believed by some to play a significant role in preventing or delaying the onset of cancer and cardiovascular disease. There are useful tables of all the relevant polyphenolics in grapes, grape juice, and red and white wines. In addition there is a discussion of the preparation of anthocyanins from pomace, which is the pressed skins, seeds and stems to be disposed of by wineries after extraction. The authors have no hesitation in recommending the development of novel food products to contain such preparations; soberly, they do not mention the "French paradox" as such. Progressing to citrus fruits, they present a wealth of information not only on polyphenols but also carotenoids and vitamin C.

In the chapter entitled "Functional Products from Rice" by Drs. K.A. Moldenhauer, E.T. Champagne, McCaskill and H. Guraya (authors from various parts of USA) there is a section on rice bran oil which caught my eye since it has just come on to the market in my part of the world with a moderately-intense advertising campaign. Rice bran oil is stated to be excellent for frying in terms of low foam and peroxide formation, the latter due to the presence of (as stated) "powerful antioxidants". In addition the oryzanols, now receiving attention as antioxidants and hypolipidaemic agents, are briefly discussed.

Other specific crops dealt with are oats (Drs. P.J. Wood and M.U. Beer), wheat (Drs. E. Chao, C. Simmons and R. Black), flax (Drs. B.D. Ooomah and G. Mazza), mustard (Drs. W. Cui and N.A.M. Eskin), plants from Latin America (Drs. S.H. Guzmann-Maladonado and O. Paredes-Lopez), a group of medicinal plants including ginseng (Drs. T.S.C. Li and L.C.H. Wang) and a group of rather common vegetables including the cruciferae, onions and garlic (Drs. P. Delaquis and G. Mazza). All of the treatments of these offer much of interest in the field of free radical biology.

Of course there is also material on animal rather than plant products. In the chapter entitled "Functional Seafood Lipids and Proteins" Dr. F. Shahidi of the Memorial University of Newfoundland notes that since difficulties have arisen in respect of the safety of synthetic antioxidants such as butylated hydroxyanisole, in the future the control of oxidation of marine oils will probably be given over to natural antioxidants, and highlights the potential of green tea extracts in this context. There is also a chapter on "Functional Milk and Dairy Products" by Drs. P. Jelen and S. Lutz from Alberta, in which it is noted that some of the observed anticarcinogenic effects of whey protein mixtures (in rats) can be attributed to the glutathione content. In the past it seems we have been overenthusiastic about the destructive potential of the human gastrointestinal tract – many peptides and polysaccharides seem to survive well and exert hitherto unexpected biological effects.

Many of us in the free radical field have little or no knowledge of botany and one of the best features of the book is that in some cases seeds referred to have been drawn out with anatomical detail. The complexity of the structure of a grain of rice was a revelation to this writer at least. Also, there is a wealth of formulae corresponding to the chemical substances discussed. This is very helpful in trying to appreciate the function of plant constituents because one can envisage the variety of corresponding chemical structures.

I should think this will be one of the standard reference volumes on the subject for the next few years.

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METAL IONS IN BIOLOGICAL SYSTEMS VOLUME 36. INTERRELATION BETWEEN FREE RADICALS AND METAL IONS IN LIFE PROCESSES
EDS. ASTRID AND HELMUT SIGEL
MARCEL DEKKER, NEW YORK, 1999

This is the latest volume in the well-established series *Metal Ions in Biological Systems*. It has been known for decades that transition metal ions are often free radicals themselves and play an important role in promoting free radical reactions both *in vitro* and *in vivo*. Indeed, the first review article to make this point (*Biochem. J.* [1984] **219**, 1–14) has become a citation classic. The present volume is an excellent reminder to newcomers to the field of how important transition metals really are. It begins, logically enough, with a consideration of basic Fenton Chemistry, both in terms of mechanism (Meyerstein) and of how the iron required might become available *in vivo* (Liochev). Chapter 3 (Branchaud) takes a broader view of oxygen reduction products, with an interesting discussion on the thermochemistry of lipid peroxidation. Buxton and Mulazzani (Chapter 4) discuss free radicals as generators of "uncommon" oxidation states of transition metals, such as Ni^{+}, Cd^{+} and Fe (IV).

The book then moves on to biological systems. Lyons *et al.* review the mutant CuZnSOD enzymes found in some cases of familial ALS. The several suggested mechanisms of toxicity are well-discussed, but to my mind there is no clear answer as yet. This chapter also contains excellent discussions of the properties of SOD^{-} strains of yeast. Sagripanti (Chapter 6) evaluates the mechanisms by which copper and iron ions can promote oxidative DNA damage, with useful discussions of the mechanisms of metal binding to the DNA molecule. This is complemented by the subsequent chapter, in which Kelley and Barton explain the mechanisms of radical migration through the double helix.

Lipid peroxidation is the subject of Chapter 8: Sergent *et al.* outline the various roles that metal ions can play in this process. Nohl and Stolze discuss methaemoglobin in relation to free radical damage in red blood cells (Chapter 9). Chapter 10 (Atwood *et al.*) is a good account of oxidative damage and the possible roles of zinc, copper, iron and aluminium in the pathology of Alzheimers' disease, but it overlaps somewhat with Chapter 11, which deals with both AD and with mutant CuZnSODs in ALS (an overlap with Chapter 4). Perhaps it would have been more logical to group these chapters together.

Chapter 12 (Hartmann *et al.*) reviews the interesting topic of metal ion-dependent thiyl radical generation, with a particular focus on copper. Methylmercury-induced oxidative stress is well-reviewed by Sarafian in Chapter 13. Nickel and chromium-induced free radical damage to DNA as a potential mechanism accounting for their carcinogenicity is critically discussed in detail in Chapter 14 (Landolph), which also briefly mentions arsenic and beryllium. On the reverse aspect, Vol'pin *et al.* (Chapter 15) discuss organocobalt sources of free radicals as potential anti-cancer agents. Makrigiorgos gives a useful account of the role of site-specific free radicals in DNA damage by metals and anti-tumour antibiotics, and of the difficult task of detecting these radicals.

The book then moves on to nitric oxide, whose synthesis and biological actions usually involve metal ions, both as cofactors in NOS enzymes and as targets of $NO^{\bullet}$ binding. The basics are well-reviewed by Fukuto and Wink (Chapter 17). This

is followed by an interesting chapter on peroxynitrite, well-written by Koppenol, although I hope this author will forgive me if I cannot agree with his assertion (p. 612) that it "may be in order to retire the Fenton reaction" in favour of $ONOO^-$ as the major toxic species accounting for $O_2^{\bullet -}$-dependent damage *in vivo*. Basic $NO^\bullet$ chemistry is continued in Chapter 19, where Walker *et al.* describe haem proteins that interact with $NO^\bullet$ in the saliva of bloodsucking insects. Chapters 20 (by Fricker) and 21 (Fung *et al.*) are devoted to a consideration of $NO^\bullet$ scavengers, $NO^\bullet$ donors and NOS inhibitors as potential therapeutic agents. Surprisingly, $ONOO^-$ scavengers were not mentioned. The book ends with a comprehensive index.

Overall, I enjoyed this book and recommend it. The editors deserve congratulation in selecting a first-rate group of authors and getting them to deliver.

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