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Book Review

Plasma Membrane Redox Systems and Their Role in Biological Stress and Disease

Han Asard, Alajos Berczi, and Roland J. Caubergs, Eds. Kluwer Academic Publishers, Dordrecht, The Netherlands, 1998; 332 pp.

Reviewed by AUBREY D.N.J. DE GREY

THE PLASMA MEMBRANE (PM) redox community holds its main conference every 2 years. In recent years, each such meeting has been followed by publication of the proceedings as articles in a special issue of *Protoplasma*. The 1998 meeting in Antwerp went one better: it gave rise not only to the usual special issue but also to *Plasma Membrane Redox Systems and Their Role in Biological Stress and Disease*, most of whose chapters are based on the plenary lectures from the meeting.

The main theme of the conference was the same as that of the forum in this issue of *Antioxidants & Redox Signaling*, the biomedical role of PM redox processes. However, the book also features several chapters devoted to an area of PM redox biology that has dominated the field until recently: namely, its role in plant physiology. Progress has been markedly greater in that area than in mammalian PM redox in regard to molecular characterization of the enzymes involved. Four of the book's 13 chapters discuss plant enzymes exclusively, and they are a major theme of two others. If the plant PM redox apparatus is a predictor of things to come in elucidation of its mammalian counterpart, we still have some way to go in characterizing the latter, since (as set out in, for example, the chapter by Berczi *et al.*) there are at least five such enzymes in plants, even if one restricts consideration to confirmed or putative flavoproteins. Murphy *et al.* discuss an additional enzyme, one that generates an oxidative burst in response to pathogens and seems, according to some lines of evidence, to be directly homologous to the neutrophil enzyme responsible for the analogous activity in mammals.

The mammalian respiratory burst is itself the topic of a chapter by one of the groups that have contributed the most to our now very detailed understanding of that enzyme, that of Segal *et al.* As they describe, all of this enzyme's components are now cloned and sequenced and their arrangement within the enzyme is also known. There is still some doubt regarding the way in which the superoxide produced in the phagocytic vacuole is used to kill pathogens, particularly with regard to the role of myeloperoxidase, which is also discussed in this chapter.

Two chapters consider the process of iron uptake into cells: Askwith and Kaplan consider the mechanism used by yeasts, while Connolly and Guerinot focus on plants. A corresponding chapter on iron uptake in animal cells is conspicuous by its absence (but see the review by Smith in this issue).

Three chapters are from groups that have also contributed to this issue's forum. Morré's chapter on the surface oxidase includes a detailed discussion of the possible role of membrane-bound thiols as electron reservoirs, oxidized to disulfides and re-reduced to thiols by the same enzyme that reduces extracellular oxygen. He also describes the curious ultradian periodicity exhibited by the enzyme, and pre-

sents data in support of the hypothesis that it receives electrons from PM coenzyme Q, making it at least one of the terminal oxidases of transmembrane electron transport. The role of coenzyme Q in the plasma membrane is analyzed in detail in the chapter by Villalba *et al.*, including its participation in the regeneration of both oxidized extracellular ascorbate and oxidized PM tocopherol. Gonzalez-Reyes *et al.* focus on the control of cell growth by these enzymes: interestingly, similar systems appear to mediate proliferation of animal cells and enlargement (elongation) of plant cells.

The book's last three chapters concern specific pathologies in which PM redox is implicated: atherosclerosis, AIDS, and cancer. Jessup *et al.* show that metal-mediated oxidation of lipids in atherosclerotic plaques, which has long been touted as a causative event in plaque formation, may also be promoted by electron export from macrophages. Ryser *et al.* present evidence that both diphtheria toxin and HIV are taken up by cells by a mechanism in which protein thiol/disulfide exchange enzymes play an integral part, such that this uptake is markedly diminished by both chemical and antibody-based inhibition of those enzymes. Finally, Medina discusses the numerous functions that PM redox processes appear to perform in the survival and drug resistance of tumor cells.

This is an outstanding collection of reviews covering the entire field of plasma membrane redox biology. I did not find a single chapter disappointing. Moreover, it was clearly edited and produced extremely efficiently—its official date of publication is only 8 months after the meeting at which the originating talks were presented, and yet it is clear that authors were given time to peruse each other's drafts, as there is extensive referencing of one chapter by another. It is in that regard that the only real production error was made: all references in the text are given in the form "Author, year," so it would have been very simple and helpful to use "Author, this volume" rather than "Author, 1998" for such interchapter citations. But this is of course a somewhat trivial point; I strongly recommend the book to all who seek a solid grounding in this fascinating field.

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