Free radicals in biological systems

Free Radicals in Biology. Vol. 1: Pp. xv+287. Vol 2: Pp. xiv+303. Edited by W. A. Pryor. (Academic: New York and London, 1976.) £19.55; $27.50 each volume.

PUBLICATION of a series of volumes devoted to the role of free radicals in biological systems is certain to be of interest to those workers who are particularly concerned with the relationship between events at the basic chemical level and their biological consequences. The first two volumes of such a series have appeared under the editorship of W. A. Pryor, the stated aim being to present reviews which, for specialist and generalist alike, may be primary sources of reference as well as short up-to-date surveys. This aim is clearly satisfied in several of the contributions.

The first volume opens with a general survey of the chemical reactions of free radicals; written by the editor, it is also, to some extent, an introduction to the series. A short chapter by Mead presents the evidence for the involvement of free radicals in the autoxidation of lipid membranes both *in vitro* and *in vivo*. It is inevitable that the technique of electron spin resonance (ESR), so widely used for the detection and identification of free radicals, should be given a prominent place in the first volume. Basic concepts and characteristics of ESR spectra, together with some applications to biological free radicals, are covered by Borg. The technique of spin labelling (the introduction of paramagnetic probes) is very powerful in investigations of structure–function problems in biology and is discussed in some detail by Smith, Schreier-Muccillo and Marsh; I gained the impression, however, that this subject area is slightly out of context in this particular volume. One chapter is devoted to free radicals in photosynthesis (Loach and Hales), particular attention being paid to those involved in the primary events in bacterial photosynthesis. A very clear account of the function of the superoxide dismutases, catalases and peroxidases in the metabolism of $O^{\cdot}_2$ and H_2O_2 is given by Fridovich.

There is greater emphasis on chemistry in volume 2. Pyridinyl radicals, which are models for those derived from nicotinamide adenine dinucleolide (NAD), are discussed by E. M. Kosower, and an account of radical and radical–ion reactions in the glutathione–glutathione disulphide system is given by N. S. Kosower and E. M. Kosower. There is a great deal of current interest in the production and reactions of singlet oxygen; it is appropriate, therefore, that a chapter (by Foote) deals with the intermediary function of this reactive species in photosensitised oxidations and in certain biological systems. The atmosphere is not neglected, and the mechansim of photochemical smog formation (Kerr, Calvert and Demerjian) and the toxicity of air pollutants such as nitrogen oxides and ozone (Menzel) and peracyl nitrates (Mudd) are discussed in terms of possible free radical intermediates. The controversial question of the presence of free radicals in dry biological systems is reviewed by Heckly who shows that many of the claims are due to artefacts. Henriksen *et al.* describe the effects of ionising radiations on dry protein, nucleic acids and related substances, particular emphasis being given to ESR studies of single crystals of the components of these macromolecules; the production of free radicals in such a manner will clearly be of great radiobiological significance.

These two volumes cover a fairly broad area and the series as a whole should therefore be valuable source material for those involved in the chemistry–biology interface.

George Scholes

George Scholes is Reader in the Radiation and Biophysical Chemistry Laboratory, School of Chemistry, University of Newcastle upon Tyne, UK.

Concanavalin A

Concanavalin A as a Tool. Edited by H. Bittiger and H. P. Schnebli. Pp. xv+639. (Wiley-Interscience: London and New York, October 1976.) £19.50; $38.50.

CONCANAVALIN A has had a curious history. It is of course only one of a very large number of lectins, and was by no means the first one to be used extensively in biology. The father-figure of cell biology, Paul Ehrlich, for example, was using other lectins before 1900 in a whole series of beautifully designed experiments showing the interactions of lectins with cell surfaces. Concanavalin A was, however, first to be crystallised by Sumner in 1919, and a pure protein became available rather than crude extracts of seeds which were then (and also sometimes still are) used as a source of lectins. The amino acid sequence and three-dimensional structure of concanavalin A were determined by Edelman and his colleagues, and the specificity of carbohydrate binding was worked out in detail, largely by Goldstein and his colleagues. Since then concanavalin A has been used in an astonishing range of experiments and is now a standard laboratory reagent, both in solution and as an immobilised reagent for affinity chromatography. It is, therefore, not surprising to see a book dedicated to this most versatile reagent.

Concanavalin A as a Tool is, however, much more than a collection of data concerning one particular lectin. It is, in effect, both a source book and a laboratory aid to many of the techniques in routine use in cell biology laboratories. There are 61 chapters, each written by an expert or experts and ranging from isolation, structure and specificity, histochemistry (fluorescence microscopy and electron microscopy) to separation methods using immobilised lectin, agglutination reactions, lymphocyte mitogenesis and a host of biological applications—for example, selection of lectin-resistant cell lines.

Each chapter is short and to the point (few are more than half-a-dozen pages) but each is self contained in giving just enough background to illustrate the particular application being described. The main feature of most chapters is a "Methods Section" which provides sufficient detail to be used in the laboratory. The list of useful methods is too long to mention here and presumably will vary in content depending on the user. Some typical examples are induction and titration of concanavalin A antibodies, preparation of conjugates (FITC, ferritin as well as con A-trypsin and con A-asparagine conjugates), labelling with radioiodine or tritium, agglutination assays (with excellent discussion of the many pitfalls), preparation and properties of divalent derivatives, binding assays and analysis of heterogeneity of receptor sites, and the preparation and use of affinity columns. An appendix lists commercially available reagents and derivatives.

In short, Bittiger and Schnebli must be well satisfied with their efforts and those of their contributors. *Concanavalin A as a Tool* is a book to own and keep close by the bench. It also makes good reading despite the large amount of information packed into a relatively small space and constant change of authors—an indication of some excellent editorial work. If the price seems substantial (although not excessive), the purchaser is really getting two books for the price of one.

R. C. Hughes

R. C. Hughes is a member of the MRC staff at the National Institute for Medical Research, London, UK.