

This book presents both the official position and the moral questions at the root of this controversial subject. It concludes that animals *are* morally entitled to be treated humanely but whether they are entitled to more than that is unclear.

I thoroughly recommend this book to all whose work impinges on animal testing and also those who have a general interest in the subject.

Gordon Birch

Zinc in Human Biology. Edited by C. F. Mills. International Life Sciences Institute/Springer-Verlag, London, 1989. ISBN 3-540-7875-8. i + 464 pp. Price: US\$180.00.

Textbooks of biochemistry usually make only brief references to zinc. The reader would not normally learn that Zn^{2+} is the most important Lewis acid in biochemistry, and that over two hundred zinc metalloenzymes are now known in various species. In fact, zinc is an essential micronutrient for all forms of life from microbes to man, and it appears to have a greater variety of biochemical functions—catalytic, regulatory, structural—than any other essential trace element. The breadth of the essential functions of zinc in life processes is indicated by the presence of zinc metalloenzymes in all six categories of the International Nomenclature Classification. Symptoms of zinc deficiency can appear in protean forms, and clinical diagnosis based on either symptomology or analysis of blood and other tissues is extremely difficult in the absence of a high index of suspicion. Nevertheless, there is a growing list of diseases and functional disorders either caused or exacerbated by zinc deficiency, and there is good evidence that the typical British diet provides less than two-thirds of the United States RDA for zinc for normal adults, and less than half of the RDA for pregnant women.

Accordingly, the appearance of this book is very timely. There are twenty-four chapters with contributions by twenty-nine authors. The breadth of coverage is indicated by the following chapter descriptions:

Chapter 1 covers general aspects of the physiology of zinc.

Chapter 2 is an introduction to the biochemistry of zinc by R. J. P. Williams, and provides an excellent over-view of zinc biochemistry.

Chapter 3 details the intestinal absorption of zinc, and emphasises the sometimes neglected role of malabsorption as a factor in zinc deficiency. (Chapter 19 is also relevant here).

Chapter 4 reviews the promoters and antagonists of zinc absorption, and ways in which the availability and biochemical functions of zinc can be influenced by other dietary components.

Chapters 5 & 6 deal with questions of systemic transport and systemic interactions of zinc respectively; these are usefully complementary to Chapter 4.

Chapters 7 & 8 deal with various aspects of zinc in cell division and tissue growth.

Chapters 9–18 cover various pathological aspects of zinc deficiency, including effects on reproduction and behaviour; the latter aspects covered in Chapters 11 and 14 are probably the most socially important of all pathological effects of zinc deficiency, not least because many psychiatrists and others in the social sciences still seem to be under the impression that psychosocial influences on behaviour, etc., are the only ones that really matter. Workers in these fields would be well advised to read Chapter 14 in particular. Zinc intakes higher than those readily available from diet may prove beneficial in cases involving malabsorption and in certain disease states. These aspects are reviewed in Chapter 19.

In Chapter 17, Dr P. J. Aggett discusses severe zinc deficiency quite well, though his statement that 'There is no evidence that zinc deficiency has any prominent role in anorexia nervosa' is a simple mis-statement of fact that is astonishing, coming as it does from one whom I had previously supposed to be an authority in the field. Apart from our own work on anorexia nervosa, Katz *et al.* (*J. Adolescent Health Care*, 8 (1987) 400–6) have independently reported a successful double-blind, randomised, controlled trial of zinc supplementation, and there have been two reports by Safai-Kutti and Kutti (*Amer. J. Clin. Nutr.*, 44 (1986) 581–2) of the successful use of zinc in treating anorexia nervosa. These are not the only reports of success in treating eating disorders by zinc supplementation, but they will do for a start. Unfortunately, there is a deeply entrenched idea among psychiatrists that eating disorders are basically psychosocial in origin. The idea that many or even most of these disorders can be successfully treated by two-pennyworth of zinc sulphate appears to be far too radical for the more traditionally-minded in the field of psychiatry. Animal studies on zinc and anorexia and other eating disorders are discussed in Chapter 11 (Zinc Status and Food Intake). Such studies obviously exclude psychosocial influences.

Chapter 20 provides an excellent review of the problem of diagnosing zinc deficiency. This problem has long been regarded as so difficult that the most reliable evidence for a zinc deficiency state has been considered to be an unequivocally beneficial response to zinc supplementation, but Dr Golden here makes a good case for diagnosis based on the level of metallothionein-I in erythrocytes. The reviewer's zinc taste-test for the diagnosis of zinc deficiency is not mentioned, though it is described in the *British National Formulary* (No. 16, 1988) as the most reliable test.

Chapters 21 & 22 deal with human zinc requirements and dietary sources.

Chapter 23 deals with adverse effects from excessive, usually grossly excessive, zinc intake by humans and experimental animals.

Finally, in Chapter 24, the editor contributes an overview of the present level of understanding, and lists various problems that await solution.

The general standard of these reviews is high, though Chapter 13 on the immunological aspects of zinc biochemistry is rather short, and does not do justice to this important aspect of the topic.

I warmly recommend this important book to all biochemists, nutritionists, and in general to all those interested in the biochemical origins of disease. My own review copy is already well-thumbed.

D. Bryce-Smith

Fat-Soluble Vitamin Assays in Food Analysis. By G. F. M. Ball. Elsevier Applied Science Publishers, London, 1988. ISBN 1-85166-239-1. xii + 326 pp. Price: £45.00.

This book comprises a comprehensive review of physico-chemical methods for determining the fat-soluble vitamins in foods and feedstuffs. The author describes their chemical structure, natural occurrence and biological activity in an early chapter, and then discusses aspects relevant to sample preparation. A chapter on non-chromatographic measurement of fat-soluble vitamins is then followed by the main chapters, which deal with the principles and applications of gas-liquid chromatography (GLC) and high performance liquid chromatography (HPLC) in the analysis of these vitamins.

The chapters on extraction and purification of vitamin-rich extracts are very useful and illustrate some of the precautions required to minimise losses of vitamins in the early stages of the analytical procedure. The chapters on GLC and HPLC analysis of fat-soluble vitamins provide rather more experimental detail than is really required, since if an analyst is trying to reproduce an analytical procedure he will surely go to the original paper in the literature. In addition, many of the analytical procedures described involve minor variations, and merely illustrate the range of stationary phases and mobile phases that can be used in the analysis of fat-soluble vitamins. Many chromatograms are reproduced in the book and this is valuable in allowing the analyst to assess the quality of the separation achieved by many of the procedures described.

The book is well referenced, with good quality diagrams and there appear to be few errors. The author has produced a very comprehensive review and this text is likely to be an essential purchase for scientists involved in the analysis of fat-soluble vitamins.

M. H. Gordon