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## BOOK REVIEW

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# Handbook on Metalloproteins

(Bertini, I., Sigel, A., and Sigel, H., eds., Marcel Dekker, New York-Basel, 2001, 1182 p., \$265)

The book contains 23 chapters written by an international group of authors that includes 43 recognized experts in the field of metalloproteins.

Chapter 1 written by the Editors is introductory and contains not only a short summary of studies in bioorganic chemistry, but also mainly acquaints the reader with the structure of the book, presents short characteristics of the chapters, and gives twelve Internet sites containing additional information about metalloproteins.

Chapter 2 (T. Larsen, G. Reed) is devoted to interaction of sodium and potassium with proteins. The chapter considers in detail proteins/enzymes with known and unknown structures, analyzes structural and functional specific features of such proteins as pyruvate kinase, fructose-1,6-bisphosphatase, tryptophanase, and other enzymes.

Chapter 3 (B. Fakler) considers the structure and functions of sodium and potassium protein channels in membranes of bacteria and mammals. Molecular mechanisms underlying membrane permeability for sodium and potassium are analyzed. The selectivity, activation, and inactivation of channels are also discussed in this chapter.

Chapter 4 (A. Matte, L. Delbaere) characterizes magnesium-activated enzymatic systems. The first part of the chapter describes chemistry of magnesium, specific features of this metal during its interaction with water, nucleotides, and organic phosphates. The chapter also considers magnesium metabolism in prokaryotic and eukaryotic cells. The subsequent parts of the chapter describe specific features of kinases, sphingomyelinase, DNA-polymerases, and other magnesium-activated enzymes.

Chapter 5 (A. Muranyi, B. Finn) considers calcium-dependent proteins/enzymes including calmodulin, S100 proteins, annexins, C2-domains, and lectins.

Chapter 6 (A. Butler et al.) presents data on vanadium-containing proteins and enzymes. Vanadium-containing haloperoxidases and nitrogenases are described.

Chapter 7 (R. Martin) discusses the role of chromium in proteins. Based on his own and literature data, the author concludes that living systems contain no complexes of chromium with proteins.

Chapter 8 (D. Weatherburn) contains data on manganese-containing enzymes and proteins. Oxidoreductases, transferases, hydrolases, lyases, isomerases, and ligases are considered. Manganese-containing proteins, such as lectins, integrins, the diphtheria toxin, and the mannose-6-phosphate receptor are analyzed.

Chapter 9 (P. Turano, Y. Lu) discusses data on iron in heme and in relative proteins. Cytochromes, globins, catalases, peroxidases, cytochrome P450, and other proteins are characterized.

Chapter 10 (D. Bentrop et al.) considers iron- and sulfur-containing proteins. These proteins contain two or more iron ions bound by sulfide ionic bridges to thiol ligands of cysteine residues.

Chapter 11 (P. Nordlund) considers structural and functional features of iron-containing proteins which also contain oxygen and nitrogen. Lipooxygenases, dioxygenases, estradiol dioxygenases, and other proteins are discussed.

Chapter 12 (F. Arnesano, A. Provenzani) presents data on iron homeostasis of eukaryotes and bacteria. The main accents is given to structures of ferritins and mechanisms of iron storage and transportation by transferrins and lactoferrin.

Chapter 13 (J. Pratt) summarizes data on cobalt in vitamin B<sub>12</sub> and in a number of enzymes. The main attention is given to B<sub>12</sub>-dependent mutases (isomerases) and also to B<sub>12</sub>-dependent methyltransferases.

Chapter 14 (S. Ciurli, S. Mangani) analyzes data on nickel-containing enzymes. Urease, hydrogenase, and methyl coenzyme-M-reductase are discussed.

Chapter 15 (M. Halcrow et al.) considers copper-containing proteins, their transport, activation of oxygen, and reduction of inorganic molecules. A number of enzymes with known structure are considered: galactose oxidases, aminooxidases, peptidylglycine- $\alpha$ -hydroxylating monooxygenase, hemocyanin, catechol oxidases, and cytochrome *c* oxidases.

Chapter 16 (P. Lindley) considers oxidases containing several copper ions (multicopper oxidases). Data are presented on ascorbate oxidase, laccase, nitrite reductase, and human ceruloplasmin. A separate part of the chapter

considers coagulating factors V and VIII and their role in the blood coagulation.

Chapter 17 (A. Vila, C. Fernandez) discusses the role of copper in electron-transporting proteins: plastocyanin, amicyanin, pseudoazurine, etc.

Chapter 18 (P. Lindley) summarizes data on copper-containing proteins with different functions. Data are presented on serum albumin, Cu/Zn superoxide dismutase, and metallothioneins.

Chapter 19 (D. Auld) presents data on metalloenzymes and on zinc-containing proteins. Attention is mainly given to characteristics of protein centers responsible for the binding of zinc.

Chapter 20 (G. Folkers) also considers zinc-containing proteins, and especially accentuates characteristics of the zinc-binding centers in proteins.

Chapter 21 (E. Babini, M. Viezzoli) presents data mainly on two zinc-containing proteins: metallothioneins and insulin.

Chapter 22 (C. Garner et al.) summarizes reports on enzymes/proteins containing molybdenum and tungsten.

By now, more than thirty various molybdenum-containing oxotransferases have been found, and they play an important role in all living organisms: bacteria, plants, and animals.

Chapter 23 (J. Prat) elucidates "ardent points" in studies on metalloproteins and also sets new problems and outlines new approaches which are promising for new studies. In particular, prospects are discussed in comprehension of Mg-ATPase functions which provides proton penetration through membranes and is the tiniest motor known to date.

Overall, the book is reference for specialists in biochemistry, bioorganic chemistry, bioinorganic chemistry, biotechnology, and analytical chemistry. No doubt it is an excellent manual for university professors and students in biology and chemistry. The fine design of the book, numerous figures including colored illustrations, combined tables and plots, the subject index, and voluminous bibliography for each chapter (altogether about 4500 sources) also increase the scientific level and availability of the matter presented.

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