

Book review

Metal Ions in Life Sciences. Vol. 2. Nickel and its Surprising Impact in Nature, A. Sigel, H. Sigel, R.K.O. Sigel (Eds.). John Wiley and Sons, Ltd., Chichester, UK (2007). 728 pp., ISBN: 978-0-470-01671-8, US \$390.00

The series “Metal Ions in Life Sciences” succeeds the series on “Metal Ions in Biological Systems” which had been founded in 1973 by A. and H. Sigel and continued for more than 30 years with the publication of 44 volumes. The decision to devote Volume 2 of the new series to the bioinorganic chemistry of nickel is highly appropriate because of the many emerging facets of this actually young element in biology and biochemistry and the vibrant research conducted in the field and its dynamic development.

The 17 chapters in altogether 700 pages start with two contributions on the geobiochemical sources, the fluxes and deposition of nickel and on the environmental role both as micronutrient and as toxic element with special emphasis on Ni hyper-accumulating plants and their mechanism to avoid toxicity. Chapter 3 provides the inorganic chemical and physico-chemical fundamentals for most of the follow-up articles. It gives a very detailed account of the reactivity of nickel in a biological environment, especially its ability to form complexes with small molecules, polysaccharides, nucleic acids and peptides and proteins. It is followed by a chapter on models of the active sites of the diverse Ni-dependent enzymes, a very timely area because of putative applications like the formation of elemental hydrogen by biomimetic models of the active centre of NiFe-hydrogenases. A placement of this chapter in the book after those dealing with the discussion of the various enzymes would have been appropriate since it would have saved the redundant discussion of the natural systems and their mechanism of action.

The trait of Ni-dependent enzymes which fascinates most is the diversity of the reactions which they catalyse. Consequently, each enzyme class is presented in an individual chapter. They deal with urease, the first protein to be crystallized

but not demonstrated to contain nickel until about 50 years later, NiFe-hydrogenase, methyl CoM-reductase, CO-dehydrogenase, superoxide dismutase, glyoxalase, Ni-dependent prolyl *cis-trans* isomerase, and acireductone reductase. In each case, in-depth information is given on the structure, mechanism of action and physiological role of the relevant protein. Since nickel is a toxic element, at least at higher concentrations, metal homeostasis is an important task for an organism. The chaperones involved in Ni homeostasis are discussed in a separate contribution, although its information could have presented side-by-side in the form of a biosynthesis paragraph within the articles dealing with the individual enzymes. Next, the intriguing role of nickel in the gastric adaptation of *Helicobacter pylori* and the role of urease and NiFe-hydrogenase in this process are presented together with the details on nickel uptake by the cells and the regulation of the expression of the genes by the metal. The book concludes with a contribution on nickel toxicity for animals and man with special emphasis on carcinogenesis, describing what is known about uptake, binding to, and damage of bio-molecules in the cause of respiratory tract malignancy.

All chapters of the book are authoritatively written by experts involved in the promotion of the field. The treatise is comprehensive, it presents the latest information, the articles are well structured and easy to read and the text is fortified by numerous well-designed figures, a huge number of them in colour. Overall, this is a superb book which serves the novice, but even more the expert, in this highly interdisciplinary field.

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