Available online at www.sciencedirect.com
ScienceDirect
Coordination Chemistry Reviews 251 (2007) 1309–1310
COORDINATION CHEMISTRY REVIEWS
www.elsevier.com/locate/ccr

Book review

Metal Ions in Life Sciences, A. Sigel, H. Sigel, R.K.O. Sigel (Eds.). Neurodegenerative Diseases and Metal Ions, Vol. 1. J. Wiley & Sons Ltd., Chichester, 2006. ISBN: 0-470-01488-1, ISSN: 1559-0836

Comedians quip that "the old ones are the best!"; this is certainly true when selecting the human species to open a new era of reviews in bioinorganic science. Our ageing population, each one having *circa* 180 000 kilometres of nerves and about 20 billion neurons in their cerebral cortex, possess innumerable opportunities for biochemical aberrations to occur.

A fundamental understanding of biological error processes can lead to active prevention and to efficient repair. Thus, the topic for this first volume of Metal Ions in Life Sciences (MILS) could not have been more appropriately chosen. 'Neurodegenerative Diseases and Metal Ions' is the title of this opening volume of this new series built upon the successes of Metal Ions in Biological Systems (MIBS), of which volume 1 was published in 1974 (titled '*Simple* Complexes'! If only we had known what the future held!); there have been 44 volumes of MIBS in total.

The research topics are reviewed in this new volume with both thoroughness and enthusiasm and will motivate undergraduates in the life and physical sciences to master the essentials of their *simple* coordination chemistry modules – in ligand field, in molecular orbitals, etc. – in order to experience the challenges of this latest series which has now been broadened out to *all* of the life sciences; to a student – "Education is a process of diminishing deception!"

Neurodegenerative disease usually involves misfolding of neurological proteins caused by metal ions or complex species. Particular nuisances are the redox metals such as copper, iron, manganese, and also those metal ions, such as aluminium, which sport high charge densities. Another type of mischief, in addition to misfolding, is that of the neurotoxicity caused by HSAB soft metal ions such as cadmium, lead and mercury. Zinc, although it does not redox, is essential in balanced ratios – mainly copper:zinc – for health in humans; it is also implicated in oxidative stress syndromes involving essential copper, iron and manganese.

Both the overall challenges of public health and of environmental influences are tackled. Over the last 150 years our expected life-spans from birth have doubled from *circa* 40–80 years but variations in eating habits, lifestyles, and presence of trace-element impurities adhering to our foods (18–19th century hunter-gatherers to modern-day, scrupulously cleaned, and packaged modern foods) and the physiological variations of uptakes from intakes as one ages has generally lead to decreasing quantities of the essential trace elements being in the brain but to increasing amounts of "environmental" elements – both challenging the neuroproteins, i.e. there's more of the metals that do the damage but less to facilitate repair!

New researchers are urged to read the introductory chapter which clearly corrects the true role of metal ions in neurology; whereas the heavier metal ions went relatively unnoticed by early biochemists because they were not linked to major disease syndromes, Strozyk and Bush point out that the analytical presence of Fe, Cu and Zn in gray matter equates to Mg concentrations but last century term "trace-metals" de-emphasized their true essential roles!

Since the blood–brain barrier discourages the direct uptake of transition metal ions it is suggested that the aetiology of neuro-degenerative disease is more likely to be from biochemical homeostatic malfunction, rather than caused directly by nutritional trends or environmental challenges, i.e. there is no obvious causal analytical relationship with either nurture or nature.

A most useful organisational scheme for neurological diseases involving metal ions is proposed and most of the phenotypes have a keynote chapter in this volume—Wilson's, Menkes', Hallervorden-Spatz's, Friedreich's, Alzheimer's, Parkinson's, Drusen-Sorsby's, Huntington's, etc. and many other pathology or symptom named conditions such as metallic prions.

Two of the main objectives being reviewed in this volume are reliable probes to quantify metal-dependent anomalies and drugs, which repair such biochemistries. Future volumes also address these questions (volume 2 covers nickel, 3—the cytochrome P350 proteins, and 4—biomineralisation).

The success of this area of research has arisen from *multidisciplinary* teams of well trained specialists in the fundamental sciences of inorganic chemistry, biochemistry, physics, computer science, etc. being moulded into research groups, all of whom have a clear understanding of the overall problem being tackled. Over the last three decades such MIBS reviews have enabled all members of such groups to see the targets and to cross communicate. This is not the same as teams of *interdisciplinary* researchers whose mastery is limited to a lesser knowledge of two or more subjects!

Whereas drug companies may have regarded the early volumes of MIBS as having novelty values (see trace elements comment), this new series of MILS will be a pivotal feature of all libraries as clinical trials of metallotropic drugs used against

0010-8545/$ – see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.ccr.2006.10.017

Alzheimer's disease, Parkinson's, macular degeneration, etc. are reported.

These volumes are available as print editions, as e-books and as o-books carrying both ISBN and ISSN numbers. Some of the illustrations have greater clarity because they are in colour. Concepts are bang up-to-date by breaking research news appearing as reference notes. In 1974 volume 1 of MIBS used 11 authors and 6 chapters of average length 41 pages; the 2006 MILS volume 1 has 41 authors, 15 chapters and averages 29 pages. I perceive at least 15 disciplines represented by the authors. Although the average age of the two editors has increased annually, the introduction of a third editor (genetically related!) has restored the youthful bounce with which the first series was launched. Long may they continue!

David R Williams
Cardiff University, Chemistry, Main Building,
Cardiff UK CF10 3AT,
United Kingdom
E-mail address: williamsd@cardiff.ac.uk

31 October 2006

Available online 6 December 2006