NEUROTOXICITY OF CADMIUM, LEAD, AND MERCURY HANA R. POHL, HENRY G. ABADIN, AND JOHN F. RISHER pdf

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Pohl, H. R., Abadin, H. G. and Risher, J. F. () Neurotoxicity of Cadmium, Lead, and Mercury, in Neurodegenerative Diseases and Metal Ions, Volume 1 (eds A. Sigel.

Katsuyuki Aoki and Kazutaka Murayama 43 Abstract Campbell and Stephen Neidle Abstract The Biological Significance of Metal Sensing Morrow and Christopher M. Clever and Mitsuhiko Shionoya Abstract Gray, and Jay R. Ward and Robert R. Jameson, and Kurt A. Jellinger 12 Zinc Metalloneurochemistry: Physiology, Pathology, and Probes Christopher J. Chang and Stephen J. Abadin, and John F. Risher 15 Neurodegerative Diseases and Metal Ions. Lindahl and David E. Bryngelson and Michael J. Mulrooney, and Robert P. An Introduction Mary A. Schuler and Stephen G. Poulos and Yergalem T. Fleming, and Lisandra L. Contakes, and Harry B. McLean, and Hazel M. De Voss and Max J. Bell, Nicola Hoskins, Christopher J. Whitehouse, and Luet L. Wong 15 Chemical Defense and Exploitation. Gillam and Dominic J. Peter Guengerich 17 Cytochrome P Enzymes: Observations from the Clinic Peggy L. Carver Subject Index Volume 4 Biomineralization. From Nature to Application 1 Crystals and Life: Wilt and Christopher E. Hunter and Terry J. Beveridge 5 Biomineralization of Calcium Carbonate. Baran and Paula V. Lichtenegger, Henrik Birkedal, and J. Herbert Waite 10 Ferritin. Biomineralization of Iron Elizabeth C. Recorders of the Past? Danielle Fortin, Sean R. Paine 16 Mechanical Design of Biomineralized Tissues.

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2: Neurodegenerative diseases and metal ions in SearchWorks catalog

14 NEUROTOXICITY OF CADMIUM, LEAD, AND MERCURY (Hana R. Pohl, Henry G. Abadin, and John F. Risher). 15 NEURODEGENERATIVE DISEASES AND METAL IONS. A CONCLUDING OVERVIEW (Dorothea Strozyk and Ashley I. Bush).

Jenkins and Chris F. Ragsdale and Mishtu Dey Tinorganyls. Abadin and Hana R. Kligerman, and Roland A. Hirner and Albert V. Rettenmeier Subject Index Comments and suggestions with regard to contents, topics, and the like for future volumes of the series are welcome. General Aspects and Disease Etiology 7. Metallothionein-Related Biomonitoring in Diseases 7. Biomarker of Susceptibility 7. Metallothionein in the Treatment of Diseases 8. The history on research of metallothionein is reviewed. Various methods for isolation, characterization, and quantification are evaluated. The role of metallothionein in metal metabolism and toxicity is explained. Gender differences and polymorphism as well as possible relationships with diseases are discussed. The review is based on data from the literature and on own original experimental and epidemiological data. Aspects on future research within the metallothionein field are indicated. Research on MT has been going on for more than 50 years and this chapter displays the progress made; it reviews the biochemical and experimental methods used in this research since the beginning. Many metal binding proteins are known with a specific function of the metal ion s , e. Metallothionein is a protein as well and importantly, it also serves functions in the cell; sometimes it is mentioned in relation to chelators because of its capacity to bind metal ions. Below we give an overview on the historical development of MT research. We concentrate mainly on mammalian metallothioneins and indicate also several of the aspects discussed in other chapters. Since the early days, both isolation and characterization as well as the role of MT in Cd toxicology [1,2] have contributed to the understanding of MT and its role as a general sequestering protein for toxic metals also reducing cellular occurrence of reactive oxygen species. Small amounts of cadmium had been shown to be present in tissues and body fluids in several animal species. Various hypotheses were postulated to explain this unexpected finding: Either would cadmium be coordinated to a macromolecule and then have a natural function in biological systems or else cadmium could just be a contaminant. In the first detailed report on metallothionein was published [5,6]. Isolation was performed from five frozen horse kidneys with for that time conventional methods. The specific absorption at nm was explained by cadmium mercaptide charge transfer bonds. Metallothionein was assumed to lack aromatic amino acids as indicated by the absence of an absorption at nm. This was later verified by amino acid analyses [7,8] which also showed that the high sulfur content was due to cysteine. At that time reactive mercapto groups in proteins were determined by titration with silver ions, CMB, and N-ethylmaleimide. Amino acids were identified by two-dimensional paper chromatography and ion exchange chromatography. Cysteine residues were quantified as cysteic acid after oxidation of metallothionein with performic acid and as derivates of N-ethylmaleimide. The sedimentation constant was determined via a Schlieren diagram by sedimentation in an ultracentrifuge at 1. The diffusion constant, i. The estimated molecular weight of the protein was still varying from â€” This was in part explained by the formation of various artefacts during preparation. Metal analyses gave 5. Some exchange between zinc and cadmium was obviously taking place. It was suggested that bonding with three deprotonated SH-groups and one atom of either cadmium or zinc occurred. As part of the research of the Swedish group on the health effects caused by cadmium, a study on rabbits [9] showed that cadmium-metallothionein could be induced by repeated injections of small doses of cadmium. A single high dose of cadmium [1] was found to be more toxic to the organism giving rise to liver damage and lethality, while the same dose administered as several small doses during a prolonged exposure time gave no such effects. In fact, animals with induced metallothionein synthesis by pretreatment with smaller doses of cadmium developed resistance to acute toxicity to the liver [1] and the testes Met. Isolation of the cadmium-binding protein from livers of cadmium exposed rabbits showed an increase of metallothionein in relation to the administered dose or amount of

cadmium present [7]. In animals protected by pretreatment, cadmium in the target tissues, liver and testis, was bound to a low molecular weight protein corresponding to metallothionein. After homogenization of the tissues rivanol was applied to precipitate high molecular weight proteins and cell fragments. Several steps of precipitation, dialyses, and various gel chromatography steps were carried out, as Sephadex gel had previously been introduced into protein chemistry. The initial assumptions by Piscator in [9] were later confirmed in these animal experiments which demonstrated indeed that exposure to cadmium increased the concentration of metallothionein in the liver. These findings gave further support to the original ideas of metallothionein induction as a mechanism of making tissue less sensitive to cadmium toxicity. In this group [11â€”13], working with the toxicity and kinetics of cadmium, it was known that cadmium gave rise to adverse health effects upon increasing exposure, particularly to renal damage. Metallothionein research now continued or developed into two tracks â€” one in protein chemistry and another one focusing on kinetics and toxicity of cadmium and other metal ions. However, all studies demanded pure and well characterized metallothionein and this was prepared with techniques modern at that time. Tissue was homogenized in a buffer system, mostly of Tris-HCl in sodium chloride with a pH of 8. This step was followed by ultracentrifugation at gav and the supernatant was taken for gel chromatography Sephadex gel G If the absorption ratio at and nm was low, improvement could be achieved in one step by Sephadex G used for preparative purposes. When the fractions eluted as MT on G Sephadex were separated on G, a protein was isolated with a high absorption at nm and no metal content [11]. Further separation by isoelectric focusing or ion exchange chromatography after concentrating and desalting by ultrafiltration on UM-2 filters with a cut off level for a molecular weight of [7] showed different fractions containing MT. Further separation by isoelectric focusing of rabbit liver revealed at least three major forms of MT with pI 3. To be successful with the preparation of metallothionein from tissue it became obvious quite early that avoidance of oxidation of the protein by rapid preparation and working at a cool temperature was crucial. Mercaptoethanol could, however, restore oxidized metallothionein [12,13] as shown by gel chromatograpy on Sephadex G where metallothionein showed up at the ordinary position after treatment with mercaptoethanol. An important contribution to the tertiary structure was made [14] when two metal clusters were described, i. The a-domain constitutes the C-terminal and the b-domain the N-terminal end of the protein. The other track of research already indicated above expanded to the importance of MT for different metal ions, in particular for copper [15] and mercury [16â€”18]. Pioneering work [10] showed that MT could protect against testicular damage caused by cadmium. Knowledge on MT and its involvement in the transport of cadmium and that cadmium is partly present in blood [2] bound to MT led to a metabolic model for cadmium toxicity. The identification of a cadmium-binding protein in mammals, which was first believed to have a high molecular mass, turned out to be a low molecular mass protein see also Chapter As part of the research on cadmium and adverse health effects in Sweden, a project on MT was developed and it was shown that MT is a most important protein in the metabolism and kinetics of cadmium in animals and humans. Methods for isolation and characterization of MT were developed. To study the history of MT also means to consider available analytical techniques and methods. The combination of available knowledge about protein separation and radioactive techniques made it possible to isolate, characterize, and study the role of MT [1]. However, an increasing number of publications in which a different nomenclature for MT was used made it clear that an evaluation of the knowledge available at that time would be of importance. Hence, a workshop with approximately 25 invited participants, who had submitted background manuscripts, was arranged and a tentative report [20] was prepared and distributed in advance to each participant. Agreement on the nomenclature of MT in the mentioned first workshop [20,21] stimulated interest in MT research. The official designation in the SwissProt proteins data base and the MCBI data base Medical Center for Biotechnology Information , which deals with the genome and also gives proteins, uses Arabic numbers, e. Perhaps more importantly, the Met. Further issues on nomenclature can be found on the website: In-between a meeting had been arranged in Aberdeen in Other meetings have focused on various areas of interests, e. A variety of meetings with different themes and approaches followed Table 1 [24â€”27]. History of

metallothionein and important workshops. Initially it followed two tracks, i. Among the metal ions especially cadmium and zinc were in the focus, but to some extent also copper. Of course, matters developed further and in a high intake of Cd-containing seafood and shellfish by human consumers in New Zealand was reported [28] and it was also shown that the chemical species containing Cd was different in two species of oysters. Cd-binding proteins identified in foodstuff have been reviewed by Petering and Fowler [29]. The chemical species containing Cd, particularly its binding to metallothionein-like proteins, is of importance for the uptake, distribution, and toxicity of Cd. These insights are of relevance with regard to the outcome of human exposure to metals in the form of MT. The number of publications per year has increased over time and a recent search on Medline for the years to late gives nearly publications and the corresponding search in Pubmed provides almost hits. New techniques developed from molecular biology have confirmed earlier findings, opened new aspects, and made this rapid progress possible. Major hallmarks of MT are the amino acids that vary between 61â€” Specific absorption occurs at Zn , Cd , Hg , and nm Cu. Synthesis of MT-1 and -2 is induced by Cd21 and Zn There are no disulfide bonds and MT is regarded as heat-stable. It is mainly localized in the cytoplasm. Metallothioneins exist in four major forms, MT-1 to MT MT-3, present in brain and renal tissue see Chapters 10 and 11 , is not inducible by Cd as are MT-1 and 2. MT-1 also occurs in several isoforms and MT-4 is expressed in keratinocytes. In humans the gene is localized on chromosome 16 and in the mouse on chromosome 8 see also Chapter 2. Metallothionein has been isolated from the liver and several other tissues of animals. Its synthesis is induced by Cd21, Zn21, and other metal ions or stress [20,32,33] see Chapter

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3: CiNii å›³æ›¸ - Neurodegenerative diseases and metal ions

[et al.] -- Zinc metalloneurochemistry: physiology, pathology, and probes / Christopher J. Chang and Stephen J. Lippard -- The role of aluminum in neurotoxic and neurodegenerative processes / TamÃ¡s Kiss, Krisztina Gajda-Schrantz, and Paolo F. Zatta -- Neurotoxicity of cadmium, lead, and mercury / Hana R. Pohl, Henry G. Abadin, and John F.

Biochemistry Back cover copy Metal Ions in Life Sciences links coordinationchemistry and biochemistry in their widest sense and thus increasesour understanding of the relationship between the chemistry ofmetals and life processes. The series reflects theinterdisciplinary nature of Biological Inorganic Chemistryand coordinates the efforts of scientists in fields likebiochemistry, inorganic and coordination chemistry, molecular andstructural biology, enzymology, environmental chemistry, physiology, toxicology, biophysics, pharmacy, and medicine. Consequently, the volumes are an essential source for researchersactive in these and related fields as well as teachers preparingcourses, e. Volume 1, offers in 15 stimulating chapters anauthoritative view of the fascinating research onNeurodegenerative Diseases and Metal Ions. The interplay between metal ions, catecholamines and the formation of reactive oxygen speciesresulting in oxidative stress is considered, as is themetalloneurochemistry of zinc and the neurotoxicity of aluminum, cadmium, lead, and mercury. The need for novel drugs whichmanipulate metal-centered neuropathology is emphasized. With morethan references this book is a vital resource forscientists and advanced students. Gray, and Jay R. Bayer and Gerd Multhaup. Youdim, and Peter Riederer. Tishler, and Susan Perlman. Ward and Robert R. Jameson, and Kurt A. Chang and Stephen J. Abadin, and John F. Coordination Chemistry Reviews , Dec show more Review quote "This is a worthwhile contribution that should have a broad audience. He serves on various editorial and advisory boards, published over articles on metal ion complexes of nucleotides, coenzymes, and other biologically relevant ligands. Among further honors are the P. He received his doctoral degree summa cum laude from the University of Dortmund, Germany, working with Bernhard Lippert; thereafter he spent nearly three years at Columbia University, New York, USA, in the group of Anna Marie Pyle now Yale University ; during the six years abroad he received several fellowships from various sources. His research focuses on the structural and catalytic role of metal ions in ribozymes, especially group II introns, and on related topics.

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4: Interplay between Metal Ions and Nucleic Acids - PDF Free Download

Hana R Pohl of Centers for Disease Control and Prevention, GA (CDC) with expertise in: Xenobiology and Toxicology. Henry G Abadin. John L Irwin. cadmium, copper, lead, mercury, tin or zinc.

Bibliographic record and links to related information available from the Library of Congress catalog. Contents data are machine generated based on pre-publication provided by the publisher. Contents may have variations from the printed book or be incomplete or contain other coding. Gray, and Jay R. The Denatured State 4. Protein Folding Dynamics 5. Historical Connections between Copper and Transmissible Spongiform 3. Copper Binding to Prion Protein 4. Copper Coordination by Prion Protein 5. Copper Uptake and Prion Protein Internalisation 6. Prion Protein as an Antioxidant 7. Transmissible Spongiform Encephalopathies and Metals 9. Bayer and Gerd Multhaup 1. Youdim, and Peter Riederer 1. Iron in the Ethiology of Parkinson? Sources of Increased Iron in Parkinson? Consequences of Iron Overload in Parkinson? Tishler, and Susan Perlman 1. Puzzling Changes in Cell Numbers in Huntington? Human Brain Development and Disease Phenotypes 3. Oligodendrocytes and Iron in Brain Development and Degeneration 4. Transition Metal Metabolism and Proteinopathies 5. In Vivo Measurement of Brain Iron 6. Novel Treatment Considerations 7. Monomeric SOD1 and Pathogenesis 7. Genes Identified in Copper-Transport Disorders 4. Treatment of Copper-Transport Disorders 6. Ward and Robert R. The Importance of Iron in Brain 6. The Involvement of Iron in Neurodegenerative Diseases 7. Experimental Approaches to Brain Iron Loading 8. Jameson, and Kurt A. Relevant In Vitro Chemistry 4. Relevant Manganese Chemistry 6. Manganese and Manganosis 7. Other Metal Ions and Catecholamines 8. Chang and Stephen J. Zinc in the Brain 3. Zinc Sensing for Neuroscience Applications 4. Small-Molecule Fluorescent Probes for Zinc 6. Chemical Forms of Aluminum in Biological Systems 3. Aluminum Loading in Humans 4. Toxicology of Aluminum in Animals and Humans 5. Abadin, and John F. Nervous system -- Degeneration.

5: Neurodegenerative Diseases and Metal Ions : Astrid Sigel :

Cadmium, lead, and mercury under normal conditions are found in breast milk at concentration ranges of < 1 microgram/L, micrograms/L, and micrograms/L, respectively.

6: Table of contents for Neurodegenerative diseases and metal ions

The interplay between metal ions, catecholamines and the formation of reactive oxygen species resulting in oxidative stress is considered, as is the metalloneurochemistry of zinc and the neurotoxicity of aluminum, cadmium, lead, and mercury.

7: Metallothioneins and Related Chelators (Volume 5) (Metal Ions in Life Sciences) - PDF Free Download

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