



The bioaccessibility of adsorped heavy metals on biofilm-coated microplastics and their implication for the progression of neurodegenerative diseases

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Abstract Microplastic (MP) tiny fragments (< 5 mm) of conventional and specialized industrial polymers are persistent and ubiquitous in both aquatic and terrestrial ecosystem. Breathing, ingestion, consumption of food stuffs, potable water, and skin are possible routes of MP exposure that pose potential human health risk. Various microorganisms including bacteria, cyanobacteria, and microalgae rapidly colonized on MP surfaces which initiate biofilm formation. It gradually changed the MP surface chemistry and polymer properties that attract environmental metals. Physicochemical and environmental parameters like polymer type, dissolved organic matter (DOM), pH, salinity, ion concentrations, and microbial community compositions regulate metal adsorption on MP biofilm surface. A set of highly conserved proteins tightly regulates metal uptake, subcellular distribution, storage, and transport

to maintain cellular homeostasis. Exposure of metal-MP biofilm can disrupt that cellular homeostasis to induce toxicities. Imbalances in metal concentrations therefore led to neuronal network dysfunction, ROS, mitochondrial damage in diseases like Alzheimer's disease (AD), Parkinson's disease (PD), and Prion disorder. This review focuses on the biofilm development on MP surfaces, factors controlling the growth of MP biofilm which triggered metal accumulation to induce neurotoxicological consequences in human body and strategies to reestablish the homeostasis. Thus, the present study gives a new approach on the health risks of heavy metals associated with MP biofilm in which biofilms trigger metal accumulation and MPs serve as a vector for those accumulated metals causing metal dysbiosis in human body.

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Metals And Neurodegenerative Diseases An Introductory Text

Paolo Zatta



Metals And Neurodegenerative Diseases An Introductory Text:

Heavy Metal Toxicity and Neurodegeneration Prasann Kumar, Neha Gogia, 2025-08-01 Heavy Metal Toxicity and Neurodegeneration delves into the intricate relationship between heavy metals and neurodegenerative diseases. It synthesizes and presents the latest research findings, shedding light on the mechanisms by which heavy metals cause neuronal damage and contribute to disease progression. By integrating various perspectives and collating diverse studies, this book serves as an invaluable resource for those seeking to understand the profound impact of heavy metals on neurological health. In addition to detailing the mechanisms involved, the book highlights the importance of early detection and preventive measures. It caters to researchers, clinicians, policymakers, and students, offering a comprehensive and accessible overview that bridges the gap between theory and practical application. This scholarly work is poised to inform and guide future research and policy decisions in the field of neurodegenerative disease.

Provides a comprehensive overview of how heavy metals interact with biological systems, particularly the nervous system. Explains the mechanisms through which metals contribute to neurodegenerative diseases. Highlights the public health implications of heavy metal exposure, including its impact on vulnerable populations such as children and older people.

Progress in Neurodegeneration Maria Rosa Avila-Costa, Veronica Anaya Martinez, 2009

Metal Ions and Neurodegenerative Disorders Paolo Zatta, 2003

Numerous studies have established a clear connection between neuronal oxidative stress and several neurodegenerative diseases, with consequential damages to lipids, proteins, nucleic acids, etc. In addition, several modifications indicative of oxidative stress have been described in association with neurons, neurofibrillary tangles, and senile plaques in Alzheimer's disease, including advanced glycation end products and free carbonyl oxidation. Oxidative damage and antioxidant responses are now well characterized, but sources of damaging free radicals are yet to be fully understood. Evidences of alteration in metal ion metabolism have been reported in various diseases like Alzheimer's, Wilson, Menkes, Prion, Pick, Huntington disease, epilepsy, and other pathological events. Thus, metal ions play a pivotal role in neurodegenerative phenomena. Chelation therapy is still in the early days of its development, but research in this area could lead to new products that could revolutionize treatment.

Two international conferences on OC Metals and the Brain: From Neurochemistry to Neurodegeneration (OCO), Padova, Italy, 2000 and Fez, Morocco, 2002, were recently held to discuss the role of metal ions in neurophysiopathology. A third will be held in 2005 in Johannesburg, South Africa. This book follows the same train of thought as those conferences in order to highlight the unquestionable importance of metal ions in the research on the neurophysiopathology of neurodegenerative diseases. The excellent reputation of the scientists who have contributed to this project ensures the quality of the chapters presented here, and hopefully, this will help spur new research initiatives in the field, which is still in its infancy.

Contents: Metal Catalyzed Redox Activity in Neurodegenerative Disease; M. A. Taddeo et al. Aluminum and Central Nervous System Morphology in Hemodialysis; E. Reusche. Transition Metals Oxidation Lipoproteins and Amyloid Major Players in Alzheimer's Disease; A.

Kontush Molecular Basis of Copper Transport Cellular and Physiological Functions of Menkes and Wilson Disease Proteins ATP7A and ATP7B D R Kramer et al Copper Zinc Superoxide Dismutase and Familial Amyotrophic Lateral Sclerosis M B Yim et al Copper and Prion Disease J Sasson Metallothioneins in Neurodegeneration M Aschner et al Iron and Neurodegeneration S L Grab Iron Neuromelanin and Synuclein in Neuropathogenesis of Parkinson s Disease K L Double et al Iron and Epilepsy W Y Ong et al Role of Iron Metabolism in Multiple Sclerosis M J Kotze et al Neuroprotective Effects of Lithium S Ermidiou Pollet and other articles Readership Academics graduate students and researchers in neurology psychiatry neuroscience and environmental health

Metals and Neurodegeneration: Restoring the Balance Anthony R. White, Katja M.

Kanninen, Peter J. Crouch, 2016-02-02 Biometals such as copper zinc and iron have key biological functions however aberrant metabolism can lead to detrimental effects on cell function and survival These biometals have important roles in the brain driving cellular respiration antioxidant activity intracellular signaling and many additional structural and enzymatic functions There is now considerable evidence that abnormal biometal homeostasis is a key feature of many neurodegenerative diseases and may have an important role in the onset and progression of disorders such as Alzheimer s Parkinson s prion and motor neuron diseases Recent studies also support biometal roles in a number of less common neurodegenerative disorders The role of biometals in a growing list of brain disorders is supported by evidence from a wide range of sources including molecular genetics biochemical studies and biometal imaging These studies have spurred a growing interest in understanding the role of biometals in brain function and disease as well as the development of therapeutic approaches that may be able to restore the altered biometal chemistry of the brain These approaches range from genetic manipulation of biometal transport to chelation of excess metals or delivery of metals where levels are deficient A number of these approaches are offering promising results in cellular and animal models of neurodegeneration with successful translation to pre clinical and clinical trials At a time of aging populations and slow progress in development of neurotherapeutics to treat age related neurodegenerative diseases there is now a critical need to further our understanding of biometals in neurodegeneration This issue covers a broad range of topics related to biometals and their role in neurodegeneration It is hoped that this will inspire greater discussion and exchange of ideas in this crucial area of research and lead to positive outcomes for sufferers of these neurodegenerative diseases

Metal-Based Neurodegeneration Robert Crichton, Roberta Ward, 2013-09-04 Neurodegenerative diseases of the human brain appear in various forms resulting in disorders of movement and coordination cognitive deterioration and psychiatric disturbances Many of the key factors leading to neurodegenerative diseases are similar including the dysfunction of metal ion homeostasis redox active metal ions generating oxidative stress and intracellular inclusion bodies Metal based Neurodegeneration presents a detailed survey of the molecular origins of neurodegenerative diseases Each chapter is dedicated to a specific disease presenting the latest scientific findings including details of their biochemical actors proteins or peptides their normal and pathological

conformations and a description of the diseases characteristics with an emphasis on the role of metal induced oxidative stress which can result in the production of intracellular aggregates of target proteins and peptides Topics covered include Brain function physiology and the blood brain barrier Immune system and neuroinflammation Aging and mild cognitive impairment MCI Parkinson s Disease Alzheimer s Disease Creutzfeldt Jakob and related prion diseases Alcoholic Brain Damage Therapeutic strategies to combat the onset and progression of neurological diseases This extensively updated full colour second edition of Metal based Neurodegeneration is an essential text for research scientists and clinicians working in gerontology neuropathology neurochemistry and metalloprotein mechanisms *Metal Related Neurodegenerative Disease* ,2013-11-07 This issue reviews the role of metals in neurodegenerative diseases including Parkinson s and Huntington s disease restless leg syndrome and NBIA disorders and Wilson s disease and manganese and calcium accumulation disorders An update on advances in neuroimaging and pathology of metal related disease is also presented This volume of International Review of Neurobiology brings together cutting edge research on metal related neurodegenerative disease It reviews the role of metals in neurodegenerative diseases including Parkinson s and Huntington s disease restless leg syndrome and NBIA disorders and Wilson s disease and manganese and calcium accumulation disorders An update on advances in neuroimaging and pathology of metal related disease is also presented **The American journal of clinical nutrition** ,1954

Neurodegenerative Diseases and Metal Ions Astrid Sigel, Helmut Sigel, Roland K. O. Sigel, 2006-07-11 About the Series Metal Ions in Life Sciences links coordination chemistry and biochemistry in their widest sense and thus increases our understanding of the relationship between the chemistry of metals and life processes The series reflects the interdisciplinary nature of Biological Inorganic Chemistry and coordinates the efforts of scientists in fields like biochemistry inorganic chemistry coordination chemistry molecular and structural biology enzymology environmental chemistry physiology toxicology biophysics pharmacy and medicine Consequently the volumes are an essential source for researchers active in these and related fields as well as teachers preparing courses e g in Bioinorganic Chemistry About this Book Volume 1 devoted solely to the vital research area concerning the role of metal ions in neurodegenerative diseases offers in 15 stimulating chapters an authoritative and timely view of this fascinating subject Written by 41 internationally recognized experts *Neurodegenerative Diseases and Metal Ions* highlights supported by 130 illustrations the recent progress made in understanding the role metal ions play in diseases like transmissible spongiform encephalopathies Creutzfeldt Jakob and related diseases Alzheimer s Parkinson s Huntington s Wilson s and Menkes diseases as well as in familial amyotrophic lateral sclerosis and others 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 The need for novel drugs which manipulate metal centered neuropathology is emphasized

Metal Ions And Neurodegenerative Disorders Paolo Zatta, 2003-11-03 Numerous studies have established a clear

connection between neuronal oxidative stress and several neurodegenerative diseases with consequential damages to lipids proteins nucleic acids etc In addition several modifications indicative of oxidative stress have been described in association with neurons neurofibrillary tangles and senile plaques in Alzheimer s disease including advanced glycation end products and free carbonyl oxidation Oxidative damage and antioxidant responses are now well characterized but sources of damaging free radicals are yet to be fully understood Evidences of alteration in metal ions metabolism have been reported in various diseases like Alzheimer s Wilson Menkes Prion Pick Huntington disease epilepsy and other pathological events Thus metal ions play a pivotal role in neurodegenerative phenomena Chelation therapy is still in the early days of its development but research in this area could lead to new products that could revolutionize treatment Two international conferences on Metals and the Brain From Neurochemistry to Neurodegeneration Padova Italy 2000 and Fez Morocco 2002 were recently held to discuss the role of metal ions in neurophysiopathology A third will be held in 2005 in Johannesburg South Africa This book follows the same train of thought as those conferences in order to highlight the unquestionable importance of metal ions in the research on the neurophysiopathology of neurodegenerative diseases The excellent reputation of the scientists who have contributed to this project ensures the quality of the chapters presented here and hopefully this will help spur new research initiatives in the field which is still in its infancy

Mechanisms and Metal Involvement in Neurodegenerative Diseases Roberta J Ward,Robert Crichton,David Dexter,2013-07-18 Dementia and neurodegenerative diseases such as Parkinson s and Alzheimer s are becoming an increasingly important cause of medical and social concern due to the growth in the ageing population Mechanisms and Metal Involvement in Neurodegenerative Diseases delivers in one volume a streamlined source of information on each of the main neurodegenerative diseases including mild cognitive impairment Parkinson s Alzheimer s Freiderich s ataxia prion disease multiple sclerosis and alcoholic brain damage Each chapter is structured to give the definition of disease proteins involved with structure of normal protein and abnormal proteins pathology associated with the abnormal proteins oxidative stress and inflammation iron homeostatic mechanisms primary neurotransmitter involved other metal involvement and therapeutic strategies Structures of the adherent protein involved in the disease process are also presented with emphasis on the chemical structures used in the treatment of each neurodegenerative disease together with their biochemical mode of action Written by acknowledged experts in their respective areas this new book provides readers with readily accessible information on each of the neurodegenerative diseases

Science John Michels (Journalist),2005 **Biometals in Neurodegenerative Diseases** Anthony R. White,Michael Aschner,Lucio G. Costa,Ashley I. Bush,2017-04-28 Biometals in Neurodegenerative Diseases Mechanisms and Therapeutics is an authoritative and timely resource bringing together the major findings in the field for ease of access to those working in the field or with an interest in metals and their role in brain function disease and as therapeutic targets Chapters cover metals in Alzheimer s Disease Parkinson s Disease Motor Neuron Disease Autism and lysosomal storage

disorders This book is written for academic researchers clinicians and advanced graduate students studying or treating patients in neurodegeneration neurochemistry neurology and neurotoxicology The scientific literature in this field is advancing rapidly with approximately 300 publications per year adding to our knowledge of how biometals contribute to neurodegenerative diseases Despite this rapid increase in our understanding of biometals in brain disease the fields of biomedicine and neuroscience have often overlooked this information The need to bring the research on biometals in neurodegeneration to the forefront of biomedical research is essential in order to understand neurodegenerative disease processes and develop effective therapeutics Authoritative and timely resource bringing together the major findings in the field for those with an interest in metals and their role in the brain function disease and as therapeutic targets Written for academic researchers clinicians and advanced graduate students studying or treating patients in neurodegeneration neurochemistry neurology and neurotoxicology Edited by international leaders in the field who have contributed greatly to the study of metals in neurodegenerative diseases Subject Guide to Books in Print ,2001 Journal of Molecular Microbiology and Biotechnology ,2000 **Neurodegenerative Diseases and Metal Ions** Astrid Sigel,Helmut Sigel,Roland K. O. Sigel,2006-05-12 About the Series Metal Ions in Life Sciences links coordination chemistry and biochemistry in their widest sense and thus increases our understanding of the relationship between the chemistry of metals and life processes The series reflects the interdisciplinary nature of Biological Inorganic Chemistry and coordinates the efforts of scientists in fields like biochemistry inorganic chemistry coordination chemistry molecular and structural biology enzymology environmental chemistry physiology toxicology biophysics pharmacy and medicine Consequently the volumes are an essential source for researchers active in these and related fields as well as teachers preparing courses e g in Bioinorganic Chemistry About this Book Volume 1 devoted solely to the vital research area concerning the role of metal ions in neurodegenerative diseases offers in 15 stimulating chapters an authoritative and timely view of this fascinating subject Written by 41 internationally recognized experts Neurodegenerative Diseases and Metal Ions highlights supported by 130 illustrations the recent progress made in understanding the role metal ions play in diseases like transmissible spongiform encephalopathies Creutzfeldt Jakob and related diseases Alzheimer s Parkinson s Huntington s Wilson s and Menkes diseases as well as in familial amyotrophic lateral sclerosis and others 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 The need for novel drugs which manipulate metal centered neuropathology is emphasized *Redox-active Metals in Neurological Disorders* Steven M. LeVine,James R. Connor,Hyman M. Schipper,2004 Redox active metals have been implicated in the pathogenesis of many neurological disorders This volume presents developments and ideas related to the pathogenic roles of redox active metals in the neurological diseases Contributions dealing with therapeutic interventions that are directed at countering these pathogenic mechanisms are

included **Books in Print** ,1991 *The Gale Encyclopedia of Science* ,2001 Contains 2 000 entries ranging from short definitions to major overviews of concepts in all areas of science *Forthcoming Books* Rose Arny,1998

Comprehensive Toxicology: Nervous system and behavioral toxicology I. Glenn Sipes,1997 This volume in the Comprehensive Toxicology series demonstrates how the use of extremely powerful molecular and cell biology techniques has stimulated the growth of toxicology as a scientific discipline The field of toxicology has evolved from its earlier days of in vivo and descriptive studies to focusing on mechanisms Frequently mechanisms require an examination at the cellular and molecular level Molecular toxicology has opened the door to comprehending the basic mechanisms of how toxicants show their effects The volume is a comprehensive integrated profile of the molecular effects of toxicants and the molecular mechanisms involved in producing cellular and tissue injury

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