

*metal ions in
biological systems*

volume 39

*molybdenum and tungsten:
their roles in biological processes*

edited by

Astrid Sigel
and **Helmut Sigel**



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Metals Ions In Biological System Their Roles In Biological Processes

Astrid Sigel, Helmut Sigel



Metals Ions In Biological System Their Roles In Biological Processes:

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humans including its toxicology The Role of Metal Ions in Biology, Biochemistry and Medicine Michael Moustakas, 2021 Metal ions are fundamental elements for the maintenance of the lifespan of plants animals and humans Their substantial role in biological systems was recognized a long time ago They are essential for the maintenance of life and their absence can cause growth disorders severe malfunction carcinogenesis or death They are protagonists as macro or microelements in several structural and functional roles participating in many bio chemical reactions and arise in several forms They participate in intra and intercellular communications in maintaining electrical charges and osmotic pressure in photosynthesis and electron transfer processes in the maintenance of pairing stacking and the stability of nucleotide bases and also in the regulation of DNA transcription They contribute to the proper functioning of nerve cells muscle cells the brain and the heart the transport of oxygen and to many other biological processes up to the point that we cannot even imagine a life without metals In this book the papers published in the Special Issue The Role of Metal Ions in Biology Biochemistry and Medicine are summarized providing a picture of metal ion uses in biology biochemistry and medicine but also pointing out the toxicity impacts on plants animals humans and the environment Metal Ions and the Route to Life Wolfgang Nitschke, Simon Duval, 2025-08-28 Volume 28 entitled Metal Ions and the Route to Life of the series Metal Ions in Life Sciences advocates for the prime importance of the recognition of metal ions and metal bearing minerals in the transition from inanimate matter to first life on our planet Unlike the relatively unreactive organic molecules the traditional protagonists of orthodox origin of life hypotheses metals and minerals are natural catalysts abundantly present in the majority of settings on the early Earth considered as conducive to bringing forth life In these palaeochemical settings they may have catalyzed the anabolic conversions of inorganic precursor molecules into organics and may have converted redox disequilibria between environmental reductants and oxidants into the ordering i e the lowering of entropy of first living entities Far fetched Yet this is precisely what metal ions do in life today An unlikely coalition of biology biochemistry and bioenergetics and physics thermodynamics and condensed matter physics is growingly questioning the plausibility of the orthodox hypotheses while putting metal ions and minerals centre stage in their scenarios In this volume 29 internationally renowned experts from fields as diverse as microbiology biochemistry astrobiology electrochemistry ecology mineralogy geology and geochemistry shine light from their individual angles on this topic bringing home metal ions primordial importance to extant life presenting minerals with tantalizing reactivities appearing as look alikes of life s processes and sketching out plausible metal ion based scenarios for life s emergence on planet Earth Metal Ions and the Route to Life provides the empirical groundwork to interested researchers and the general public for revisiting their preconceived ideas about the origin of life and for appreciating the absolute indispensability of metal ions in life now just as at its beginnings

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Heavy Metal Tolerance in Plants Jonathan Shaw,2024-11-01 This volume provides a synthesis of recent work on evolutionary aspects of metal tolerance in plants It presents contributions from scientists with a wide diversity of expertise It covers the evolution of heavy metal tolerance in groups of plants fungi and protists The book discusses the physiological genetic and molecular aspects of metal tolerances It deals with the evolution of populations in metal contaminated environments Several chapters include tolerance in animals in order to place the rest of the book on plants in proper perspective This publication is an exciting addition for scientists with both applied and basic interest in metal toxicity and tolerance It is of importance to those in vegetation ecology land reclamation agronomy physiology population ecology ecological genetics evolutionary biology and molecular biology **The Role of Metal Ions in Biology, Biochemistry and**

Medicine Michael Moustakas,2021-09-06 Metal ions are fundamental elements for the maintenance of the lifespan of plants animals and humans Their substantial role in biological systems was recognized a long time ago They are essential for the maintenance of life and their absence can cause growth disorders severe malfunction carcinogenesis or death They are protagonists as macro or microelements in several structural and functional roles participating in many bio chemical reactions and arise in several forms They participate in intra and intercellular communications in maintaining electrical charges and osmotic pressure in photosynthesis and electron transfer processes in the maintenance of pairing stacking and the stability of nucleotide bases and also in the regulation of DNA transcription They contribute to the proper functioning of nerve cells muscle cells the brain and the heart the transport of oxygen and to many other biological processes up to the point that we cannot even imagine a life without metals In this book the papers published in the Special Issue The Role of Metal Ions in Biology Biochemistry and Medicine are summarized providing a picture of metal ion uses in biology biochemistry and medicine but also pointing out the toxicity impacts on plants animals humans and the environment

Metal Ions in Biochemistry Pabitra Krishna Bhattacharya,Prakash B. Samnani,2020-12-13 The second edition of Metal Ions in Biochemistry deals with the multidisciplinary subject of bio inorganic chemistry encompassing the disciplines of inorganic chemistry biochemistry and medicine The book deals with the role of metal ions in biochemistry emphasising that biochemistry is mainly the chemistry of metal biochemical complexes Hence the book starts with the structures of

biochemicals and the identification of their metal binding sites Thermodynamic and kinetic properties of the complexes are explained from the point of view of the nature of metal ligand bonds Various catalytic and structural roles of metal ions in biochemicals are discussed in detail Features The role of Na and K in brain chemistry The role of zinc insulin in glucose metabolism and its enhancement by vanadium and chromium compounds Discussion of the role of zinc signals zinc fingers and cascade effect in biochemistry Haemoglobin synthesis and the role of vitamin B12 in it The role of lanthanides in biochemical systems A detailed discussion of the role of non metals in biochemistry a topic missing in most of the books on bio inorganic chemistry The study of bio inorganic chemistry makes biochemists rethink the mechanistic pathways of biochemical reactions mediated by metal ions There is a realisation of the role of metal complexes and inorganic ions as therapeutics such as iron in leukaemia thalassemia and sickle cell anaemia iodine in hypothyroidism and zinc vanadium and chromium in glucose metabolism The most recent realisation is of the use of zinc in the prevention and treatment of COVID 19

Handbook of Marine Macroalgae Se-Kwon Kim,2011-11-04 The Handbook of Macroalgae Biotechnology and Applied Phycology describes the biological biotechnological and the industrial applications of seaweeds Vast research into the cultivation of seaweeds is currently being undertaken but there is a lack of methodological strategies in place to develop novel drugs from these sources This book aims to rectify this situation providing an important review of recent advances and potential new applications for macroalgae Focusing on the chemical and structural nature of seaweeds the book brings the potentially valuable bioactive nature to the fore Novel compounds isolated from seaweeds are reviewed to provide an invaluable reference for anyone working in the field

Metal Ions in Biological Systems Sanat Dhar,2013-03-09 The articles published in this volume are based on the papers delivered at a conference on the Role of Metal Ions in Biological Systems held November 20 and 21 1972 at Argonne National Laboratory The purpose of the conference was to present to an interdisciplinary audience of physical scientists some recent developments illustrating the chemical and environmental participation of the heavy metal ions in the biological system The invited speakers at the conference are specialists in the fields they describe and the articles presented here are at a level of interest to readers with backgrounds in physical sciences who are not necessarily doing research in the areas described The articles are referenced through 1972 and in some cases early 1973 and thus should also be of value to research workers It is hoped that the book will be of particular interest to chemists biologists workers in the fields of environmental science and public health as well as graduate and senior undergraduate students in these disciplines The conference was sponsored by the Central States Universities Inc a consortium of sixteen midwestern universities the Center for Educational Affairs Argonne National Laboratory and the United States Atomic Energy Commission It is my pleasure to thank the members of the conference committee for their ideas and active help in organizing the conference

Metal Ions in Biological Systems Astrid Sigel,Helmut Sigel,1995-02-22 Volume 31 devoted solely to the role of vanadium in life processes offers a comprehensive and timely account of this

fascinating field by 37 distinguished international authorities Highlights the properties of the various oxidation states of vanadium their affinity for biogenic ligands the effects of vanadium species on enzyme activity the role of vanadium in nitrogenases and haloperoxidases and more *Metal Ions in Biological Systems* Astrid Sigel, Helmut Sigel, 1996-02-05

Volume 32 covers metal ion bonding to phosphate sugar and nucleobase residues the ambidentate as well as the stacking properties of nucleotides kinetic aspects as well as properties of nucleobase and nucleotide analogs and the oligonucleotides and nucleic acids It examines electron transfer reactions over a large number of base repairs in DNA the role of metal ions in ribozymes ternary metal nucleic acid base protein complexes metal responsive gene regulation and the structure activity relationships of anticancer drugs and their action on DNA including cisplatin and the role of proteins *The Alkali Metal Ions: Their Role for Life* Astrid Sigel, Helmut Sigel, Roland K. O. Sigel, 2016-02-09

MILS 16 provides an up to date review of the impact of alkali metal ions on life Their bioinorganic chemistry and analytical determination the solid state structures of bio ligand complexes and the properties of alkali metal ions in solution in the context of all kinds of biologically relevant ligands are covered this includes proteins enzymes and nucleic acids G quadruplexes Minerals containing sodium Na and potassium K are abundant in the Earth's crust making Na and K easily available In contrast the alkali elements lithium Li rubidium and cesium are rare and the radioactive francium occurs only in traces Since the intra and extracellular as well as the compartmental concentrations of Na and K differ significantly homeostasis and active transport of these ions are important this involves transporters carriers and pore forming ion channel proteins Systems like Na K ATPases H K ATPases or Na H antiporters are thoroughly discussed The role of K in photosynthesis and the role of Na in charging the battery of life are pointed out Also the relationships between alkali metal ions and diseases e.g. Parkinson or traumatic brain injury are covered and the relevance of Li salts in medicine pharmacology and mechanism is reviewed This and more is treated in an authoritative and timely manner in the 16 stimulating chapters of Volume 16 *The Alkali Metal Ions Their Role for Life* which are written by 44 internationally recognized experts from 12 nations The impact of this vibrant research area is manifested in nearly 3000 references over 30 tables and more than 150 illustrations two thirds in color MILS 16 also provides excellent information for teaching Astrid Sigel Helmut Sigel and Roland K O Sigel have long standing interests in Biological Inorganic Chemistry Their research focuses on metal ion interactions with nucleotides and nucleic acids and on related topics They edited previously 44 volumes in the series *Metal Ions in Biological Systems* *Metal Ions in Biological Systems* Helmut Sigel, Astrid Sigel, 1988-08-24

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