

MICROBIOLOGY MONOGRAPHS

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Magnetoreception and Magnetosomes in Bacteria



Springer

Magnetoreception And Magnetosomes In Bacteria Microbiology Monographs

**Nicholas J. Darton, Adrian
Ionescu, Justin Llandro**



Magnetoreception And Magnetosomes In Bacteria Microbiology Monographs:

Magnetoreception and Magnetosomes in Bacteria Dirk Schüler, 2006-10-19 Magnetoreception or magnetotaxis in bacteria was discovered only some 30 years ago All magnetotactic bacteria which occur in many environments and display a remarkable diversity synthesize magnetosomes complex intracellular organelles that contain magnetic iron crystals Recent developments in the research on magnetotactic bacteria are presented in this volume Included are reviews on the formation and organization of magnetosomes the genes controlling magnetosome biomineralization and new cryogenic techniques to visualize novel cytoskeleton structures Described here are potential nanobiotechnological applications of the magnetosome crystals which have magnetic and crystalline characteristics unmatched by their inorganic counterparts Related topics such as the impact of biogenic magnetic crystals in geobiology and paleomagnetism also are discussed The aim of the book is to provide a broad survey of this multidisciplinary field and to inspire future research on these fascinating organisms

Topics in Ecological and Environmental Microbiology Thomas Mitchell Schmidt, Moselio Schaechter, 2011-09-28 This book provides an overview of ecological aspects of the metabolism and behavior of microbes microbial habitats biogeochemical cycles and biotechnology It was designed by selecting relevant chapters from the comprehensive Encyclopedia of Microbiology 3rd edn and inviting the original authors to update their material to include key developments and advances in the field

Nanomicrobiology Larry L. Barton, Dennis A. Bazylinski, Huifang Xu, 2014-11-05 This book is devoted to nanomicrobiology and the nanosystems of bacteria The initial chapter discusses some of the controversies in the geochemical and biomedical fields associated with the reports of nanobacteria in the environment Current knowledge of several internal and surface structures of bacteria is addressed in this book Included are chapters discussing carboxysomes S layers gliding motility of bacteria and aggregation of iron to produce nano magnetite Information about the activities of outer membrane vesicles produced by Gram negative bacteria is discussed as a benefit to bacteria that produce it and some potential industrial applications are presented A broad review of bacterial mineral interactions is addressed in a chapter of metallic nanoparticles and colloids production by bacterial reduction of soluble redox active elements The structures of bacterial nanowires are discussed and their application in extra cellular electron transport is reviewed Nanomotor activities of bacteria are discussed as pertains to the mechanics of flagellar rotation production of energy by ATP synthase DNA packing and translocation of proteins across membranes by secretion systems The rapidly evolving field of nanosystem technology is embracing many areas and it is the hope that this book will stimulate the use of bacterial nanostructures for future developments in nanotechnology

Magnetic Nanomaterials, 2009-09-15 The book series Nanomaterials for the Life Sciences provides an in depth overview of all nanomaterial types and their uses in the life sciences Each volume is dedicated to a specific material class and covers fundamentals synthesis and characterization strategies structure property relationships and biomedical applications The series brings nanomaterials to the Life Scientists and life science to the

Materials Scientists so that synergies are seen and developed to the fullest Written by international experts of various facets of this exciting field of research the series is aimed at scientists of the following disciplines biology chemistry materials science physics bioengineering and medicine together with cell biology biomedical engineering pharmaceutical chemistry and toxicology both in academia and fundamental research as well as in pharmaceutical companies VOLUME 4 Magnetic Nanomaterials This volume takes the reader on a tour showing how magnetic nanomaterials are used in the fields of diagnosis and therapy as well as in tissue engineering and environmental applications *Magnetic Nanoparticles in Biosensing and Medicine* Nicholas J. Darton, Adrian Ionescu, Justin Llandro, 2019-02-14 Drawing together topics from a wide range of disciplines this text provides a comprehensive insight into the fundamentals of magnetic biosensors and the applications of magnetic nanoparticles in medicine Internationally renowned researchers showcase topics ranging from the basic physical principles of magnetism to the detection and manipulation synthesis protocols and natural occurrence of magnetic nanoparticles Up to date examples of their clinical usage and research applications in the biomedical fields of sensing by diverse magnetic detection methods in imaging by MRI and in therapeutic strategies such as hyperthermia are also discussed providing a thorough introduction to this rapidly developing field Each chapter features questions with answers highlighted definition boxes and numerous illustrations which help readers grasp key concepts Mathematical tools together with key literature references provide a strong underpinning for the material making it ideal for graduate students lecturers medical researchers and industrial scientific strategists Microbes for Sustainable Development and Bioremediation Ram Chandra, RC Sobti, 2019-12-13 Microbes are the predominant form of life on the planet due to their broad range of adaptation and versatile nutritional behavior The ability of some microbes to inhabit hostile environment incompatible with most forms of life means that their habitat defines the extent of the biosphere and delineates the barrier between the biosphere and geosphere The direct and indirect role of microbes that include bacteria fungi actinomycetes viruses mycoplasma and protozoans are very much important in development of modern human society for food drugs textiles agriculture and environment Furthermore microorganisms and their enzyme system are responsible for the degradation of various organic matters Microbes for Sustainable Development and Bioremediation emphasizes the role of microbes for sustainable development of ecosystem Environmental microbiology role in biogeochemical cycle and bioremediation of environmental waste is major theme which comprises the following aspects Bacterial phytoextraction mechanism of heavy metals by native hyperaccumulator plants from complex waste contaminated site for eco restoration Role of microbial enzyme for eco friendly recycling of industrial waste Field scale remediation of crude oil contaminated desert soil and treatment technology Microbial technology for metal recovery from e waste printed circuit board Impact of genomic data on sustainability of ecosystem Methane monooxygenases their regulations and applications Role of microbes in environmental sustainability and food preservation This book will be directly beneficial to researchers and classroom

students in areas of biotechnology environmental microbiology molecular biology and environmental engineering with specialized collection of cutting edge knowledge **Green Biosynthesis of Nanoparticles** Mahendra Rai,Clemens Posten,2013-12-04 There are physical and chemical methods of synthesis of nanomaterials But due to the damage caused by these methods to the environment there is a pressing need of green nanotechnology which is a clean and eco friendly technology for the development of nanomaterials The present book includes green synthesis of nanoparticles by algae diatoms and plants The mechanism behind the synthesis of nanoparticles will also be discussed The book would be a valuable resource for students researchers and teachers of biology chemistry chemical technology nanotechnology microbial technology and those who are interested in green nanotechnology *Biological Materials of Marine Origin* Hermann Ehrlich,2014-12-01 This is the second monograph by the author on biological materials of marine origin The initial book is dedicated to the biological materials of marine invertebrates This work is a source of modern knowledge on biomineralization biomimetics and materials science with respect to marine vertebrates For the first time in scientific literature the author gives the most coherent analysis of the nature origin and evolution of biocomposites and biopolymers isolated from and observed in the broad variety of marine vertebrate organisms fish reptilian birds and mammals and within their unique hierarchically organized structural formations There is a wealth of new and newly synthesized information including dozens of previously unpublished images of unique marine creatures including extinct extant and living taxa and their biocomposite based structures from nano to micro and macroscale This monograph reviews the most relevant advances in the marine biological materials research field pointing out several approaches being introduced and explored by distinct modern laboratories *Encyclopedia of Microbiology* ,2009-01-14 Available as an exclusive product with a limited print run Encyclopedia of Microbiology 3e is a comprehensive survey of microbiology edited by world class researchers Each article is written by an expert in that specific domain and includes a glossary list of abbreviations defining statement introduction further reading and cross references to other related encyclopedia articles Written at a level suitable for university undergraduates the breadth and depth of coverage will appeal beyond undergraduates to professionals and academics in related fields 16 separate areas of microbiology covered for breadth and depth of content Extensive use of figures tables and color illustrations and photographs Language is accessible for undergraduates depth appropriate for scientists Links to original journal articles via Crossref 30% NEW articles and 4 color throughout NEW **Advances in Magnetism of Soils and Sediments** Sara Satolli,Eric C. Ferre,Myriam Kars,Sarah P. Slotznick,Ricardo I. F. Trindade,2021-09-08

Intracellular biomineralization in bacteria Damien Faivre,2014-11-14 Bacteria can sequester metals and other ions intracellularly in various forms ranging from poorly ordered deposits to well ordered mineral crystals Magnetotactic bacteria provide one example of such intracellular deposits They synthesize intracellular magnetic minerals of magnetite Fe_3O_4 and or greigite Fe_3S_4 magnetosomes which are generally less than 150 nm and organized into one or multiple chain structures

The magnetosome chain s act like a compass needle to facilitate the navigation of magnetotactic bacteria by using the Earth s magnetic field Due to their ubiquitous distribution in aquatic and sedimentary environments magnetotactic bacteria play important roles in global iron cycling Other intracellular mineral phases have been evidenced in bacteria such as As_2S_3 CaCO_3 CdS Se_0 or various metal phosphates which may play as well a significant role in the geochemical cycle of these elements However in contrast to magnetotactic bacteria the biological and environmental function of these particles remains a matter of debate In recent years such intracellularly biomineralizing bacteria have become an attractive model system for investigating the molecular mechanisms of organelle like structure formation in prokaryotic cells The geological significance of intracellular biomineralization is important spectacular examples are fossil magnetosomes that may significantly contribute to the bulk magnetization of sediments and act as potential archives of paleoenvironmental changes In addition intracellular mineral deposits formed by bacteria have potentially versatile applications in biotechnological and biomedical fields After more than four decades of research the knowledge on intracellularly biomineralizing bacteria has greatly improved The aim of this Research Topic is to highlight recent advances in our understanding of intracellular biomineralization by bacteria Magnetotactic bacteria are a system of choice for that topic but other intracellularly biomineralizing bacteria may bring a unique perspective on that process Research papers reviews perspectives and opinion papers on i the diversity and ecology of intracellularly biomineralizing bacteria ii the molecular mechanisms of intracellular biomineralization iii the chemo and magneto taxis behaviors of magnetotactic bacteria iv the involvement of intracellularly biomineralizing bacteria in local or global biogeochemical cycling v the paleoenvironmental reconstructions and paleomagnetic signals based on fossil magnetosomes vi and the applications of intracellular minerals in biomaterial and biotechnology were welcomed

Microbial Megaplastids Edward Schwartz, 2009-01-29 Megaplastids are extrachromosomal genetic elements in the size range of 100 kb and larger They are found in physiologically and phylogenetically diverse groups of bacteria and archaea By definition megaplastids are not essential for the viability of their hosts under all growth conditions but paradoxically many megaplastids carry the genetic information for the defining and characteristic traits of the organism in which they reside *Microbial Megaplastids* reviews our knowledge of the extensively studied representatives such as the catabolic plasmids of the pseudomonads the rhizobial *Sym* plasmids the *Ti* plasmids of the genus *Agrobacterium* and the giant enterobacterial virulence plasmids It also presents snapshots of more recently discovered megaplastids The contribution of megaplastids to the biology of their hosts is described highlighting the interactions between megaplastid and chromosomal genes

Bacterial Organelles and Organelle-like Inclusions Dieter Jendrossek, 2021-01-04 The new series *Microbiology Monographs* begins with two volumes on intracellular components in prokaryotes In this first volume *Inclusions in Prokaryotes* the components labeled inclusions are defined as discrete bodies resulting from synthesis of a metabolic product Research on the biosynthesis and reutilization of the

accumulated materials is still in progress and interest in the inclusions is growing This comprehensive volume provides historical background and comprehensive reviews of eight well known prokaryotic inclusions **Inclusions in Prokaryotes** Jessup M. Shively, 2006-05-04 The new series Microbiology Monographs begins with two volumes on intracellular components in prokaryotes In this first volume Inclusions in Prokaryotes the components labeled inclusions are defined as discrete bodies resulting from synthesis of a metabolic product Research on the biosynthesis and reutilization of the accumulated materials is still in progress and interest in the inclusions is growing This comprehensive volume provides historical background and comprehensive reviews of eight well known prokaryotic inclusions **Microbial Metal Respiration** Johannes Gescher, Andreas Kappler, 2014-02-21 Microbes can respire on metals This seemingly simple finding is one of the major discoveries that were made in the field of microbiology in the last few decades The importance of this observation is evident Metals are highly abundant on our planet Iron is even the most abundant element on Earth and the fourth most abundant element in the Earth's crust Hence in some environments iron but also other metals or metalloids are the dominant respiratory electron acceptors Their reduction massively drives the carbon cycle in these environments and establishes redox cycles of the metallic electron acceptors themselves These redox cycles are not only a driving force for other biotic reactions but are furthermore necessary for initiating a number of geochemically relevant abiotic redox conversions Although widespread and ecologically influential electron transfer onto metals like ferric iron or manganese is biochemically challenging The challenge is to transfer respiratory electrons onto metals that occur in nature at neutral pH in the form of metal oxides or oxihydroxides that are effectively insoluble Obviously it is necessary that the microbes specially adapt in order to catalyze the electron transfer onto insoluble electron acceptors The elucidation of these adaptations is an exciting ongoing process To sum it up dissimilatory metal reduction has wide spread implications in the field of microbiology biochemistry and geochemistry and its discovery was one of the major reasons to establish a novel scientific field called geomicrobiology Recently the discovery of potential applications of dissimilatory metal reducers in bioremediation or current production in a microbial fuel cell further increased the interest in studying microbial metal reduction **Plant Growth and Health Promoting Bacteria** Dinesh K. Maheshwari, 2010-09-28 To cope with the increasing problems created by agrochemicals such as plant fertilizers pesticides and other plant protection agents biological alternatives have been developed over the past years These include biopesticides such as bacteria for the control of plant diseases and biofertilizer to improve crop productivity and quality Especially plant growth promoting rhizobacteria PGPR are as effective as pure chemicals in terms of plant growth enhancement and disease control in addition to their ability to manage abiotic and other stresses in plants The various facets of these groups of bacteria are treated in this Microbiology Monograph with emphasis on their emergence in agriculture Further topics are Bacillus species that excrete peptides and lipopeptides with antifungal antibacterial and surfactant activity plant bacteria environment interactions mineral nutrient exchange nitrogen assimilation

biofilm formation and cold tolerant microorganisms

Laccases in Bioremediation and Waste Valorisation Dietmar Schlosser, 2020-08-31 This Microbiology Monographs volume covers the latest advances in laccase applications in bioremediation and waste valorisation The first three chapters provide a comprehensive introduction to fungal and bacterial laccases the two most important enzyme groups from an application viewpoint and their practical use in bioremediation and lignocellulosic waste valorisation Subsequent chapters discuss possible combinations of laccases and further potentially collaborating enzymes and offer in depth insights into laccase immobilisation for wastewater treatment and environmental biosensor applications of laccases Lastly the book addresses the quest for enzymes with improved and better fitting properties covering laccase engineering by directed and computational evolution and novel enzymes from extreme environments As such it is a fascinating read for microbiologists in both industry and academia

Molecular Microbiology of Heavy Metals Dietrich H. Nies, Simon Silver, 2007-03-24 All forms of life depend on a variety of heavy metal ions Nearly one third of all gene products require a metal ion for proper folding or function However even metals generally regarded as non poisonous are toxic at higher concentrations including the essential ones Thus sensitive regulation of metal uptake storage allocation and detoxification is needed to maintain cellular homeostasis of heavy metal ions Molecular Microbiology of Heavy Metals includes chapters on allocation of metals in cells metal transporter storage and metalloregulatory proteins cellular responses to metal ion stress transcription of genes involved in metal ion homeostasis uptake of essential metals metal efflux and other detoxification mechanisms Also discussed are metal bioreporters for the nanomolar range of concentration and tools to address the metallome Chapters in the second part cover specific metals such as Fe Mn Cu Ni Co Zn and Mo as key nutrient elements and Ag As Cd Hg and Cr as toxic elements

Microbial Production of High-Value Products Bernd H. A. Rehm, David Wibowo, 2022-09-06 This edited volume emphasizes how microorganisms have become a reliable pillar of biotechnology The authors discuss advances in synthetic biology and genetic engineering that have made it possible to reprogram the microbial cellular capabilities This enables an economically viable production of high value products at an industrial level The first part of the book provides an overview of synthetic biology and genome editing tools for engineering microbial cell factories in modern fermentation Readers also learn how high throughput bioprocessing methods are used to recover and purify microbial products The remaining parts of this book explore the implementation and challenges of these upstream and downstream processing techniques for manufacturing high value products Cost effectiveness and quality control are key factors when discussing the production of low molecular weight products biopharmaceuticals biopolymers and protein based nanoparticles This book is a valuable resource for biotechnologists both in the industry and in academia

Biology of Rhodococcus Héctor M. Alvarez, 2010-09-07 Rhodococcus a metabolically versatile actinobacteria which is frequently found in the environment has gained increasing interest due to its potential biotechnological applications This Microbiology Monographs volume provides a thorough review of the various aspects of the

biochemistry physiology and genetics of the Genus *Rhodococcus* Following an overview of its taxonomy chapters cover the structural aspects of rhodococcal cellular envelope genomes and plasmids metabolic and catabolic pathways such as those of aromatic compounds steroids and nitriles and desulfurization pathways as well as the adaption to organic solvents Further reviews discuss applications of *Rhodococcus* in the bioremediation of contaminated environments in triacylglycerol accumulation and in phytopathogenic strategies as well as the potential of biosurfactants A final chapter describes the sole pathogenic *Rhodococcus* member *R. equi*

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