

Russell H. Vreeland *Editor*

Advances in Understanding the Biology of Halophilic Microorganisms

 Springer

Advances In Understanding The Biology Of Halophilic Microorganisms

Marco Cascella



Advances In Understanding The Biology Of Halophilic Microorganisms:

Advances in Understanding the Biology of Halophilic Microorganisms Russell H. Vreeland, 2012-12-14 This book is designed to be a long term career reference The chapters present modern procedures This is a how to book with a difference These chapters reveal the background information about working with salt loving organisms are loaded with information about how experiments are conducted under high salt provide information about analyses that work under these conditions and those that may not present a wide range of details from laboratory designs to equipment used and even to simple anecdotal hints that can only come from experience Microbiological training focuses largely on the growth the handling and the study of the microbes associated with humans and animals Yet the largest proportion of the Earth's microbiota lives in saline environments such as the Oceans saline deserts and terminal hypersaline environments This need for salt can be intimidating for those interested in entering the field or for those interested in understanding how such research is accomplished

Halophiles Dinesh K Maheshwari, Meenu Saraf, 2015-09-16 The world of halophiles is quite diverse and their representatives in three domains of life i.e. archaea bacteria and eukarya They are found all over the small subunit rRNA based tree of life and these micro organisms are adapted to salt concentration up to saturation hence able to grow at 300g l NaCl concentration Their metabolic diversity is high as well encompassing oxygenic and anoxygenic phototrophs aerobic heterotrophs denitrifiers sulphate reducers fermenters and methanogens The proteins of halophiles are magnificently engineered to function in a milieu containing 2.5M salt that encodes genes represent a valuable repository and resource for reconstruction and visualizing processes of habitat selection and adaptive evolution Search for new enzymes endowed with novel activities and enhanced stability continues to be desirable purpose for important commercial production of biotechnological significance These poly extremophiles proved excellent source of enzymes and metabolites possessing inherent ability to function in extreme conditions of high salt alkaline pH and facilitating catalysis for industrial application in food processing industrial bioconversion bioremediation etc In fact it has just begun to realize the great potential and true extent of diversity and suitable applications if explored them judiciously This book highlights current applications and research on halophiles to provide a timely overview Chapters are written by expert authors from around the world and include topics of varied importance which include their role to play in enzyme production restoration of soil fertility and plant growth antimicrobial and biocatalytic potential biomolecules in nanotechnology and aspects of quorum sensing The book is divided into three sections dealing with biodiversity biotechnology and sustainable exploitation of halophiles This major new work represents a valuable source of information to all those scientists interested in microorganisms in general and extremophiles in particular with respect to their innovative products and applications

Great Salt Lake Biology Bonnie K. Baxter, Jaimi K. Butler, 2020-07-03 Great Salt Lake is an enormous terminal lake in the western United States It is a highly productive ecosystem which has global significance for millions of migrating birds who rely on this critical feeding station on

their journey through the American west For the human population in the adjacent metropolitan area this body of water provides a significant economic resource as industries such as brine shrimp harvesting and mineral extraction generate jobs and income for the state of Utah In addition the lake provides the local population with ecosystem services especially the creation of mountain snowpack that generates water supply and the prevention of dust that may impair air quality As a result of climate change and water diversions for consumptive uses terminal lakes are shrinking worldwide and this edited volume is written in this urgent context This is the first book ever centered on Great Salt Lake biology Current and novel data presented here paint a comprehensive picture building on our past understanding and adding complexity Together the authors explore this saline lake from the microbial diversity to the invertebrates and the birds who eat them along a dynamic salinity gradient with unique geochemistry Some unusual perspectives are included including the impact of tar seeps on the lake biology and why Great Salt Lake may help us search for life on Mars Also we consider the role of human perceptions and our effect on the biology of the lake The editors made an effort to involve a diversity of experts on the Great Salt Lake system but also to include unheard voices such as scientists at state agencies or non profit advocacy organizations This book is a timely discussion of a terminal lake that is significant unique and threatened *Their World: A Diversity of Microbial Environments* Christon J. Hurst, 2016-05-02 This volume summarizes recent advances in environmental microbiology by providing fascinating insights into the diversity of microbial life that exists on our planet The first two chapters present theoretical perspectives that help to consolidate our understanding of evolution as an adaptive process by which the niche and habitat of each species develop in a manner that interconnects individual components of an ecosystem This results in communities that function by simultaneously coordinating their metabolic and physiologic actions The third contribution addresses the fossil record of microorganisms and the subsequent chapters then introduce the microbial life that currently exists in various terrestrial and aquatic ecosystems Coverage of the geosphere addresses endolithic organisms life in caves and the deep continental biosphere including how subsurface microbial life may impact spent nuclear fuel repositories The discussion of the hydrosphere includes hypersaline environments and arctic food chains By better understanding examples from the micro biosphere we can elucidate the many ways in which the niches of different species both large and small interconnect within the overlapping habitats of this world which is governed by its microorganisms Marine Biotechnology Anjana K. Vala, Dushyant R. Dudhagara, 2025-08-12 The marine environment has always been beneficial to mankind in one way or another With advancements in scientific knowledge and technological development novel aspects of marine resources have been and are being revealed that can be harnessed for sustainable development of blue economy The book *Marine Biotechnology A Gateway to Blue Economy* is an attempt to present before the scientific community a compilation of recent developments in the field of marine biotechnology contributed by leading scientists of international repute The book covers diverse roles of marine biotechnology including in agriculture probiotics health sector novel biomolecules biochemicals

biomedicine and pharmaceuticals *The Proceedings from Halophiles 2013, the International Congress on Halophilic Microorganisms* R. Thane Papke, Aharon Oren, Antonio Ventosa, Jesse Dillon, 2015-07-08 The Halophiles 2013 meeting is a multidisciplinary international congress with a strong history of regular triennial meetings since 1978 Our mission is to bring researchers from a wide diversity of investigation interests e g protein and species evolution niche adaptation ecology taxonomy genomics metagenomics horizontal gene transfer gene regulation DNA replication repair and recombination signal transduction community assembly and species distribution astrobiology biotechnological applications adaptation to radiation desiccation osmotic stress into a single forum for the integration and synthesis of ideas and data from all three domains of life and their viruses yet from a single environment salt concentrations greater than seawater This cross section of research informs our understanding of the microbiological world in many ways The halophilic environment is extreme especially above 10% NaCl restricting life solely to microbes The microorganisms that live there are adapted to extreme conditions and are notable for their ability to survive high doses of radiation and desiccation Therefore the hypersaline environment is a model system both the abiotic and biologic factors for insightful understanding regarding conditions and life in the absence of plant and animals e g life on the early earth and other solar system bodies like Mars and Europa Lower salinity conditions e g 6 10% NaCl form luxuriant microbial mats considered modern analogues of fossilized stromatolites which are enormous microbially produced structures fashioned during the Precambrian and still seen today in places like Shark s Bay Australia Hypersaline systems are island like habitats spread patchily across the earth s surface and similar to the Galapagos Islands represent unique systems excellent for studying the evolutionary pressures that shape microbial community assembly adaptation and speciation The unique adaptations to this extreme environment produce valuable proteins enzymes and other molecules capable of remediating harsh human instigated environments and are useful for the production of biofuels vitamins and retinal implants for example This research topic is intended to capture the breadth and depth of these topics

Extremophiles as Astrobiological Models Joseph Seckbach, Helga Stan-Lotter, 2021-01-13 The data in this book are new or updated and will serve also as Origin of Life and evolutionary studies Endospores of bacteria have a long history of use as model organisms in astrobiology including survival in extreme environments and interplanetary transfer of life Numerous other bacteria as well as archaea lichens fungi algae and tiny animals tardigrades or water bears are now being investigated for their tolerance to extreme conditions in simulated or real space environments Experimental results from exposure studies on the International Space Station and space probes for up to 1 5 years are presented and discussed Suggestions for extraterrestrial energy sources are also indicated Audience Researchers and graduate students in microbiology biochemistry molecular biology and astrobiology as well as anyone interested in the search for extraterrestrial life and its technical preparations **From Genes to Species: Novel Insights from Metagenomics** Eamonn P. Culligan, Roy D. Sleator, 2016-10-07 The majority of microbes in many environments are considered as yet uncultured and

were traditionally considered inaccessible for study through the microbiological gold standard of pure culture. The emergence of metagenomic approaches has allowed researchers to access and study these microbes in a culture independent manner through DNA sequencing and functional expression of metagenomic DNA in a heterologous host. Metagenomics has revealed an extraordinary degree of diversity and novelty not only among microbial communities themselves but also within the genomes of these microbes. This Research Topic aims to showcase the utility of metagenomics to gain insights on the microbial and genomic diversity in different environments by revealing the breadth of novelty that was in the past largely untapped.

Planetary Astrobiology Victoria Meadows, Giada Arney, Britney Schmidt, David J. Des Marais, 2020-07-07. Are we alone in the universe? How did life arise on our planet? How do we search for life beyond Earth? These profound questions excite and intrigue broad cross sections of science and society. Answering these questions is the province of the emerging, strongly interdisciplinary field of astrobiology. Life is inextricably tied to the formation, chemistry, and evolution of its host world, and multidisciplinary studies of solar system worlds can provide key insights into processes that govern planetary habitability, informing the search for life in our solar system and beyond. *Planetary Astrobiology* brings together current knowledge across astronomy, biology, geology, physics, chemistry, and related fields, and considers the synergies between studies of solar systems and exoplanets to identify the path needed to advance the exploration of these profound questions. *Planetary Astrobiology* represents the combined efforts of more than seventy-five international experts consolidated into twenty chapters and provides an accessible interdisciplinary gateway for new students and seasoned researchers who wish to learn more about this expanding field. Readers are brought to the frontiers of knowledge in astrobiology via results from the exploration of our own solar system and exoplanetary systems. The overarching goal of *Planetary Astrobiology* is to enhance and broaden the development of an interdisciplinary approach across the astrobiology, planetary science, and exoplanet communities, enabling a new era of comparative planetology that encompasses conditions and processes for the emergence, evolution, and detection of life.

Microbiology and Biogeochemistry of Hypersaline Environments Aharon Oren, 1998-09-16. This book, intended for researchers and students in the fields of microbiology, biochemistry, and biogeochemistry, details the biology and biogeochemistry of various halophilic microorganisms that live in high-density saline environments worldwide. These organisms are especially important to biodegradation and hazardous site clean-up. Topics include the biochemistry, genetics, and molecular biology of these organisms, new methods to type them, and osmotic adaptation.

The Conservation of Subterranean Cultural Heritage C. Saiz-Jimenez, 2014-10-24. This proceedings volume contains selected papers presented at the Workshop on the Conservation of the Subterranean Cultural Heritage held 25-27 March 2014 in Seville, Spain. The workshop was organized by the Spanish Network of Science and Technology for the Conservation of Cultural Heritage. TechnoHeritage Contributions cover the following fields: archaeology, history, conservation, maintenance, and restoration, architectural sciences, and engineering.

Halophilic Microorganisms and their Environments Aharon

Oren,2006-04-06 This water he told me runs out to the eastern region and flows into the Arabah and when it comes into the sea into the sea of foul waters i e the Dead Sea the water will become wholesome Every living creature that swarms will be able to live wherever this stream goes the fish will be very abundant once these waters have reached there It will be wholesome and everything will live wherever this stream goes Fishermen shall stand beside it all the way from En gedi to En eglaim it shall be a place for drying nets and the fish will be of various kinds and most plentiful like the fish of the Great Sea Ezekiel s prophecy Ezekiel 47 8 10 for revival and purification of the Dead Sea waters This new book on Halophilic Microorganisms and their Environments is the fifth volume in the COLE series Cellular Origin and Life in Extreme Habitats see <http://www.wkap.nl/prod/s/COLE> In the previous books we covered aspects of enigmatic microorganisms microbial diversity astrobiology and symbiosis so this book on halophilic microbes adds a fitting link to the rest of series books Since ancient times hypersaline habitats have been considered extreme environments and some were thought not to sustain life at all Yet every organism requires salt for its existence Salty places have been compared to an environment of extinction e g the Dead Sea

National Library of Medicine Current Catalog National Library of Medicine (U.S.),1992 **Manual of Environmental Microbiology** Cindy H. Nakatsu,Robert V. Miller,Suresh D. Pillai,2020-08-11 The single most comprehensive resource for environmental microbiology Environmental microbiology the study of the roles that microbes play in all planetary environments is one of the most important areas of scientific research The Manual of Environmental Microbiology Fourth Edition provides comprehensive coverage of this critical and growing field Thoroughly updated and revised the Manual is the definitive reference for information on microbes in air water and soil and their impact on human health and welfare Written in accessible clear prose the manual covers four broad areas general methodologies environmental public health microbiology microbial ecology and biodegradation and biotransformation This wealth of information is divided into 18 sections each containing chapters written by acknowledged topical experts from the international community Specifically this new edition of the Manual Contains completely new sections covering microbial risk assessment quality control and microbial source tracking Incorporates a summary of the latest methodologies used to study microorganisms in various environments Synthesizes the latest information on the assessment of microbial presence and microbial activity in natural and artificial environments The Manual of Environmental Microbiology is an essential reference for environmental microbiologists microbial ecologists and environmental engineers as well as those interested in human diseases water and wastewater treatment and biotechnology

Advances in Microbial Physiology ,1977-08-24 Advances in Microbial Physiology publishes topical and important reviews interpreting physiology to include all material that contributes to our understanding of how microorganisms and their component parts work Metagenomics and Microbial Ecology Surajit De Mandal,Amrita Kumari Panda,N. Senthil Kumar,Satpal Singh Bisht,Fengliang Jin,2021-11-29 Microorganisms comprise the greatest genetic diversity in the natural ecosystem and characterization of these microbes is

an essential step towards discovering novel products or understanding complex biological mechanisms The advancement of metagenomics coupled with the introduction of high throughput cost effective NGS technology has expanded the possibilities of microbial research in various biological systems In addition to traditional culture and biochemical characteristics omics approaches metagenomics metaproteomics and metatranscriptomics are useful for analyzing complete microbial communities and their functional attributes in various environments Metagenomics and Microbial Ecology Techniques and Applications explores the most recent advances in metagenomics research in the landscape of next generation sequencing technologies This book also describes how advances in sequencing technologies are used to study invisible microbes as well as the relationships between microorganisms in their respective environments Features Covers a wide range of concepts investigations and technological advancement in metagenomics at the global level Highlights the novel and recent approaches to analyze microbial diversity and its functional attributes Features a range of chapters that present an introduction to the field and functional insight into various ecosystems

Encyclopedia of Microbiology Thomas M. Schmidt, 2019-09-11 Encyclopedia of Microbiology Fourth Edition Five Volume Set gathers both basic and applied dimensions in this dynamic field that includes virtually all environments on Earth This range attracts a growing number of cross disciplinary studies which the encyclopedia makes available to readers from diverse educational backgrounds The new edition builds on the solid foundation established in earlier versions adding new material that reflects recent advances in the field New focus areas include Animal and Plant Microbiomes and Global Impact of Microbes The thematic organization of the work allows users to focus on specific areas e g for didactical purposes while also browsing for topics in different areas Offers an up to date and authoritative resource that covers the entire field of microbiology from basic principles to applied technologies Provides an organic overview that is useful to academic teachers and scientists from different backgrounds Includes chapters that are enriched with figures and graphs and that can be easily consulted in isolation to find fundamental definitions and concepts

General and Applied Aspects of Halophilic Microorganisms Francisco Rodriguez-Valera, 2012-12-06 During recent years the subject of extreme environments and extremophiles has become a central topic in modern Biology The capability of some microorganisms to withstand and often prefer the harsh conditions found in such environments is helping to define the physico chemical limits of life and in consequence its essential nature Halophiles are one of the most representative types of extremophiles requiring high concentrations of inorganic salts mostly sodium chloride to grow and survive They inhabit hypersaline environments the distribution and abundance of which during geological eras are attested by the vast amounts of evaporite rocks present in the Earth crust and by their role in the generation of petroleum deposits The conditions of high osmolarity and ionic strength that are concomitant with concentrated salt solutions challenge the stability of lipid bilayers and the structure of proteins forcing halophilic microbes to develop specialized molecules and physiological mechanisms to cope with this environmental stress Even so halophilism is a

widespread trait in the microbial world All the major groups of eucaryotic microbes two groups of archaeobacteria and most phylogenetic branches of eubacteria have halophilic representatives Therefore the study of halophilic microorganisms is indeed a highly heterogeneous and extensive topic The present volume contains the contributions to the FEMS NATO Advanced Research Workshop on General and Applied Aspects of Halophilic Microorganisms held at Alicante Spain September 17-22 1989

Model Ecosystems in Extreme Environments, 2019-05-29 Model Ecosystems in Extreme Environments Second Edition examines ecosystems at the most extreme habitats and their interaction with the environment providing a key element in our understanding of the role and function of microorganisms in nature The book highlights current topics in the field such as biodiversity and the structure of microbial communities in extreme environments the effects of extreme environmental conditions on microbial ecosystems and ecological and evolutionary interactions in extreme environments among other topics It will be a valuable text for faculty and students working with extremophiles and or microbial ecology and researchers including astrobiologists biologists evolutionary scientists astronomers geochemists and oceanographers Explores in detail how microbial ecosystems thrive in extreme environments Highlights the relevance of extremophiles as model ecosystems to the study of microbial ecology Examines how extreme ecosystems can help our search for life on other planets

Adaptation to Life at High Salt Concentrations in Archaea, Bacteria, and Eukarya Nina Gunde-Cimerman, Aharon Oren, Ana Plemenitaš, 2005-09-30 Salt is an essential requirement of life Already from ancient times e.g. see the books of the Bible its importance in human life has been known For example salt symbolizes destruction as in Sodom and Gomorrah but on the other hand it has been an ingredient of every sacrifice during the Holy Temple periods Microbial life in concentrated salt solutions has fascinated scientists since its discovery Recently there have been several international meetings and books devoted entirely to halophiles This book includes the proceedings of the Halophiles 2004 conference held in Ljubljana Slovenia in September 2004 www.u-lj.si/bfbhaloph/index.html This meeting was attended by 120 participants from 25 countries The editors have selected presentations given at the meeting for this volume and have also invited a number of contributions from experts who had not been present in Ljubljana This book complements Halophilic Microorganisms edited by A. Ventosa and published by Springer Verlag 2004 Halophilic Microorganism and their Environments by A. Oren 2002 published by Kluwer Academic Publishers as volume 5 of Cellular Origins Life in Extreme Habitats and Astrobiology COLE and Microbiology and Biogeochemistry of Hypersaline Environments edited by A. Oren and published by CRC Press Boca Raton 1999 Salt loving halophilic microorganisms grow in salt solutions above seawater salinity 3-5% salt up to saturation ranges i.e. around 35% salt High concentrations of salt occur in natural environments e.g.

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