

J. Wingender  
T. R. Neu  
H.-C. Flemming (Eds.)

# Microbial Extracellular Polymeric Substances

Characterization,  
Structure  
and Function



Springer

# Microbial Extracellular Polymeric Substances Characterization Structure And Function

**Stephanie M. Smith**



## **Microbial Extracellular Polymeric Substances Characterization Structure And Function:**

**Microbial Extracellular Polymeric Substances** Jost Wingender, Thomas R. Neu, Hans-Curt Flemming, 2012-12-06  
Microbial extracellular polymeric substances EPS are the key components for the aggregation of microorganisms in biofilms flocs and sludge They are composed of polysaccharides proteins nucleic acids lipids and other biological macromolecules EPS provide a highly hydrated gel matrix in which microbial cells can establish stable synergistic consortia Cohesion and adhesion as well as morphology structure biological function and other properties such as mechanical stability diffusion sorption and optical properties of microbial aggregates are determined by the EPS matrix Also the protection of biofilm organisms against biocides is attributed to the EPS Their matrix allows phase separation in biofiltration and is also important for the degradation of particulate material which is of great importance for the self purification processes in surface waters and for waste water treatment

*Microbial Extracellular Polymeric Substances* Jost Wingender, Thomas R Neu, Hans-Curt Flemming, 1999-10-20 Microbial extracellular polymeric substances EPS are the key components for the aggregation of microorganisms in biofilms flocs and sludge They are composed of polysaccharides proteins nucleic acids lipids and other biological macromolecules EPS provide a highly hydrated gel matrix in which microbial cells can establish stable synergistic consortia Cohesion and adhesion as well as morphology structure biological function and other properties such as mechanical stability diffusion sorption and optical properties of microbial aggregates are determined by the EPS matrix Also the protection of biofilm organisms against biocides is attributed to the EPS Their matrix allows phase separation in biofiltration and is also important for the degradation of particulate material which is of great importance for the self purification processes in surface waters and for waste water treatment In this volume analysis characterization composition regulation function and interactions of microbial EPS are covered

**Advances in Applied Microbiology** Geoffrey M. Gadd, Sima Sariaslani, 2023-10-30 *Advances in Applied Microbiology* Volume 125 continues the comprehensive reach of this widely read and authoritative review source in microbiology Users will find invaluable references and information on a variety of areas relating to the topics of microbiology Contains contributions from leading authorities in the field Informs and updates on the latest developments in the field of microbiology Includes discussions on the role of specific molecules in pathogen life stages interactions and much more

*Microbial Exopolysaccharides: From Genes to Applications* Jochen Schmid, Julia Fariña, Bernd Rehm, Volker Sieber, 2016-06-24 Microbial polysaccharides represent an attractive alternative to those from plants or macro algae They can be produced from renewable sources including lignocellulosic waste streams Their production does not depend on geographical constraints and or seasonal limitations Additionally the manipulation of biosynthetic pathways to enhance productivity or to influence the chemical polysaccharide composition is comparatively easy in bacteria Microbial exopolysaccharides represents a valuable resource of biogenic and biodegradable polymers suitable to replace petro based polymers in various technical applications Furthermore biocompatible exopolysaccharides are very

attractive in medical applications such as drug delivery systems use as vaccines or nanoparticles This research topic will depict the status quo as well as the future needs in the field of EPS and biofilm research Starting from the unexplored diversity of microbial polysaccharide producers to production processes and possibilities for modifications to enhance the already high number of functionalities based on the chemical structures An overview of the recent and future applications will be given and the necessity in unravelling the biosynthesis of microbial exopolysaccharide producers is depicted highlighting the future trend of tailor made polymers Constraints in structure analysis of these highly complex biogenic polymers are described and different approaches to solve the restrictions in imaging and NMR analysis will be given Therefore this research topic comprises the whole process from genes to applications

**Nanoscale Structure and Properties of Microbial Cell Surfaces** Elena P. Ivanova,2007 This book presents an accessible and comprehensive survey of recent advances in the understanding of the structure and properties of microbial cell surfaces Gathering leading experts in the field it is the first book to cover the fundamental knowledge of microbial cell surfaces at the nanometre scale resolution that is now provided by various scanning probe microscopy techniques SPM The advent of SPM has recently opened up a wide range of novel and fascinating applications for biological research The book presents the most recent advances in the application of SPM techniques to study cell surfaces It is a useful guide for researchers that are seeking to tap the power and scope of this technology to further their own work on cell surface structure and properties The book also provides the reader with a realistic appreciation of the advantages and limitations of the SPM techniques as well as the potential of these techniques to advance our understanding of biological systems to a new level

**Roles of Extracellular Polymeric Substances (EPS) in the Transport, Retention, Detachment, and Deposition of Trichloroethylene (TCE) Degrading Toluene Oxidizing Bacteria in Porous Media** Aksara Putthividhya,2004

**Pulp and Paper Industry** Pratima Bajpai,2015-04-09 Pulp and Paper Industry Microbiological Issues in Papermaking features in depth and thorough coverage of microbiological issues in papermaking and their consequences and the current state of the different alternatives for prevention treatment and control of biofilm slime considering the impact of the actual technological changes in papermaking on the control programmes The microbial issues in paper mill systems chemistry of deposits on paper machines the strategies for deposit control and methods used for the analysis of biofouling are all dealt in this book along with various growth prevention methods The traditional use of biocides is discussed taken into account the new environmental regulations regarding their use Finally discusses the trends regarding the future of the microbiological control in papermaking systems In depth coverage of microbiological issues in papermaking and their consequences Discusses eco efficient processes green processes for biofilm slime control Offers a thorough review of the current literature with links to the primary literature Comprehensive indexing Author is an authority in the pulp and paper industry

*Multi-Scale Biogeochemical Processes in Soil Ecosystems* Yu Yang,Marco Keiluweit,Nicola Senesi,Baoshan Xing,2022-03-23 MULTI SCALE BIOGEOCHEMICAL

PROCESSES IN SOIL ECOSYSTEMS Provides a state of the art overview of research in soil biogeochemical processes and strategies for greenhouse gas mitigation under climate change Food security and soil health for the rapidly growing human population are threatened by increased temperature and drought soil erosion and soil quality degradation and other problems caused by human activities and a changing climate Because greenhouse gas emission is the primary driver of climate change a complete understanding of the cycles of carbon and major nutritional elements is critical for developing innovative strategies to sustain agricultural development and environmental conservation Multi Scale Biogeochemical Processes in Soil Ecosystems Critical Reactions and Resilience to Climate Changes is an up to date overview of recent research in soil biogeochemical processes and applications in ecosystem management Organized into three parts the text examines molecular scale processes and critical reactions presents ecosystem scale studies of ecological hotspots and discusses large scale modeling and prediction of global biogeochemical cycles Part of the Wiley IUPAC Series on Biophysico Chemical Processes in Environmental Systems this authoritative volume Provides readers with a systematic and interdisciplinary approach to sustainable agricultural development and management of soil ecosystems in a changing climate Features contributions from an international team of leading scientists Examines topics such as soil organic matter stabilization soil biogeochemistry modeling and soil responses to environmental changes Discusses strategies for mitigating greenhouse gas emission and improving soil health and ecosystems resilience Includes an introduction to working across scales to project soil biogeochemical responses to climatic change Multi Scale Biogeochemical Processes in Soil Ecosystems Critical Reactions and Resilience to Climate Changes is essential reading for scientists engineers agronomists chemists biologists academic researchers consultants and other professionals whose work involves the nutrient cycle ecosystem management and climate change *Marine & Freshwater Research* ,2009 **The Characterization and Role of *Xylella Fastidiosa* Plant Cell Wall Degrading Enzymes and Exopolysaccharide in Pierce's Disease of Grapevine** Mary Caroline Roper,2006 **Manipulation and Analysis of Biomolecules, Cells, and Tissues** ,2003 *The Perfect Slime* Hans-Curt Flemming,Dr Thomas R. Neu,Dr Jost Wingender,2016-09-15 The Perfect Slime presents the latest state of knowledge and all aspects of the Extracellular Polymeric Substances EPS matrix from the ecological and health to the antifouling perspectives The book brings together all the current material in order to expand our understanding of the functions properties and characteristics of the matrix as well as the possibilities to strengthen or weaken it The EPS matrix represents the immediate environment in which biofilm organisms live From their point of view this matrix has paramount advantages It allows them to stay together for extended periods and form synergistic microconsortia it retains extracellular enzymes and turns the matrix into an external digestion system and it is a universal recycling yard it protects them against desiccation it allows for intense communication and represents a huge genetic archive They can remodel their matrix break free and eventually they can use it as a nutrient source The EPS matrix can be considered as one of the emergent properties

of biofilms and are a major reason for the success of this form of life Nevertheless they have been termed the black matter of biofilms for good reasons First of all the isolation methods define the results In most cases only water soluble EPS components are investigated insoluble ones such as cellulose or amyloids are much less included In particular in environmental biofilms with many species it is difficult to impossible isolate separate the various EPS molecules they are encased in and to define which species produced which EPS The regulation and the factors which trigger or inhibit EPS production are still very poorly understood Furthermore bacteria are not the only microorganisms to produce EPS Archaea Fungi and algae can also form EPS This book investigates the questions What is their composition function dynamics and regulation What do they all have in common **Characterization of Membrane-aerated Biofilms for Wastewater**

**Treatment** Alina Christianson Cole,2005 **The Cohesive Strength of Biofilms** Eric Hunter Poppele,2006

*Lichenological Contributions in Honour of G.B. Feige* Manfred Jensen,2003 This volume features 42 contributions on the occasion of the 65th birthday of G Benno Feige in 2002 The authors of this volume come from 19 countries which shows its international relevance The articles are distributed to four sections chemicals in lichens new species and phylogeny ecophysiology and morphology distribution and ecology Manual of Environmental Microbiology Christon J. Hurst,Ronald L. Crawford,2002 The new second edition of this essential manual summarizes the information and knowledge of environmental microbiology in a single source It details the natural fate of microorganisms in the environment as well as the intentional attempts to eliminate from the environment microorganisms that are pathogenic to humans or to plants and animals The basic principles of environmental microbiology and general analytical methodologies common across the range of the environments covered are presented first The core sections are structured with regard to the type of environmental medium being discussed This landmark effort defines the study of environmental microbiology as we know it today and serve as an essential contribution to the literature **Chemical Abstracts** ,2002 Canadian Journal of Microbiology ,2001

Bibliotheca lichenologica ,1973 *In-situ Remediation of MTBE Using Bioaugmentation with Bacterial Strain PM1* Stephanie M. Smith,2004

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