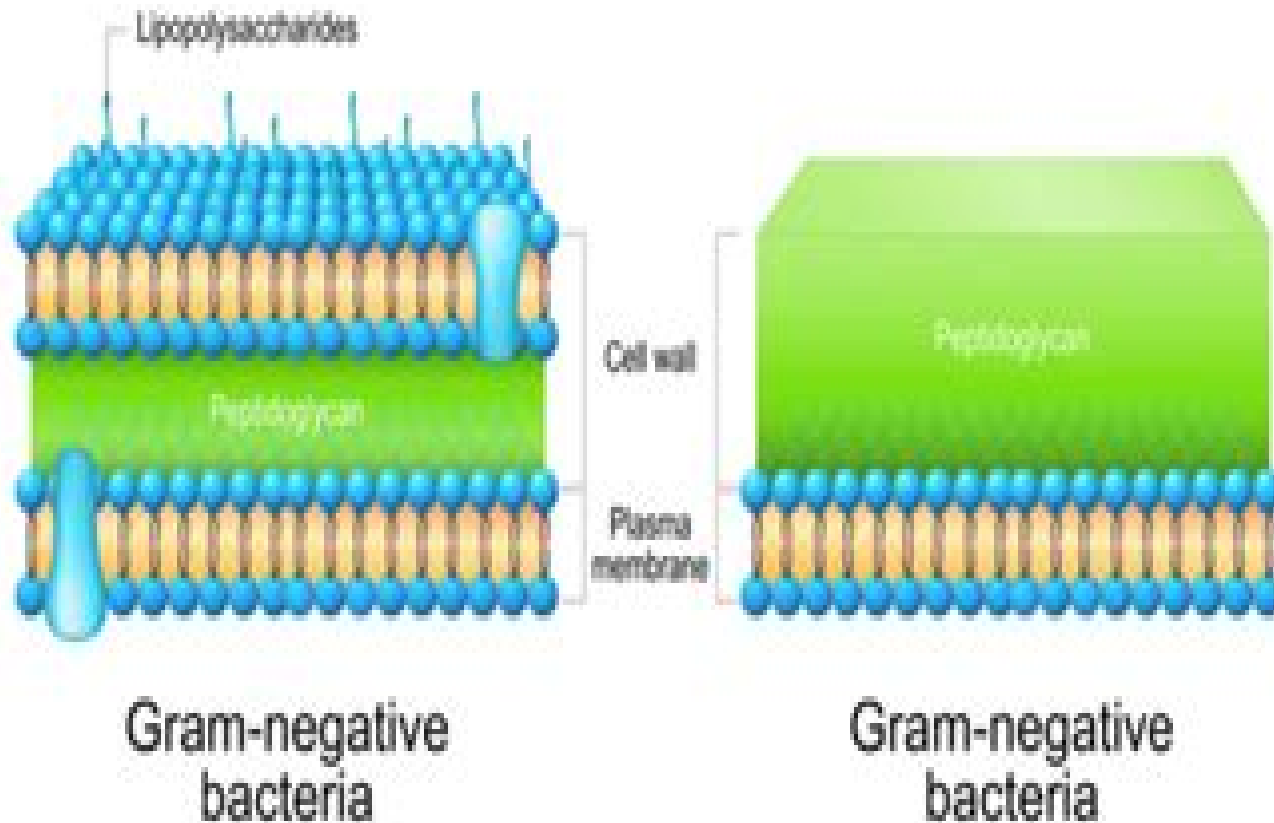


Bacterial Cell Walls



The Bacterial Cell Wall

Milton R. J. Salton



The Bacterial Cell Wall:

The Bacterial Cell Wall Guntram Seltmann, Otto Holst, 2013-03-09 The bacterial cell wall represents a very complex structure disconnecting the interior of single cell organisms from the environment thus protecting but also enabling them to interact with the surrounding milieu and to exchange both substances and information Knowledge of the biochemistry of the cell wall components and the genetic background helps to understand their significance with regard to microbiology and immunology of bacteria This book represents the second edition of a publication which was presented nearly 20 years ago in the German language Die bakterielle Zellwand Since that time our knowledge in this field has been significantly enlarged Therefore the manuscript had to be completely revised and updated To maintain both the size and the introductory character of the book at least to a great extent the authors had to restrict the presented material to that which appears basic and most important This requirement must inevitably bring about many subjective factors As pointed out in the first edition the term cell wall was not taken too strictly Since the constituents located outside the cytoplasmic membrane are frequently difficult to divide in structure localisation and or function into true cell wall components and supplementary substances they are all at least briefly mentioned

Bacterial Cell Walls and Membranes Andreas Kuhn, 2019-06-18 This book provides an up to date overview of the architecture and biosynthesis of bacterial and archaeal cell walls highlighting the evolution based similarities in but also the intriguing differences between the cell walls of Gram negative bacteria the Firmicutes and Actinobacteria and the Archaea The recent major advances in this field which have brought to light many new structural and functional details are presented and discussed Over the past five years a number of novel systems e g for lipid porin and lipopolysaccharide biosynthesis have been described In addition new structural achievements with periplasmic chaperones have been made all of which have revealed amazing details on how bacterial cell walls are synthesized These findings provide an essential basis for future research e g the development of new antibiotics The book s content is the logical continuation of Volume 84 of SCBI on Prokaryotic Cytoskeletons and sets the stage for upcoming volumes on Protein Complexes

Bacterial Cell Wall Structure and Dynamics Tobias Dörr, Partick J. Moynihan, Christoph Mayer, 2019-12-27 Bacterial cells are encased in a cell wall which is required to maintain cell shape and to confer physical strength to the cell The cell wall allows bacteria to cope with osmotic and environmental challenges and to secure cell integrity during all stages of bacterial growth and propagation and thus has to be sufficiently rigid Moreover to accommodate growth processes the cell wall at the same time has to be a highly dynamic structure During cell enlargement division and differentiation bacteria continuously remodel degrade and resynthesize their cell wall but pivotally need to assure cell integrity during these processes Finally the cell wall is also adjusted according to both environmental constraints and metabolic requirements However how exactly this is achieved is not fully understood The major structural component of the bacterial cell wall is peptidoglycan PG a mesh like polymer of glycan chains interlinked by short chain peptides constituting a net like macromolecular structure that has

historically also termed murein or murein sacculus Although the basic structure of PG is conserved among bacteria considerable variations occur regarding cross bridging modifications and attachments Moreover different structural arrangements of the cell envelope exist within bacteria a thin PG layer sandwiched between an inner and outer membrane is present in Gram negative bacteria and a thick PG layer decorated with secondary glycopolymers including teichoic acids is present in Gram positive bacteria Furthermore even more complex envelope structures exist such as those found in mycobacteria Crucially all bacteria possess a multitude of often redundant lytic enzymes termed autolysins and other cell wall modifying and synthesizing enzymes allowing to degrade and rebuild the various structures covering the cells However how cell wall turnover and cell wall biosynthesis are coordinated during different stages of bacterial growth is currently unclear The mechanisms that prevent cell lysis during these processes are also unclear This Research Topic focuses on the dynamics of the bacterial cell wall its modifications and structural rearrangements during cell growth and differentiation It pays particular attention to the turnover of PG its breakdown and recycling as well as the regulation of these processes Other structures for example secondary polymers such as teichoic acids which are dynamically changed during bacterial growth and differentiation are also covered In recent years our view on the bacterial cell envelope has undergone a dramatic change that challenged old models of cell wall structure biosynthesis and turnover This collection of articles aims to contribute to new understandings of bacterial cell wall structure and dynamics *The Bacterial Cell Wall* Milton R. J. Salton, 1964

Bacterial Cell Wall J.-M. Ghuysen, R. Hakenbeck, 1994-02-09 Studies of the bacterial cell wall emerged as a new field of research in the early 1950s and has flourished in a multitude of directions This excellent book provides an integrated collection of contributions forming a fundamental reference for researchers and of general use to teachers advanced students in the life sciences and all scientists in bacterial cell wall research Chapters include topics such as Peptidoglycan an essential constituent of bacterial endospores Teichoic and teichuronic acids lipoteichoic acids lipoglycans neural complex polysaccharides and several specialized proteins are frequently unique wall associated components of Gram positive bacteria Bacterial cells evolving signal transduction pathways Underlying mechanisms of bacterial resistance to antibiotics *The Bacterial Cell Surface* S.M. Hammond, P.A. Lambert, Andrew Rycroft, 2012-12-06 It is a common statement that because of its simplicity the bacterial cell makes an ideal model for the study of a wide variety of biological systems and phenomena While no one would dispute that much of our understanding of biological function derives from the study of the humble bacterium the concept of a simple life form would be hotly disputed by any scientist engaged in the determination of the relationship between structure and function within the bacterial cell Bacteria are particularly amenable to intensive study their physiology can be probed with powerful biochemical genetical and immunological techniques Each piece of information obtained inevitably raises as many questions as answers and can lead to a highly confused picture being presented to the lay reader Nowhere is this more evident than in the study of the surface layers of the bacterial cell Examination of the early

electron micrographs suggested that the bacterial cytoplasm was surrounded by some sort of semi rigid layer possessing sufficient intrinsic strength to protect the organism from osmotic lysis The belief that the surface layers were rather passive led to their neglect while researchers concentrated on the superficially more exciting cytoplasmic components Over the last twenty years our view of the bacterial envelope has undergone extensive revision revealing a structure of enormous complexity

The Bacterial Cell Wall Hung Ton-That, 2023-10-10 This detailed volume explores methods currently used to investigate the cell wall of various bacterial species and pathogens By using a combination of genetic molecular biochemical and cytological techniques the protocols address many fundamental questions involving the composition biosynthesis and regulation of bacterial peptidoglycan Written for the highly successful Methods in Molecular Biology series chapters include introductions to their respective topics lists of the necessary materials and reagents step by step and readily reproducible laboratory protocols as well as tips for troubleshooting and avoiding known pitfalls Authoritative and practical The Bacterial Cell Wall Methods and Protocols provides current and future researchers with a compilation of many of the most important and useful procedures in a single resource

The Bacterial Cell Wall Brandon Gilgen, 2025-08-25 The bacterial cell wall is a vital structural component that provides shape and protection to the cell It is primarily composed of peptidoglycan a complex polymer of sugars and amino acids The structure of the cell wall varies between Gram positive and Gram negative bacteria In Gram positive bacteria the cell wall is thick with multiple layers of peptidoglycan and includes teichoic acids which are essential for maintaining cell wall integrity and function In contrast Gram negative bacteria have a thinner peptidoglycan layer situated between the inner cytoplasmic membrane and an outer membrane that contains lipopolysaccharides The outer membrane provides an additional barrier enhancing resistance to certain antibiotics The cell wall is crucial for bacterial survival protecting against osmotic pressure and environmental stresses Its unique composition makes it a target for antibiotics such as penicillin which inhibit peptidoglycan synthesis leading to bacterial cell death This book includes some of the vital pieces of work being conducted across the world on various topics related to bacterial cell walls The aim of this book is to present researches that have transformed this discipline and aided its advancement It aims to equip students and experts with the advanced topics and upcoming concepts in this area

Bacterial Cell Wall Homeostasis Hee-Jeon Hong, 2016 This volume brings together the most widely used and important protocols currently being employed in researching and understanding bacterial cell wall homeostasis Chapters in Bacterial Cell Wall Homeostasis cover a variety of subjects such as modern microscopy techniques and other biophysical methods used to characterize the subcellular structure of the bacterial cell wall high throughput approaches that can be used to identify all the genes and proteins that participate in the correct functioning of an organism u2019s cell wall protocols for assaying individual gene products for specific cell wall functions or identify chemicals with inhibitory activity against the cell wall and methods for analyzing the non protein components of the cell wall and the increasing use of computational approaches for predicting and modeling cell wall related

functions and processes Written in the highly successful Methods in Molecular Biology series format chapters include introduction to their respective topics lists of the necessary material and reagents step by step readily reproducible laboratory protocols and tips on troubleshooting and avoiding known pitfalls Thorough and cutting edge Bacterial Cell Wall Homeostasis Methods and Protocols emphasizes the diversity of the research taking place in bacterial cell wall homeostasis and explains how the integration of information from across multiple disciplines is going to be essential if a holistic understanding of this important process is to be obtained

Microbial Cell Walls Milton R. J. Salton, 1960 The Bacterial Cell Surface Stephen M. Hammond, Peter A. Lambert, Andrew N. Rycroft, 1984 **Studies of the Biosynthesis of the Bacterial Cell Wall and Antibiotic Deoxysugar Components** Zhihong Guo, 1998 The Bacteria: Their Origin, Structure, Function and Antibiosis Arthur L. Koch, 2006-04-24 Understanding antibiotic chemotherapy at the ecological level is necessary for more permanent advances in development and in the usage of antibiotic agents This book traces the history of bacteria from the development of life on earth to the evolution of diversity It is this diversity that led almost automatically to the development of pathogens as well as antibiotics If we are to create long term antibiotics we must design them with this history in mind

Studies of the Biosynthesis of Bacterial Cell Wall and Antibiotic Deoxysugar Moieties, DTDP-rhamnose, CDP-ascarylose and DTDP-mycaminose Nanette Loida Sanidad Que, 1997 Immunology of the Bacterial Cell Envelope D. E. S. Stewart-Tull, M. Davies, 1985-09-17 The first real attempt to collate information on the immunology of the cell envelope This unique approach provides a cross reference to the immunological studies on various cell surface components which should be useful to researchers working with a single component Reviews each outer surface component in terms of its innate antigenicity or its effect on mammalian immune response Describing many different experimental techniques this comprehensive illustrated guide is a valuable one volume reference source

Bacterial Cell Structure Howard John Rogers, 1983 *Probing the Bacterial Cell Wall with Chemical Biology Tools*, 2017 Bacterial Cell Surface Techniques Ian Hancock, Ian Poxton, 1988 Bacterial Cell Surface Techniques is the first complete practical text on the chemistry and immunochemistry of bacterial cell walls It provides details of methods available for the preparation of cell walls and their components All the sections are written by researchers with first hand practical experience of the techniques The book concentrates on techniques that are available to most laboratories and provides complete information for workers new to the field while at the same time serving as a valuable reference work for those already engaged in cell surface research

Bacteriology Logan Hurst, 2019-06-16 Bacteriology is the branch and specialty of biology that studies the morphology ecology genetics and biochemistry of bacteria as well as many other aspects related to them This subdivision of microbiology involves the identification classification and characterization of bacterial species A person who studies bacteriology is a bacteriologist Bacteriological study subsequently developed a number of specializations among which are agricultural or soil bacteriology clinical diagnostic bacteriology industrial bacteriology marine bacteriology public health bacteriology sanitary

or hygienic bacteriology and systematic bacteriology which deals with taxonomy Bacterial cells lack a membrane bound nucleus Their genetic material is naked within the cytoplasm Ribosomes are their only type of organelle The term e nucleoid refers to the region of the cytoplasm where chromosomal DNA is located usually a singular circular chromosome Bacteria are usually single celled except when they exist in colonies These ancestral cells reproduce by means of binary fission duplicating their genetic material and then essentially splitting to form two daughter cells identical to the parent A wall located outside the cell membrane provides the cell support and protection against mechanical stress or damage from osmotic rupture and lysis The major component of the bacterial cell wall is peptidoglycan or murein This book provides an excellent introduction to bacteria In addition it brings a first rate general introduction to the subject for student whose courses include microbiology as a component These include student of biochemistry botany zoology medicine pharmacy and agriculture as well as food science biotechnology ecology and environmental science

The Bacterial Cell: Coupling between Growth, Nucleoid Replication, Cell Division and Shape Arie Z. Zaritsky, Conrad L. Woldringh, Jaan Männik, 2016-05-02 Bacterial Physiology was inaugurated as a discipline by the seminal research of Maal e Schaechter and Kjeldgaard published in 1958 Their work clarified the relationship between cell composition and growth rate and led to unravel the temporal coupling between chromosome replication and the subsequent cell division by Helmstetter et al a decade later Now after half a century this field has become a major research direction that attracts interest of many scientists from different disciplines The outstanding question how the most basic cellular processes mass growth chromosome replication and cell division are inter coordinated in both space and time is still unresolved at the molecular level Several particularly pertinent questions that are intensively studied follow a what is the primary signal to place the Z ring precisely between the two replicating and segregating nucleoids b Is this coupling related to the structure and position of the nucleoid itself c How does a bacterium determine and maintain its shape and dimensions Possible answers include gene expression based mechanisms self organization of protein assemblies and physical principles such as micro phase separations by excluded volume interactions diffusion ratchets and membrane stress or curvature The relationships between biochemical reactions and physical forces are yet to be conceived and discovered This e book discusses the above mentioned and related questions The book also serves as an important depository for state of the art technologies methods theoretical simulations and innovative ideas and hypotheses for future testing Integrating the information gained from various angles will likely help decipher how a relatively simple cell such as a bacterium incorporates its multitude of pathways and processes into a highly efficient self organized system The knowledge may be helpful in the ambition to artificially reconstruct a simple living system and to develop new antibacterial drugs

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