Preface

For the further evolution of single-celled organisms, the development of cell wall structures was advantageous for the successful colonization of different moderate and extreme habitats. Therefore, cell wall polymers are important cell components of prokaryotic microbes. They are involved in different manifestations of life. Cell walls play a role in shape maintenance, protection against harmful agents, cell adhesion, and positive and negative biological activities against host cells.

Studies since the 1950s revealed that quite different cell wall polymers could be part of the cell wall profiles. The structure and functions of the main cell wall polymers, such as peptidoglycan (murein, pseudomurein), outer membrane proteins, lipopolysaccharides, teichoic acids, teichuronic acids, lipoteichoic acids, S-layer subunit and cell-wall associated proteins, have been elucidated in the last 60 years.

The prokaryotes are divided into two domains, bacteria and archaea. Each of these two domains possesses its own cell wall structures. Most bacteria are characterized by peptidoglycan sacculi composed of murein, while this polymer is lacking in the archaea. Some archael methanogens could possess pseudomurein instead. The common cell wall compound of Archaea is a single layer of crystalline protein subunits (S-layer) covering the cytoplasmic membrane directly. S-layers are found in bacteria on the outside of the murein sacculi of Gram-positive cells or the outer membrane in Gram-negative organisms. In addition, pseudomurein, heteropolysaccarides, lipoglycans, and glutaminylglucan are found in archaea, leading to a positive Gram staining.

This book provides a comprehensive analysis of some selected current topics on the recent advances made in the structures and biochemistry of cell wall polymers, and caters to the needs of students and scientists of live sciences.

We want to thank all the authors for putting down their experiences on paper, which facilitated this comprehensive survey on the different novel aspects of microbial cell walls. Finally, we are grateful that under the responsibility of
Dr. Dieter Czeschlik and Dr. Jutta Lindenborn, the Springer Life Sciences Editorial realized this book on microbial cell wall structures; these structures are important components for the interactions and stability of microbial cells in their environment.

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