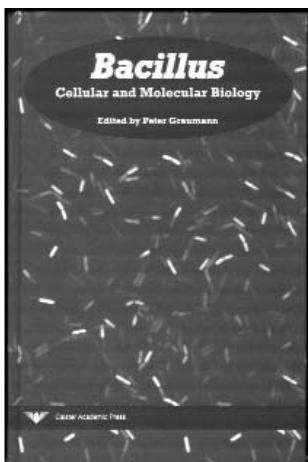


BOOK REVIEW

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Bacillus. Cellular and molecular biology

PETER GRAUMANN (ED.)

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Bacillus. Cellular and Molecular Biology provides a most comprehensive and authoritative account on the latest research on *Bacillus subtilis*. If you thought nothing new and exciting could come up from studies of an organism that has been the focus of intense research for more than 60 years, you are here for a big surprise. Despite being one of the best studied bacterial systems in terms of molecular biology and cell biology, new approaches to study *B. subtilis* have provided novel and exciting insights into the dynamic processes occurring in single cell organisms as well as their social interactions in a communal setting.

B. subtilis is a gram-positive bacterium that is ubiquitous in soils. It is highly amenable to genetic manipulation and, for this reason, it has been widely adopted as a model bacterial system and the 'gram-positive equivalent' of *Escherichia coli*. In contrast to *E. coli*, *B. subtilis* can divide asymmetrically, producing an endospore as a part of its vital cycle in unfavorable conditions, such as nutrient limitation. This has made *B. subtilis* an ideal system to study cell differentiation. Certain cell attributes such as flagellar motility and competence also may be induced prior to sporulation. Thus, *B. subtilis* also serves as a model system to study global regulatory networks.

Certain cellular processes such as DNA replication and the coordination of chromosome replication and segregation with cell division have been studied in great detail in both *B. subtilis* and *E. coli*. The similarities and differences observed in both organisms have helped to define the basic conservation underlying such vital processes while highlighting the different strategies employed by bacteria to adapt cellular mechanisms to their particular lifestyle. In the first chapter of the book, for example, Philippe Noirot and collaborators provide an elegant review of what is known about DNA replication in *B. subtilis* in comparison to *E. coli*, and highlight

those differences that are the basis of the conservation observed in chromosome duplication in gram-positive bacteria. The application of improved fluorescence microscopy techniques and genetic and genomic tools has also provided novel insights into the dynamics of cell components such as the bacterial cytoskeleton, which is nicely reviewed in one of the chapters.

Most of what is known about *B. subtilis* derives from the study of single cells from planktonic cultures of laboratory strains. Cell differentiation and multicellular growth in *Bacillus* was restricted to endospore formation. Recent studies have shown, however, that natural, undomesticated isolates of *B. subtilis* have the ability to grow as surface attached multicellular communities or biofilms. The ability to study *B. subtilis* in an *in vitro* communal setting has opened new avenues to investigate all aspects of multicellular processes in an organism that is so well-defined and well-known at the single cell level. Elegantly reviewed by Eduardo González-Pastor in the last chapter of the book, the social behavior of *B. subtilis* highlights the novel insights that can be gained when studying bacteria in a communal setting, such as fratricidal behaviors, and the deep implications that these studies have in our understanding of the adaptive responses that enable microorganisms to survive in their natural environment. This is an amazing new field of research that is yet to be fully explored. It again emphasizes that *B. subtilis* is still at the forefront of bacterial research.

In addition to the depth of knowledge and detailed description of the latest research, the book chapters are well written and nicely organized so that the reader can follow the description of cell cycle events such as DNA replication, DNA repair, chromosome segregation and cell division and cell cycle regulatory mechanisms just as they would be timed in the cell cycle. Care also has been taken to blend writing styles and allow the flow from chapter to chapter, thus facilitating the reading. The book is also perfect as a reference for advanced undergraduate and graduate-level courses, as it presents the latest research in bacterial molecular biology, differentiation, gene/protein regulation and development in a clearly written and well-illustrated style. It provides a perfect balance of descriptive background information and detailed experimental methods, while giving a thorough account of the latest discoveries. A must read for anybody interested in just about any aspect of bacterial research.

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