Reviews and Resources

BOOKS

Bacterial Resistance to Antimicrobials (2nd ed.)

Antimicrobial drugs (antibiotics) were considered “miracle drugs” when first introduced in the 1940s because they were highly effective for the treatment of many microbial diseases previously thought to be untreatable. Antimicrobials can significantly increase the survival rates of patients and, as Wax et al. point out in the preface of their book, build the foundation of modern medicine. Yet, the frequent use of these drugs over the years led to the development of various types of antimicrobial resistances (e.g., single and multiple drug resistances, and cross resistance), which let become antibiotics “an endangered category of drugs.”

Bacterial Resistance to Antimicrobials contains a total of 17 well-arranged chapters. The first chapter gives an interesting historical overview about microbial drug resistance. The author of this chapter points out that the framework for understanding the problem of antibiotic resistance was developed prior to the 1940s when investigators studied resistance to antimicrobial toxins (e.g., arsenicals), dyes (e.g., trypan red), and disinfectants (e.g., acids and phenols). He discusses topics such as drug fastness, microbial metabolism and adaptation, drug dependence, and forms of drug resistance. The authors of Chapter 2 provide information about the ecology of antibiotic resistance genes. More specifically, their focus is not so much on the movement of resistant bacterial strains but rather on understanding the transfer of antibiotic resistance genes.

The following 12 chapters (chapters 3–14) discuss the scientific foundation and mechanisms that are involved in antibiotic resistance development, as well as the laboratory methods used to detect bacterial genes coding for drug resistance. In more detail, chapter 3 is about two global intrinsic resistance systems, the mar/sor regulatory network found in Escherichia coli that limits the accumulation of noxious agents (including some clinically important antibiotics), and the aac(2’)-Ia gene in Providencia stuartii. In chapter 4, the reader is invited to learn about the structure, mechanism, and potential inhibition of multidrug resistance (MDR) efflux pumps that play a major role in the intrinsic resistance of gram-negative bacteria. The following chapter (chapter 5) is devoted to the description of the mechanisms that are involved in aminoglycoside antibiotic resistance, while the authors of chapter 6 describe the current knowledge about resistance to β-lactam antibiotics mediated through various classes of β-lactamases. Different bacterial strategies that cause modification of the targets of antimicrobial agents leading to antibiotic resistance are outlined in chapter 7. The following chapter (chapter 8) is about the problem of antibiotic permeability and about approaches to overcome drug resistance associated with bacterial permeability barriers.

Chapter 9 introduces the reader to the various genetic methods (e.g., hybridization, PCR, microarrays, and DNA sequencing) that are currently used for detecting bacterial resistance genes. The author of this chapter provides several specific examples for the application of these methods. The following five chapters analyze the importance of antibiotic resistance for selected bacteria, such as pneumococci (chapter 10), enterococci (chapter 11), Staphylococcus aureus (chapter 12), Mycobacterium tuberculosis (chapter 13), and enterobacteria (chapter 14).

The remaining three chapters (chapters 15–17) discuss the public health aspects associated with the growing problem of antimicrobial resistance development. More specifically, the author of chapter 15 defines bacterial resistance to antimicrobial agents as a worldwide problem affecting both developing and developed countries that can only be solved on a global scale involving collaboration between national governments and their health ministries, pharmaceutical corporations, and international agencies. Chapter 16 describes the specific public health responses to antimicrobial resistance in health care settings (i.e., outpatient and inpatient settings). Finally, chapter 17 addresses the issue of antibacterial drug discovery in the 21st century. The author of this final chapter emphasizes the need for the continued study of the resistance to antibacterial agents and contrasts old-fashioned and novel approaches of antimicrobial drug discovery.

This book provides a wealth of valuable information for clinicians and scientists about the topic of bacterial resistance to antimicrobials. What I liked most about the book is that the authors who work in diverse settings (academia, industry, and federal agencies) tackled the problem of antibiotic resistance development from different angles: they not only discussed the scientific foundation of this phenomenon but also addressed the social and economic impact of this problem on the population level.

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Bacterial Physiology: a Molecular Approach


The field of bacterial physiology has long relied on the important contributions of early microbiologists who studied the responses of bacteria in batch cultures.
While these studies are extremely important to our understanding of the workings of the bacterial cell, the relatively recent explosion of molecular microbiology techniques has allowed researchers to revisit the physiological processes of bacterial cells with a variety of new tools. These techniques have led to an explosion of new theories about how cells adapt and respond and have enabled the investigation of single cell or compartments of cells. This book presents some of the recent advances in bacterial physiology that have been made by the use of molecular microbiology.

New advances in relatively well-studied concepts are covered, including protein secretion systems, DNA supercoiling, alternative sigma factors, and RpoS and adaptation. A major strength of the book is the inclusion of relatively new concepts of microbial physiology, such as quorum sensing, extracellular sensors and induction components in stress tolerance, ribosome modulation factor and phenotypic variation, and bistability. The inclusion of these new topics makes this book very valuable reading for researchers in the field of microbial physiology and possibly for postgrads in the field. However, this book is probably too advanced for undergraduates or others looking for a general overview of bacterial physiology. Nonetheless, it is a valuable addition to the available literature on current bacterial physiology.

At the end of each chapter there are appropriate references to guide those desiring more in depth information on the various topics. I found this reference list to be current and covers major researchers in the area. I particularly like the “highly recommended readings” section in the reference list, which is a good guide for those wanting to investigate the topics in more detail. I enjoyed reading this book and would recommend it to researchers in the field of microbial physiology.

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