

Preface

# Antimicrobial Resistance: Challenges and Solutions



Michael R. Jacobs, MD, PhD  
*Guest Editor*

Since the introduction of arsenical antimicrobial agents into our therapeutic armamentarium by Paul Ehrlich following his pioneering work on protozoal diseases and syphilis in the first decade of the twentieth century, use of these “magic bullets” has become universal in medical, veterinary, and agricultural practice in the first decade of the twenty-first century. This has led to major improvements in our ability to conquer many infectious diseases, but overuse and misuse of these powerful and valuable agents have led to the development of resistance in bacteria, fungi, protozoa, and viruses. This issue is dedicated to delineating the challenges posed by such development of resistance in bacteria, with emphasis on severe infections that are no longer responsive to currently available agents and on respiratory tract infections where the predominant bacterial pathogens have developed resistance to most of the available drug classes. Three articles in this issue address the challenges we face in severe infections in adults, the elderly, and in children. Two articles address key problems we are facing with *Staphylococcus aureus* infections—the development of vancomycin resistance and the problem of methicillin resistance in community-acquired infections.

The second half of this issue is devoted to the challenges posed by the development of resistance in bacterial respiratory tract infections and to solutions proposed for these problems. Two articles address the mechanisms of resistance that these versatile pathogens have developed, illustrating the futility of trying to produce the “ideal” agent without control of the overuse

of these agents that will inevitably lead to resistance. The next article addresses the principles of pharmacokinetics and pharmacodynamics and the application of this knowledge to treating respiratory tract infections. This article is followed by those addressing the application of these pharmacokinetic and pharmacodynamic principles to recent surveillance isolates of the major bacterial respiratory tract pathogens and the development of new formulations of existing agents to address the development of  $\beta$ -lactam and macrolide resistance in *Streptococcus pneumoniae* and  $\beta$ -lactamase production in *Haemophilus influenzae*.

It is my hope that this issue of *Clinics in Laboratory Medicine* will illustrate the precarious state that has evolved from uncontrolled use of these valuable agents, with the hope that readers will be encouraged to advocate more responsible use of these resources in the future.

Michael R. Jacobs, MD, PhD  
Case Western Reserve University School of Medicine  
University Hospitals of Cleveland  
11100 Euclid Avenue  
Cleveland, OH 44106, USA

E-mail address: [mrj6@cwru.edu](mailto:mrj6@cwru.edu)