Polymicrobial Diseases
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Cover photos: Scanning electron micrographs of human gingival plaque showing a mixed biofilm of rods and cocci. An occasional erythrocyte and leukocyte can also be seen. Courtesy of John E. Laffoon and Janet M. Guthmiller, College of Dentistry, University of Iowa, Iowa City, Iowa.
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PREFACE

The veterinary, medical, and dental literature is filled with reports of diseases involving more than one etiologic agent. These have come to be known as polymicrobial diseases. Polymicrobial diseases in animals and humans are more common than generally realized, and many perceived “single-etiologic-agent diseases,” when examined closely, contain polymicrobial etiologies. These include respiratory diseases, gastroenteritis, conjunctivitis, keratitis, hepatitis, Lyme disease, multiple sclerosis, genital infections, intra-abdominal infections, and pertussis.

Polymicrobial Diseases is a collection of chapters from investigators researching a variety of diseases with multiple etiologies. These diseases can be categorized as those originating from polyviral infections, polybacterial infections, viral and bacterial infections, and polymicrobial mycotic infections, and those that result in immunosuppression. The book begins with a section on an integrated view of polymicrobial diseases in animals and humans, including a representative list of these diseases, the etiologic agents, and the underlying mechanisms of pathogenesis (chapter 1). Also included in this section is a chapter on the in vitro methods for the study of polymicrobial diseases (chapter 2). Section II contains information on polyviral infections in animals (chapter 3), infections with multiple hepatotropic viruses (chapter 4), multiple retroviral infections (chapter 5), and viruses associated with multiple sclerosis (chapter 6). Section III discusses polybacterial infections, including bacterial vaginosis (chapter 7), periodontal disease (chapter 8), abscesses (chapter 9), and atrophic rhinitis in swine (chapter 10). Section IV comprises polymicrobial diseases involving viruses and bacteria. These are infections seen in respiratory diseases in humans (chapter 11) and animals (chapters 12 and 13), otitis media (chapter 14), and intestinal disorders (chapter 15). The emerging role of viruses in periodontal disease is also discussed (chapter 16). Section V discusses polymicrobial infections involving fungi (chapter 17) and Candida interactions with bacterial biofilms (chapter 18). Section VI focuses on polymicrobial diseases that result...
from microbe-induced immunosuppression (chapter 19), which often allows other microbes to become established (chapter 20). In conclusion, section VII summarizes the state of polymicrobial infections in animals and humans (chapter 21).

Polymicrobial infections share underlying mechanisms of pathogenesis, and these are presented in chapter 1. First, stress, physiologic abnormalities, and metabolic disease favor the colonization of multiple organisms. Second, alterations induced in the mucosa by one organism favor the colonization of others. Third, synergistic triggering of proinflammatory cytokines increases the severity of disease, reactivates latent infections, or favors the colonization of other microorganisms. Fourth, sharing of determinants among organisms allows activities that organisms do not possess individually. Finally, suppression of the immune system by one organism allows the colonization of others.

We hope that *Polymicrobial Diseases* will stimulate great interest and spur discussion among its readers and draw together investigators from various fields to assess the mechanisms underlying the pathogenesis of these complex infections. This book provides an overview of our current knowledge of mixed infections in both animals and humans, and we believe that it will serve as a useful reference in this area. The emphasis is on identifying polymicrobial diseases, understanding the complex etiology of these diseases, recognizing difficulties in establishing methods for their study, identifying mechanisms of disease pathogenesis, and assessing appropriate methods of treatment. In some instances, the mechanisms of disease are not well known; in others, the mechanisms of pathogenesis have been under intense investigation. Our intent is to present another edition of this book dealing with the specific mechanisms of polymicrobial infection, host response to infection, predisposition and/or risk factors for the diseases, and pathogenesis of polymicrobial disease.

KIM A. BROGDEN
JANET M. GUTHMILLER
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