

PREFACE

As advances in molecular biology, biochemistry, and genomics have furthered our understanding of biological systems, we are faced with new questions. These questions have become even more pressing in the study of cell-cell interactions, particularly those of pathogens with their hosts. Strategies utilized by microorganisms to acquire nutrition, evade host defenses, and gain a foothold in the host are varied and inventive. Host cells have, in turn, evolved mechanisms to suppress pathogen processes, limit nutrient access and "seek and destroy" microbial invaders.

Nutritional immunity is at the center of the host-pathogen interaction, particularly with regard to metal acquisition. Two chapters address the acquisition of transition metals by pathogens. Work from the Kehl-Fie group discusses strategies for acquisition and sequestration of manganese by pathogen and host, respectively. Reduction of manganese availability can impair microbial spread and make them more susceptible to host defenses. German et al., describe how some other transition metals influence bacterial gene expression related to pathogenicity and virulence. They also highlight an interesting host strategy for pathogen elimination; termed "Brass Dagger" for its reliance on copper and zinc, the phagolysosomes of host macrophages accumulate metals to toxic levels to facilitate pathogen killing.

Bacterial pathogens of plants can cause great losses in agriculture; three chapters discuss various aspects of the genus *Dickeya* (formerly *Erwinia*), an important plant pathogen globally. Reverchon et al., focus their review on the complex regulatory networks that modulate early events of host adherence and virulence in the pathogen-plant interaction. The role that chromosomal superhelical density plays in regulating these interactions is of special note. Hogouvieux-Cotte-Pattat describes the dual role of plant cell wall-degrading enzymes as both nutritional providers and virulence factors. Pectate lyases in particular, which degrade the cementing pectin in plant cell walls, play important roles in modulating different phases of the infection process. Thekkiniath et al., discuss the role of multidrug efflux pumps in conferring *Dickeya* resistance to a powerful and varied arsenal of host-synthesized antimicrobial chemicals.

Pseudomonas aeruginosa is an opportunistic pathogen of plants and animals. This bacterium is a common cause of infection in the wounds of burn victims and in the lungs of cystic fibrosis patients. The highly nimble *Pseudomonas* expression platform permits facile adaptation to different environments, such as serum or mucus. Colmer-Hamood et al., describe work to mimic, in vitro, various host environments to study virulence gene expression in the bacterium. One mechanism employed by many successful pathogens, including *Pseudomonas*, is biofilm formation. Biofilms are important in adhesion, drug and toxin resistance, horizontal gene transfer, and long-term survival. Watters et al., reflect on the novel contribution of biofilms to immune evasion and suppression of host immune responses.

Splicing of RNA to maximize coding potential in eukaryotic organisms is well known. RNA splicing in viral pathogens is likely the evolutionary ancestor of these systems. Meyer discusses mRNA biogenesis and stability in the context of RNA splicing in viruses and how these systems vary with different viruses.

Emerging diseases globally have risen many fold over the last decade. One of the most notable of these is the fungal chytrid pathogen of amphibians, *Batrachochytrium dendrobatidis*. Our understanding of this pathogen and its relationship to the host can be enhanced through effective use of genomic tools. Byrne et al., discuss the value of genomic tools with evolutionary, physiological, biochemical, epidemiological, immunological, and epidemiological approaches, to make important advances to guide in the conservation of these fragile hosts.

Ultimately, our understanding of microbes and the mechanisms they use to cause disease will allow us to develop novel and useful strategies to prevent, diagnose, and treat infections. Gray et al., discuss strategies to develop treatments for neglected tropical diseases (NTDs). NTDs impact millions of individuals worldwide and yet are termed "neglected" in part because they have limited impact in western nations where funding is typically directed elsewhere. NTD research requires philanthropic and often multinational cooperation, hence the outgrowth of the Millennium Development Goals.