

Preface

It is hard to imagine that 10 years have already passed since the first edition of *Microbial Biofilms* was published. The success of the first edition of this book prompted the American Society for Microbiology to commission this second edition. Unlike the first edition, when the field was finding its way and gathering strength to become an area of intense interest that spurred a decade of breathtaking research, now we are in a period in which the fruits of this work are being harvested. While in the first monograph the majority of the research was discovery-based, which is the case in most research areas at their inception, the findings of the last decade have resulted in an in-depth understanding of the molecular mechanisms underlying the biology and antimicrobial resistance of biofilms and their pathogenesis. Furthermore, proteomic and genomic approaches identified targets that can be exploited in our discovery efforts of antibiofilm therapeutic approaches, as well as tools that will aid these efforts. We also witnessed efforts at expanding the findings from basic research into translational applications, aimed at preventing and treating biofilm-associated diseases.

In spite of tremendous scientific advances, significant hurdles remain. More research is needed to study mixed-species biofilms and link the complex environments of biofilms and the microbial (bacterial, fungal, and viral) biome. Although reductive analyses based on single genes and proteins, as well as systems biology approaches, have identified several key modulators of biofilm growth, a unified mechanistic model that encompasses the role of these modulators and explains the distinct biology and pathogenesis of biofilms is still lacking. Cross-network analyses of these findings should go a long way toward creating such a model. Moreover, systematic analyses of these interactions may allow us to exploit the novel features of microbial biofilms to discover potent antibiofilm agents. A prerequisite for attaining this goal is the development of standardized methods to evaluate biofilm growth and antibiofilm activity as well as a more thorough understanding of *in vivo* biofilms. Standardized methods will pave the way for the development of new therapeutic strategies that can be tested in relevant *in vivo* biofilm models. Our efforts to discover therapeutic approaches by translating the scientific findings of the last decade should be accelerated, together with discovery and development of devices that prevent or inhibit biofilm formation.

In this edition, some chapters are updated by established investigators based on recent findings, while others are by new contributors, providing unique and fresh insights into the field. This book will take the reader on an exciting journey of bacterial and fungal biofilms, ranging all the way from basic molecular interactions to innovative therapies, with stops along the way to examine the division

of labor in biofilms, new approaches to combat the threat of microbial biofilms, and how biofilms evade the host defense. We would like to extend our thanks to all contributors, without whom completion of this exciting monograph would not have been possible. We thank them for their patience during the publication process and for giving up their valuable time to meet our deadlines. It is our hope that this volume will be of interest to basic science researchers and clinicians, and that it may provide inspiration for graduates and postgraduates to be attracted to the field of microbial biofilms.

Mahmoud Ghannoum

Matthew Parsek

Marvin Whiteley

Pranab K. Mukherjee

