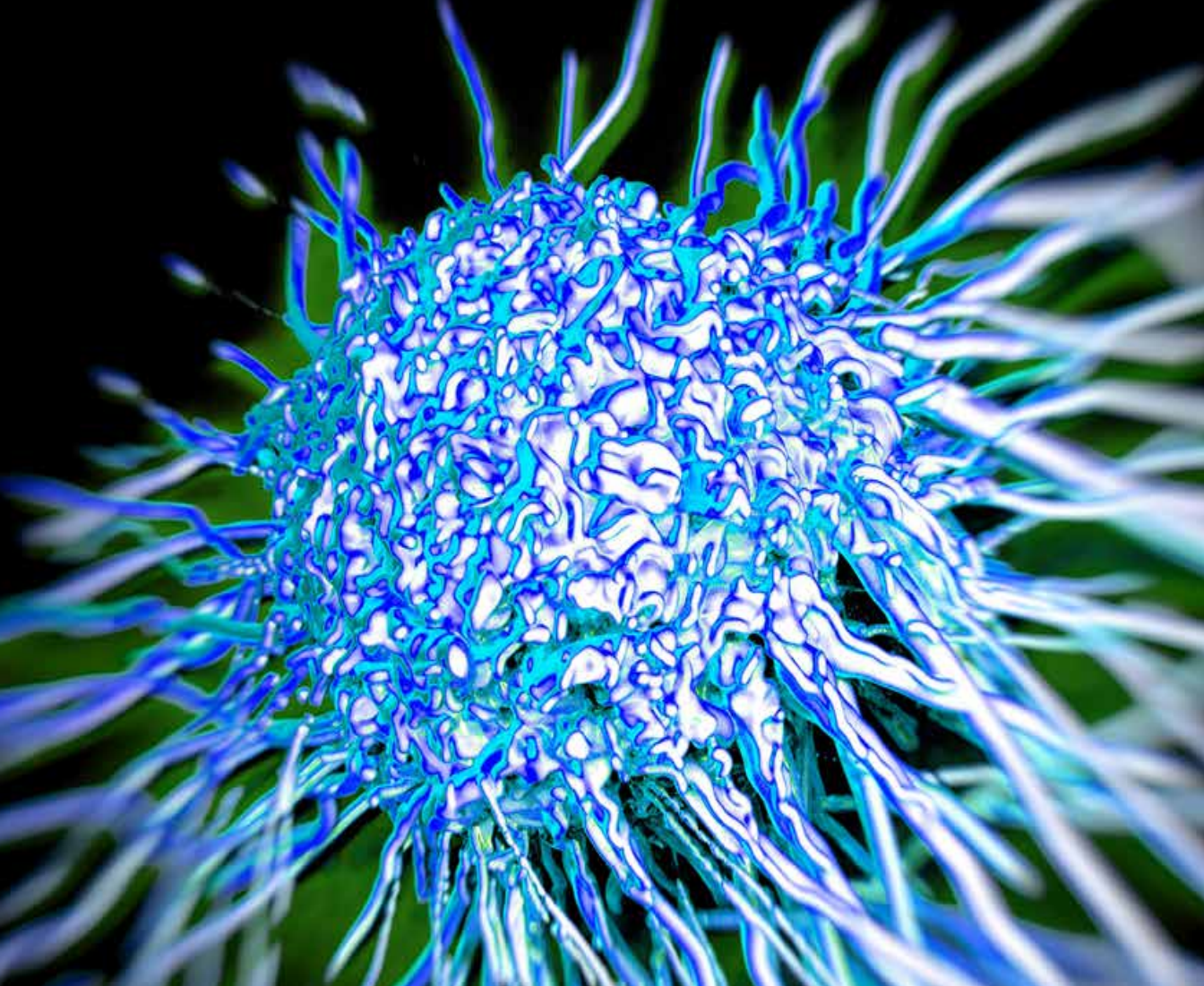
Antibodies for Infectious Diseases

Edited by James E. Crowe, Jr., Diana Boraschi, and Rino Rappuoli



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for Infectious Diseases

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Preface

Antibodies form the principal foundation for modern intervention against infectious diseases. Emil Adolf von Behring was awarded the first Nobel Prize in Physiology or Medicine in 1901 "*for his work on serum therapy, especially its application against diphtheria, by which he has opened a new road in the domain of medical science and thereby placed in the hands of the physician a victorious weapon against illness and deaths*." Antibodies now provide the focus for understanding mechanisms of immunity to most infectious diseases, and they play a central role in passive immunotherapy and active vaccination as mechanisms or correlates of immunity. For most of the 20th century, immunotherapy was based on passive transfer of polyclonal hyperimmune animal serum, immune human serum, or even hyperimmune human serum. Georges J.F. Köhler and César Milstein reported the generation of monoclonal antibodies in 1979, for which they shared the 1984 Nobel Prize in Physiology or Medicine "*for . . .the discovery of the principle for production of monoclonal antibodies*." Since that time, entire fields related to antibodies for infectious diseases, including antibody gene cloning, engineering, and expression; antibody libraries; and high-throughput antibody gene repertoire sequence analysis have extended our capabilities to explore the diversity of antibody specificity and function with unprecedented depth and breadth.

This book provides a broad survey of many of the most important aspects of the field of antibodies for infectious diseases. The book begins with a general introduction, followed by chapters 2 through 5 on general features pertaining to structure, function, isotype, and the role of complement in antibody function. Chapters 6 through 10 review contemporary approaches for antibody discovery using phage and yeast display, plasma cell and memory B cell cloning, human hybridomas, humanized mice, and computational methods. Chapters 11 through 18 review in depth the biology of antibodies specific for particular pathogens, including viruses and bacterial toxins, to illustrate the role of antibodies in antimicrobial immunity with specific targets. These chapters reveal that attempts to raise effective antibody responses to each of these pathogens faces unique and pathogen-specific challenges. Chapters 19 to 23 cover major technical advances pertaining to antibody engineering, repertoire sequencing and analysis, and new methods for study or therapeutic use of antibodies, including radiotherapy. Finally, chapters 24 and 25 cover new methods for expression of monoclonal antibodies, in plants or by transfer of antibody genes for *in vivo* expression in treated subjects.

Recent literature is exploding with new antibody-related techniques and reports of antimicrobial antibodies with unprecedented potency, breadth of activ-

ity, and therapeutic potential. We hope that this timely compilation of state-of-the-art reviews of major aspects of this field will be of interest to both antibody cognoscenti and those new to this exciting field. We thank the authors for their dedication in producing definitive reviews of the topics at hand.

James E. Crowe, Jr.
Diana Boraschi
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INTRODUCTION