Molecular Epidemiology of Infectious Diseases
Principles and Practices

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To Jesse Furman, Nicolas, Samantha, and Emma
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This book is designed to provide a background in the principles and practices of epidemiology that take advantage of new molecular biology tools to solve infectious disease problems. The book is mainly intended for health care professionals working with infectious diseases, faculty and students in medical schools interested in infectious diseases, and faculty and students in schools of public health interested in epidemiology. A rudimentary knowledge of epidemiology or molecular microbiology would be useful in reading this book. However, for epidemiologists or students of epidemiology not familiar with molecular biology, for molecular microbiologists or students of molecular microbiology not familiar with epidemiology, and for clinicians and medical students not deeply familiar with either epidemiology or molecular microbiology, the relevant concepts in both of these disciplines are discussed in appropriate sections of the book. In addition, standard terms frequently used in these two disciplines are defined in the glossary. Thus, some of the discussions may seem elementary for those who already have a background in one of these disciplines. The main goal of this book, however, is to introduce interested epidemiologists to the standard vocabulary of molecular biology, interested molecular biologists to the basic concepts of epidemiology, and interested clinicians to the vocabulary and concepts of both disciplines. The idea of this book is to provide in one place information that can be referred to by researchers and professionals with diverse backgrounds who have a common interest in epidemiology of infectious diseases.

Although the title of the book includes the seemingly sweeping set of words “molecular epidemiology of infectious diseases,” the reader will recognize that a large proportion of the book is dedicated to discussions about bacterial infectious diseases. Examples in the book that are used to illustrate practices of molecular epidemiology are almost all related to bacterial organisms. The main reason for this emphasis is that I have spent most of my
last 20 years as a researcher on bacterial diseases. However, except perhaps for concepts related to the genetics of diploid organisms and how it may influence the population structure of these organisms, most of the ideas introduced in the book should be generalizable to other categories of infectious diseases. The examples that use bacterial diseases, therefore, should be viewed as ways to illustrate different principles that define this new discipline of epidemiology.

The discipline of epidemiology of infectious diseases, as acutely demonstrated by new infectious diseases or new forms of infectious diseases that emerge every few years somewhere in the world, evolves constantly and requires continuous improvements. The most recent of these emerging infectious diseases—severe acute respiratory syndrome (SARS)—has demonstrated more than anything else in recent history the importance of linking basic epidemiologic methods to molecular biology techniques to solve a global health problem. The information provided in this book will, I hope, facilitate improved communication and exchange of ideas between those who mainly design and analyze epidemiologic data and those who mainly work in the laboratory in detecting and typing microorganisms. Then, I hope, the data and knowledge generated from this exchange of ideas will help those who take care of patients to make better clinical decisions and help those who work in public health organizations to implement novel public health intervention strategies and set policies. The final hope is that they all learn the same language of molecular epidemiology in order to be always prepared to address the problems of infectious diseases locally and globally.

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