BOOK REVIEWS

From the Editor

Molecular epidemiology, seroepidemiology, clinical epidemiology, ecoepidemiology, genetic epidemiology, infectious disease epidemiology, descriptive and analytical epidemiology—the list goes on! How many kinds of epidemiology are there? Is each a separate discipline? Few epidemiologists would answer the last question in the affirmative. Still, some consider themselves as belonging to one or another subdiscipline, for example, infectious disease, clinical, or social epidemiology. Such adjectival descriptors are often helpful in identifying a field of concentration, the locus of action, or the frame of reference of the particular epidemiologist. However, such designations should not obscure the fundamental function of epidemiology, namely, “the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to control of health problems” (1, p. 62).

“Molecular epidemiology,” the latest laboratory tool for understanding pathobiologic phenomena, provides epidemiologists with a powerful addition to their armamentarium of measurement modalities. In this issue of the Journal, Dr. Lee Riley reviews a much-needed guide to applying this tool to the epidemiologic study of infectious diseases (2). Readers may be interested to know that the first known use of the laboratory in an epidemiologic study was by Sir George Baker, who employed a Dr. Saunders to analyze specimens of cider for their lead content in his classic study of the “endemic colic of Devonshire” (3).

REFERENCES

Warren Winkelstein, Jr.

Molecular Epidemiology of Infectious Diseases
Edited by R. C. Andrew Thompson


A bibliographic search of the BIOSIS database (BIOSIS, Philadelphia, Pennsylvania) covering the period 1993–2001 identified 1,018 articles whose titles contain the words “molecular epidemiology.” When the category for these articles was restricted to “infectious diseases,” the search found 163 (16 percent) articles. The same search covering the period 1985–1992 identified 46 (15 percent) infectious-disease-related articles among 299 that deal with the topic of molecular epidemiology. While most published studies that include molecular epidemiology topics focus on cancer epidemiology (1), the editor of this recently published book is clearly accurate when he states in chapter 1 that “molecular epidemiology” is no longer regarded as an emerging discipline. It has become “an integral component of most epidemiological studies and outbreak investigations” (1, p. 1). Therefore, it is so surprising that it has taken this long for a book with this title to appear.

The book is a product of a carefully considered attempt to compile representative components of this new area of epidemiology in one place. These components include 1) molecular biology laboratory tools necessary to conduct epidemiologic investigations, including detection and strain typing procedures; 2) basic principles of phylogenetic and population genetics that underlie assumptions made about the relatedness of infectious agents; 3) new ideas about within-host ecology that determines infectious disease outcome; and 4) application of these tools and concepts to address the epidemiology of specific infectious diseases and problems of major importance to the world. The editor identified key experts in each of these fields to contribute chapters to the book. The book appears intentionally not to define “molecular epidemiology.” Instead, it attempts to demonstrate with examples what “molecular epidemiology” does.

The major strength of this book is that each chapter serves as an independent, complete guide and review of the topic and has an extensive set of references, which assures a reader of the thoroughness of the review. In fact, this book is valuable even as an infectious disease textbook for students and practitioners of epidemiology and medicine. The
chapters provide an overview of nearly all major infectious diseases in the world, including the “big 3”—acquired immunodeficiency syndrome (AIDS), tuberculosis, and malaria—viral hepatitis, measles, fungal diseases, enteric protozoan diseases, and trypanosomiasis. In addition to these disease-specific chapters, the book includes major problem-specific chapters, including those on nosocomial infections and insect vectors.

One glaring omission is a chapter or chapters on bacterial and viral diarrheal diseases. A large body of literature exists in which molecular biologic methods have been applied to study diarrheal diseases; in fact, many of the important paradigms in molecular epidemiology were established by such studies. Future editions of this book should consider including such chapters.

Ironically, however, the major strength of the book is also its weakness. Because each chapter is written by recognized international authorities in the field, there is minimal chapter-to-chapter continuity regarding many of the basic concepts of epidemiology. Descriptions of some of the laboratory methods tend to be repetitive, and several chapters emphasize ideas that do not necessarily focus on epidemiology. Rather, they reflect the expertise of the authors, which includes population genetics, phylogenetics, diagnostics, or mathematical modeling, and not necessarily epidemiology. It is not surprising that no schools of public health or epidemiology are represented by the experts in the book. Currently, the discipline is largely driven by nonepidemiologists.

One important feature that distinguishes molecular epidemiology from population genetics or phylogeny is that the former discipline always focuses on an opportunity for intervention or prevention (2). In several of the book’s chapters, descriptions of the disease are limited to an analysis of the population structure and distribution of strains of pathogens in time and by place. Tracking a strain from place to place and over time is one application of molecular techniques, but such an application is not sufficient to address important and relevant questions about disease transmission. In infectious disease epidemiology, one needs to know how an organism is introduced into a community and how and why it spreads. Who gets the infection, who develops the disease once infected, and why? How are pathogens maintained in a community of hosts? How and why does a particular strain suddenly emerge as the predominant one in a community, and why does it disappear? How do we use the knowledge that we gain about the dynamics of disease transmission to implement effective disease control measures? Some of the chapters do emphasize these ideas, and the authors of such chapters recognize that applying a molecular biology technique to subtype an organism per se does not by itself constitute molecular epidemiology. However, these concepts are not uniformly represented throughout the book.

This shortcoming is not necessarily a fault of the book. It may reflect what is emphasized and available in the current literature reporting infectious disease investigations. There is still a dearth of epidemiologic expertise in applying molecular biology tools to address basic epidemiologic questions. For this reason, a book such as this is particularly important; it may help to create this expertise. The discipline of molecular epidemiology, be it infectious disease or otherwise, is still heavily weighted toward descriptive studies of strain typing techniques, biomarkers, population genetics, and phylogenetic analyses of organisms. These are all important foundations for epidemiologic studies of infectious diseases. However, they now need to be expanded to perform analytical epidemiology. Thus, this book is important and timely and should have wide appeal, especially to those curious about this discipline who want to use the book to develop new approaches to epidemiologic investigations or deal with new questions that cannot be addressed by using conventional methods.

REFERENCES


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