

Preface

Ever since my days in veterinary school, I was fascinated with the field of microbiology. I always wondered how such a small microscopic organisms are capable of causing infections in other living organisms; big or small, young or old, and healthy or immunocompromised. The subject captured my imagination. Many of the same microorganisms that cause diseases in animals also infect humans. In recent days, pathogens of animal origin impose even greater concern with increasing threat of avian influenza to cause pandemic, and spread of deadly bovine spongiform encephalopathy (mad cow disease) and many bacterial pathogens such as *Listeria*, *E. coli* O157:H7, *Salmonella*, *Yersinia*, and *Campylobacter*. I am especially intrigued by the cunning strategy pathogens employ for their survival in a host and their exploitation of host cellular machinery to promote their own invasion into the host. Pathogenic mechanism is complex and unraveling that process requires great minds. Today, microbiologists, cell biologists, and immunologists employing many sophisticated molecular tools are unraveling that secret at a very fast pace. Thus it requires a great deal of efforts to compile and update information in a textbook and it was rather a monumental task. My goal with this book was to paint a bigger picture of pathogenic mechanism of foodborne pathogens, which are responsible for many of modern day outbreaks, and diseases worldwide, and narrate the subject with easy to comprehend illustrations. When I began teaching an advanced graduate level food microbiology course that dealt with pathogenic mechanism of foodborne pathogens in mid nineties, there was hardly any textbook that covered different foodborne microorganisms and the depth of materials needed for the course, especially the mechanism of infection for foodborne pathogens. That necessitated the collection and review of great deal of literature to provide updated materials to my students. That was the beginning and was also the inspiration and motivation to write a textbook on the subject. In the last two decades there had been a tremendous progress in the area of food microbiology especially the study of molecular mechanism of pathogenesis and a great deal of efforts was placed to compile those information in the first edition of the current textbook. In this book, an introductory chapter highlights the significance of foodborne pathogens, epidemiology, and the reason for increasing cases of foodborne illnesses. In Chap. 2, a brief review on biology of microorganisms and the importance of structural components as those relate to pathogenesis is provided.

In addition, diseases caused by viruses, parasites, mycotoxins, and seafood toxins have been included. In Chap. 3, a comprehensive review on the digestive system, mucosal immunity, and the host immune system have been described. This chapter provides the basic foundation for the understanding of the complexity of disease production by foodborne pathogens. First of all, foodborne pathogens' primary site of action is the digestive tract; therefore one must have adequate knowledge to understand the interaction of pathogens with host gastrointestinal tract and second, host innate and adaptive immune responses dictate the progression of a disease. Moreover, some pathogens exploit host immune system as part of their disease producing mechanism. Therefore, it is essential to have some basic understanding of immune system in order to understand the disease process. As it is often said – “It takes two to tango”; or “One need two hands to clap,” thus I believe, the knowledge of biology of a pathogen, and the corresponding host immune response go hand in hand to comprehend the full picture of pathogenesis process. In Chap. 4, general mechanism of foodborne pathogens have been included to provide the overall big picture of mechanism of infection and intoxication. In Chap. 5, a brief review on the animal and cell culture models as necessary tools to study pathogenesis is discussed. In Chaps. 6–15, sources, biology, pathogenic mechanism, prevention and control, and detection or diagnosis strategies for individual foodborne bacterial pathogens are described. In addition to traditional foodborne pathogens, descriptions of some of the key pathogens with bioterrorism implications such as *Bacillus anthracis*, and *Yersinia pestis* have been included to provide unique perspective.

In this book, I am pleased to generate both digital and hand-drawn artworks to illustrate the pathogenic process, and I hope these illustrations will aid in better understanding of the mechanism of pathogenesis with greater enthusiasm. I also hope this textbook would be a valuable resource not only for food microbiology graduate or undergraduate students but also for the medical microbiologists, microbiology professionals, and academicians involved in food microbiology and food safety-related research or teaching.

I would like to convey my gratitude to my current and former postdoctoral research associates and graduate students particularly Kristin Burkholder, Jennifer Wampler, Pratik Banerjee, and Ok Kyung Koo for their assistance in collecting literatures and reading the draft chapters. The comments and inputs provided by the students of FS565 over the years were extremely helpful in developing the course contents for this book. Finally, my sincerest and humble gratitude goes to my professional colleagues for their generous time and efforts in reviewing the chapters and providing expert comments and critiques: Chap. 1 (Prof. M. Cousin, Purdue University); Chap. 2 (Prof. M.G. Johnson, University of Arkansas); Chap. 3 (Prof. R. Vemulapalli, Purdue University); Chap. 4 (K. Burkholder, Purdue University); Chap. 6 (Dr. P. Banada, Purdue University); Chap. 7 (Prof. A. Wong, University of Wisconsin and Prof. J. Mckillip, Ball State University); Chap. 8 (Dr. G.R. Siragusa, USDA-ARS, Athens, GA and Dr. V. Juneja, USDA-ARS, Wyndmoor, PA); Chap. 10 (Prof. B. Reuhs, Purdue University); Chap. 11 (Prof. S. Rickie, University of Arkansas and Dr. M. Rostagno, Purdue University); Chap. 12 (Dr. R. Nannapaneni, Mississippi State University); Chap. 13 (Prof. J.S. Viridi, University of Delhi South Campus, India); Chap. 14 (Dr. G.B. Nair, Center for Health and Population Research, Dhaka, Bangladesh); Chap. 15 (Prof. C. Sasakawa, University of Tokyo, Japan).

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