

Preface

For many centuries humans have used empirical knowledge to cook and prepare foods, and although we have known for a long time about many different hazards inherent to food products, our understanding of infectious agents transmitted by foods did not materialize until the theory of germs was well established, approximately 150 years ago. Food hazards are classified as physical, chemical, and biological. By far, the biological hazards – primarily bacteria and viruses – pose the greatest risk in modern food safety. Like other infectious diseases, foodborne diseases repeat themselves, in part because we still do not fully understand their epidemiology to prevent their appearance, and in part because we do not always apply the acquired knowledge consistently. Therefore, there is always a need to revisit basic concepts to better understand food safety hazards. This book is intended to provide a review of the most prevalent biological hazards in the most common food categories.

In general, books related to food safety deal with a detailed description of known physical, chemical, and biological agents, emphasize the normative related to the presence of pathogens in foods, or review how these pathogens can be detected. More recently, some books have attempted to review our current knowledge of control strategies to reduce foodborne diseases. However, it appears that a general training tool for undergraduate and graduate students pursuing careers in food science, animal science, microbiology, and similar fields is still missing. Therefore, this book attempts to provide a study tool to advanced undergraduate and graduate students who need or wish to take a class on food safety. Nevertheless, any student with some basic knowledge in microbiology will find additional information related to different food safety topics in this book.

From the three major components that make up food safety – perception, regulations, and science – this book attempts to summarize the current scientific understanding of the most common biological hazards by food commodity. The book then provides an overview of the current regulations related to food safety in the United States. The first part includes a chapter that briefly describes our current understanding of the evolution of foodborne pathogens. The other chapters in this first part describe the basic microbiology concepts applied to food safety, the methodology used to identify microbial hazards transmitted by foods, the clinical presentations and pathogenicity of foodborne diseases, foodborne viruses, and the methodology used to type microbial pathogens for epidemiological studies. We have included a separate chapter for foodborne viruses because fewer scientists are working with viruses than are studying with bacterial agents. The methodologies that we have developed so far for viruses do not allow for an easy reproduction of viruses under laboratory conditions; thus, our studies of viruses depend heavily on molecular techniques. We have also added a chapter on molecular techniques for typing bacterial pathogens because these techniques provide unique tools to better understand the epidemiology of foodborne agents. We now know that strains from the same bacterial species have different pathogenicity potentials to humans. Therefore, as the methodologies for molecular studies become more simplified and available, we will be able to better understand the risk posed by certain bacterial strains in food commodities.

The second part of the book summarizes the major food commodities and the major biological hazards associated with these products. Several concepts may overlap in these chapters, such as the definition of certain bacterial pathogens. We believe that each of these chapters should be able to “stand alone”; if readers do skip some food commodity chapters, they will still get the basic concepts for the food commodities of interest.

The third part includes the chapters related to risk analysis, interventions, and regulations. Several books have already been written about interventions for those interested in this topic. Similarly, several books have recently emerged on the application of the risk analysis model to food safety. However, these two topics either are relatively new to food safety (risk assessment) or have undergone many different changes in the last few decades (interventions) to warrant some attention among food safety professionals. These areas of food safety are expanding rapidly, and as the world population will reach 10 billion in a few decades according to the United Nations’s predictions, food safety and the control of food safety hazards will become increasingly important in the near future. The current regulations for food safety described in this area are all related to the United States and its federal agencies. Without food laws and guidelines addressing the presence of specific biological agents in food, little would be done to control these agents. As the international trade of food commodities becomes more complex, we will see more consolidation of food safety standards for an ever-expanding international market.

The last part of this book includes a list of other books and Internet resources related to food safety. Throughout the book, there is an assumption that the reader has a basic knowledge in microbiology, such as the way bacteria grow and multiply, the effect of temperature on the survival or destruction of bacteria, and the composition of viruses. For those interested in a more in-depth review of microbiology concepts, a list of microbiology books and Internet resources is also provided. It is important to highlight that many regulations and most of the documents generated by regulatory agencies in the United States are published mainly online. Therefore, the Internet can be a useful resource for food safety information. Throughout the book, there are italicized terms and words whose definitions are found in the Glossary.

We hope this book brings a new resource to undergraduate and graduate students, food professionals, biologists, and microbiologists interested in food safety. We also hope this book will expand the resources for those food safety professionals already working for the food industry, in academia, or in regulatory agencies. We welcome any feedback to improve future editions.

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