Microbial Risk Analysis of Foods
Emerging Issues in Food Safety
Series Editor, Michael P. Doyle

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Risk analysis is a tool to facilitate complex problem solving and decision making in addressing mitigation of a hazard and comprises three components. These include risk assessment, risk management, and risk communication. Risk assessment involves using scientific information to describe the likelihood and magnitude of harm attributed to a specific hazard. Risk management applies to the activities undertaken to control a hazard. Risk communication is the exchange of information about a hazard among interested parties. Several monographs have been written describing the principles of these three concepts; however, few have been published regarding how these concepts apply to today’s initiatives to provide safer foods.

Microbial risk analysis has become an integral part of a science-based decision-making process to identify intervention strategies that yield the greatest impact in providing public health protection to the food supply with the limited resources available. A recent example is a risk assessment of *Listeria monocytogenes* in foods conducted by the Food and Drug Administration and the U.S. Department of Agriculture that has enabled the agencies to risk-rank foods having the greatest potential in serving as vehicles for listeriosis. These regulatory agencies have applied this information to risk management to focus their resources on foods of greatest risk, such as deli meats, and away from foods that are highly unlikely to cause illness if consumed, such as ice cream. Furthermore, this information, through risk communication, has been disseminated to food processors and consumers to enable them to apply greater interventions to high-risk foods. The net result is the prevention of more cases of listeriosis than would occur if all foods were equally targeted with the same amount of resources.
The concept of microbial risk analysis is not only used in the United States but has taken on international dimensions, with the World Health Organization and Food and Agriculture Organization of the United Nations actively engaged in conducting risk assessments and applying them to the risk analysis matrix. This information has subsequently been used by Codex Alimentarius in its deliberations for setting international food safety standards. Hence, microbial risk analysis has become a tool adopted worldwide to mitigate food contamination and related illnesses.

Written by a cast of internationally recognized authorities, this book elucidates how risk analysis of food-borne agents of microbial origin can be used to provide greater public health protection to our food supply. I commend Don Schaffner and his associates for this extraordinary contribution.

Michael P. Doyle, Series Editor

*Emerging Issues in Food Safety*
Microbial risk analysis is a new and emerging component of the field of microbial food safety. It is being used with increasing frequency by domestic food safety agencies as well as by international organizations to assess and manage the safety of our food supply.

There are several reasons why microbial risk analysis has emerged as such an important food safety tool at this point in time. First, the advances in computing technology have made powerful risk analysis tools accessible to a wider array of scientists and engineers than ever before. Second, our food production and distribution systems have become quite complex. So much so, in fact, that it may not be intuitively obvious exactly where the optimal food safety fixes are needed, unless a tool like risk analysis is used.

Although these two factors have made the development of microbial risk analysis possible, and even desirable, the most significant factor driving the international interest in risk analysis is one related to international policy and trade. A component of the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (called the SPS Agreement) deals with risk. Sanitary measures are those that relate to human and animal health (e.g., salmonellosis or foot-and-mouth disease) while phytosanitary measures relate to plant health (e.g., Mediterranean fruit fly). Article 5 of the SPS Agreement is entitled “Assessment of Risk and Determination of the Appropriate Level of Sanitary or Phytosanitary Protection.” The first paragraph of Article 5 states that sanitary or phytosanitary measures should be based on an assessment of the risks and should take into account risk assessment techniques developed by the relevant international organizations. Because of the SPS Agreement, many importing and exporting countries are
interested both in carrying out risk assessments of domestically produced foods and in understanding the risk posed by imported foods.

Because of the advances in computing technology, the complexities of our food production and distribution systems, and the need for fair international trade, we have seen a dramatic increase in the interest in microbial risk analysis as well as in its practice, both by national governments and international bodies like the World Health Organization and the Food and Agriculture Organization. It is within this context that I was asked to edit this important book.

While many texts are available that describe the basics of microbial risk assessment, a real need exists for an “advanced” text on the subject. The basic idea of this book is to answer the question: what do you need to know after you understand the basics of microbial risk assessment? This book has been written primarily for beginning risk assessors who need to take the “next step” in their education. It will also be a valuable reference for the graduate student or university researchers engaged in risk assessment research, or serve as a text for a graduate level course in microbial risk analysis. It will be a valuable resource for industry and government risk managers who need to understand the sort of information their risk assessors will be communicating to them in the next five years.

Topics covered in this book include qualitative risk assessment; the relationship between microbial risk assessment and other important microbial food safety concepts like the Hazard Analysis and Critical Control Points (HACCP) and Food Safety Objective (FSO) approaches to food safety; and Modular Process Risk Modeling. This book also reaches beyond microbial risk assessment to cover microbial risk management and communicate about microbial risks in foods. We are also very pleased that this volume includes a case study chapter designed to integrate many of the concepts presented in the rest of the book.

Thanks to Mike Doyle, Series Editor, for asking me to edit this book, and to Eleanor Riemer, ASM Senior Consulting Editor, for shepherding me through the process.

Thanks to all of my friends and colleagues who agreed to give generously of their time in the midst of birth, death, and the responsibilities of their day jobs. This book would not have been possible without all of your efforts.

Donald W. Schaffner
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