

Risk characterization of microbiological hazards in food

GUIDELINES



WHO



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17

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WORLD HEALTH ORGANIZATION
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Foreword

Members of the Food and Agriculture Organization of the United Nations (FAO) and of the World Health Organization (WHO) have expressed concern regarding the level of safety of food at both national and international level. Increasing foodborne disease incidence over recent decades seems, in many countries, to be related to an increase in disease caused by microorganisms in food. This concern has been voiced in meetings of the Governing Bodies of both Organizations and in the Codex Alimentarius Commission. It is not easy to decide whether the suggested increase is real or an artefact of changes in other areas, such as improved disease surveillance or better detection methods for microorganisms in patients or foods. However, the important issue is whether new tools or revised and improved actions can contribute to our ability to lower the disease burden and provide safer food. Fortunately, new tools that can facilitate actions seem to be on their way.

Over the past decade, risk analysis—a process consisting of risk assessment, risk management and risk communication—has emerged as a structured model for improving our food control systems, with the objectives of producing safer food, reducing the number of foodborne illnesses and facilitating domestic and international trade in food. Furthermore, we are moving towards a more holistic approach to food safety, where the entire food chain needs to be considered in efforts to produce safer food.

As with any model, tools are needed for the implementation of the risk analysis paradigm. Risk assessment is the science-based component of risk analysis. Science today provides us with in-depth information on life in the world we live in. It has allowed us to accumulate a wealth of knowledge on microscopic organisms, their growth, survival and death, even their genetic make-up. It has given us an understanding of food production, processing and preservation, and of the link between the microscopic and the macroscopic world, and how we can benefit as well as suffer from these microorganisms. Risk assessment provides us with a framework for organizing these data and information and gaining a better understanding of the interaction between microorganisms, foods and human illness. It provides us with the ability to estimate the risk to human health from specific microorganisms in foods and gives us a tool with which we can compare and evaluate different scenarios, as well as identify the types of data necessary for estimating and optimizing mitigating interventions.

Microbiological risk assessment (MRA) can be considered as a tool that can be used in the management of the risks posed by foodborne pathogens, including the elaboration of standards for food in international trade. However, undertaking an MRA, particularly quantitative MRA, is recognized as a resource-intensive task requiring a multidisciplinary approach. Nevertheless, foodborne illness is one of the most widespread public health problems, creating social and economic burdens as well as human suffering. It is a concern that all countries need to address. As risk assessment can also be used to justify the introduction of more stringent standards for imported foods, a knowledge of MRA is important for trade purposes, and there is a need to provide countries with the tools for understanding and, if possible, undertaking MRA. This need, combined with that of the Codex Alimentarius for risk-based scientific advice, led FAO and WHO to undertake a programme of activities on MRA at international level.

The Nutrition and Consumer Protection Division (FAO) and the Department of Food Safety and Zoonoses (WHO) are the lead units responsible for this initiative. The two groups have worked together to develop MRA at international level for application at both national and international level. This work has been greatly facilitated by the contribution of people from

around the world with expertise in microbiology, mathematical modelling, epidemiology and food technology, to name but a few.

This Microbiological Risk Assessment series provides a range of data and information to those who need to understand or undertake MRA. It comprises risk assessments of particular pathogen–commodity combinations, interpretative summaries of the risk assessments, guidelines for undertaking and using risk assessment, and reports addressing other pertinent aspects of MRA.

We hope that this series will provide a greater insight into MRA, how it is undertaken and how it can be used. We strongly believe that this is an area that should be developed in the international sphere, and the work to date clearly indicates that an international approach and early agreement in this area will strengthen the future potential for use of this tool in all parts of the world, as well as in international standard setting. We would welcome comments and feedback on any of the documents within this series so that we can endeavour to provide member countries, the Codex Alimentarius and other users of this material with the information they need to use risk-based tools, with the ultimate objective of ensuring that safe food is available for all consumers.

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Abbreviations used in the text

ALOP	Appropriate Level of Protection
ANOVA	Analysis of variance
BSE	Bovine Spongiform Encephalopathy
EC	European Commission
CAC	Codex Alimentarius Commission
CCFH	Codex Committee on Food Hygiene
CFU	Colony-forming units
COI	Cost-of-illness
DALY	Disability-adjusted life years
EFSA	European Food Safety Authority
FSIS	[USDA] Food Safety and Inspection Service
GBR	Geographical BSE-Risk
MRA	Microbiological Risk Assessment
NACMCF	[USDA/FSIS] National Advisory Committee on Microbiological Criteria for Foods
NHMRC	National Health and Medical Research Council [Australia]
P-I	probability-impact
QALY	Quality adjusted life years
SPS	[WTO Agreement on the Application of] Sanitary and Phytosanitary [Measures]
STEC	Shiga-toxin-producing <i>Escherichia coli</i>
TSE	Transmissible Spongiform Encephalopathy
USDA	United States Department of Agriculture
VOI	Value of information [analysis]
WTO	World Trade Organization
WTP	Willingness-to-pay