
Editorial

Enda Cummins

Biosystems Engineering, School of Agriculture,
Food Science and Veterinary Medicine,
University College Dublin, Earlsfort Terrace,
Dublin 2, Ireland
E-mail: enda.cummins@ucd.ie

In recent years, risk assessment has gained much attention as a valuable tool for evaluating the risks associated with environmental and foodborne hazards. In particular, risks associated with biological/chemical hazards and their influence on biological systems has developed rapidly with many methodological advances. It is therefore timely that this special issue on 'Risk assessment and management of biological systems' for the *Int. J. Risk Assessment and Management* focuses on these advances. In this issue, each of the six papers is written by an international expert (or experts) addressing, in detail, one aspect of risk assessment and therefore highlighting the truly international nature of the work. This issue should provide valuable information for risk analysts, food and environmental engineers and those interested in health and safety issues.

The objectives of the special issue are to collate recent research and developments pertaining to risk assessment and management of biological systems and to encourage meaningful dialogue and research into these areas. The special issue provides an international forum for researchers and practitioners across many professions to disseminate research and information.

The issue starts with a microbiological risk assessment (Brynstad et al.) of campylobacteriosis in the German population caused by the consumption of chicken prepared in the home. The need for clear, transparent, understandable and mathematically flexible risk modelling methods in the area of microbiological hazards in food systems is highlighted. Different types of approaches are tried along the retail to consumer chain for *Campylobacter* in chicken. The model, based on new data, takes into account different pathways for cross contamination, the impact of undercooking, the family structure and eating habits, the uneven distribution of the hazard and the different chicken products consumed. The model illustrates a new approach to analyse complex biological systems in a transparent manner and integrates many of the challenges posed by biological systems. The model was designed to include a number of important factors in the exposure assessment including cross contamination for different sources.

The second paper in this issue, by Paisley et al., focuses on the Bovine Spongiform Encephalopathy (BSE) crisis of the last two decades. The crisis has shown that a proper interaction of risk assessment, risk management and risk communication is essential. Since the advent of BSE, qualitative risk assessment has been a tool for decision-making regarding management of the epidemic. Mathematical models and risk assessments have been used as a basis for the formulation of BSE risk management options and much of the legislation regarding the control and eradication of BSE. The link between BSE and new variant Creutzfeldt-Jakob Disease (vCJD) in humans has exacerbated the need for

risk assessment. The risk assessment methodology is well developed but much uncertainty regarding important input parameters remains a major constraint. Nevertheless, the decline in the BSE epidemic in the UK and most European countries demonstrates that management has been, for the most part, successful.

Whilst there have been enormous scientific efforts made over the past few years, there are still many uncertainties regarding BSE, Transmissible Spongiform Encephalopathies (TSEs) and vCJD. Communication of uncertainty is one of the most critical and most difficult aspects of communication of risks about TSEs. Paisley et al. find that communication is considered to be the key step that underlies most failures in the management of the BSE crisis. Given today's continuing concerns regarding animal TSEs and their possible effects on human health it is important for the readers of the *Int. J. Risk Assessment and Management* to understand the state-of-the-art of risk analysis of animal TSEs. Paisley et al. compile a major review of the literature pertaining to the three inter-related facets of risk analysis: risk assessment, risk management and communication of transmissible TSEs of animal origin and describe the current state-of-the-art.

Hornstra and Telman highlight a common issue in the development of quantitative risk assessment models, namely the creation of probability distributions as inputs into stochastic risk assessment models from the available data. Hornstra and Telman use statistical methodologies to analyse the different approaches in estimating prevalence and count data including elements of uncertainty and variability. Different methods (including expert opinion and monitoring data) are investigated for transforming data into probability distributions using *Escherichia coli O157:H7* in beef as a case study. The link between the feed-to-food chain is the contribution made to the journal by Coffey and Cummins. The potential dangers of mycotoxins in bovine feed and subsequent transfer to food for human consumption have become a major food safety issue. The authors provide a comprehensive analysis of the risks from mycotoxins in feed to bovine animals and the potential for subsequent transfer to the human food chain. Key parameters in the formation of a Feed Chain Risk Assessment are detailed.

One of the criticisms of risk assessment is the issue of overlooking relevant, published information or failing to meet minimum scientific investigative standards as set forth in the scientific method, scientific evaluation process and scientific thinking. Different risk assessments are based on varying assumptions which explains why risk assessments on the same topic may result in different risk estimates. This difference may be due to what is termed *Lost Science*. Belluck takes a look at aspects of lost science and potential for harm to human health and the environment. The issue is addressed in the context of human toxicology, risk assessment, science and public policy, environmental litigation and ethics.

The issue concludes with a paper by Cummins looking at the role of quantitative risk assessment that has played in the management of foodborne biological hazards, including pathogenic bacteria, viruses and parasites. The paper focuses on the risk analysis process highlighting the past and potential future role for risk analysis methodologies. The role of Quantitative Risk Assessment in making policy decisions and formulating Food Safety Objectives (FSOs) based on best available scientific evidence, enabling policymakers to make effective legislative decisions while accounting for system uncertainty, is discussed. This paper highlights the impact of risk assessment on policy change and future role in minimising human risks from foodborne biological hazards.

This special issue covers a wide spectrum of hazards which may negatively impact on the environment and human health and focuses on many aspects of risk assessment as applied to biological systems. The special issue highlights the many methodologies available for carrying out comprehensive risk analysis while demonstrating the need to address data deficiencies and the requirement for good risk communication.

Finally, as the Guest Editor, I thank all the authors for their valuable contributions to this special issue, and to all the referees for their diligence and assistance in reviewing these papers.