1st International Conference on Microbiological Risk Assessment: Foodborne Hazards—What We Heard

ROBERT L. BUCHANAN*

U.S. Department of Health and Human Services, Food and Drug Administration, Center for Food Safety and Applied Nutrition, 5100 Paint Branch Parkway 2B64, College Park, Maryland 20740-3835, USA

The 1st International Conference on Microbiological Risk Assessment: Foodborne Hazards captured a unique time period in the emergence of a new subdiscipline within microbiology. Both the quality of the scientific contributions presented at the meeting and the discussions that accompanied them are clear evidence of the vigorous, dynamic nature of microbiological risk assessment (MRA) as an emerging area of study. The fact that approximately 30 countries were represented at the Conference demonstrates that the field has captured the interest of scientists, mathematicians, and public health officials worldwide. The applications of the MRA techniques to a number of food safety issues at both the national and international levels discussed at the Conference attests to the growing importance of the field. MRA has successfully emerged from its infancy and is maturing at a phenomenal rate.

NEW CHALLENGES AND OPPORTUNITIES

Conference participants identified a series of challenges and opportunities that need to be faced during the next few years. Numerous speakers identified challenges related to how MRAs are undertaken and utilized, emphasizing the critical need for MRAs to be based on the clear articulation of the risk questions to be analyzed and for the subsequent review of the MRA in the context of the task given to the MRA team. The need to expand the tools available to risk assessors was also a common theme, in particular a broader range of software both to develop MRAs and to make it more user friendly so that the MRA process truly becomes transparent and a tool for the food industry and regulatory agencies.

Another theme that was evident throughout the Conference was the need for risk assessors to be better connected to both the people that provide information and the people that use the results of their analyses. Interactions with the epidemiology and microbiology communities are critical if the data generated as a result of microbial research, public health surveillance, and food consumption surveys are to be captured in a manner that also benefits the development of MRAs. This interaction is particularly important for newly emerging sciences where risk assessors must be aware of the new types of data that are being acquired and how they may be useful in better describing the risk associated with microbiological food safety concerns. An excellent example is the potential role that genomics and related sciences can play in better describing diversity both for microbial agents and affected humans. The ability to better capture the variability in pathogenicity potential among strains of a pathogen and then relate it to the distribution of susceptibilities with various human subpopulations would significantly decrease the uncertainty associated with MRAs and could lead to meaningful ways of considering different risk management options for specific subpopulations.

The number of scientific disciplines that could benefit from application of MRA techniques to complex food safety problems has increased dramatically in the past few years. For example, there were several sessions at the Conference that explored how microbial risk assessors could work more closely with the economic community so that the results of MRAs can be more readily used to enhance the development of subsequent cost-benefit analyses of potential options for managing food safety risks. There were also extensive discussions on how microbial risk assessors could play an increasingly important role in our ability to respond to new challenges facing the food supply. For example, a number of participants identified the potential impact that the application of MRA techniques could have on managing food security concerns relating to counterterrorism efforts.

INTERACTING WITH RISK MANAGERS

One of the areas where there has been substantial discussion, both at the Conference and within national and international organizations, has been the interaction between risk assessors and risk managers. In the past, the ideal has been the separation of risk assessors and risk managers as a means of preserving the scientific integrity of the risk assessment process. However, several speakers discussed how this ideal is actually detrimental to the process if this separation is achieved. It was agreed that the need for continuing interactions between the producer and the client are critical to achieving risk assessments that are responsive to the needs of the risk manager. Various speakers outlined how these interactions and the safeguards have been established to ensure that unintended bias did not creep into the risk assessment process. All agreed that elim-
In addition to these new efforts, food consumption surveys and survival characteristics of a series of foodborne pathogens. Likewise, the recent development of ComBase, a joint effort between laboratories in Great Britain and the United States, provides an extensive database on the growth and survival characteristics of a series of foodborne pathogens. In addition to these new efforts, food consumption surveys such as the National Health and Nutrition Examination Survey (http://www.cdc.gov/nchs/nhanes.htm) and the Continuous Survey of Food Intakes by Individuals (http://www.barc.usda.gov/bhnrc/foedsurvey/var.cs.html) programs remain critical sources of information, despite the fact that they are not designed for risk assessment purposes. However, these resources have become so important that there are ongoing discussions with the sponsoring government agencies to determine how such surveys could be enhanced to better capture critical food safety information. Another important piece of information when estimating exposure to microbiological hazards in food is the relationship of food consumption data to the individual consumer’s tendency for consuming high-risk foods.

As experience in the conduct of MRAs is being gained worldwide, there is an ongoing effort to improve the risk models. For example, a key component of most quantitative MRAs are mathematical models that describe the growth, survival, or inactivation of microorganisms. However, in general, these models are relatively simple and based on the behavior of microorganisms in model systems. Several participants described efforts in predictive microbiology to develop models that better describe microbial characteristics in more complex environments. Microbial risk assessors are developing more sophisticated growth kinetics models that provide better ways of considering the parameters and processes affecting microbial behavior at the various stages of food production.

The improvements in MRA modeling techniques during the past several years have been extensive and impressive. However, a number of speakers noted the challenges that face the MRA community. With increasing demand from risk managers, risk assessors are looking for ways to more objectively assess the quality of the data they utilize. Likewise, there is increasing interest in acquiring at least two sets of data so that MRA models can be developed with one set and the other set can be used to validate the models. There is also a continuing need for new approaches to modeling complex activities associated with food safety. For example, despite progress in the last few years, it is universally accepted that better models (and data) are needed on the role that cross-contamination plays in the transmission of various foodborne pathogens. Another recurring need articulated by the risk managers attending the Conference was for better differentiation of variability and uncertainty, both in a technical sense and as a critical component for risk communication.

In addition to identifying new resources, the Conference participants also identified areas where new approaches to MRA would both help advance the field and provide information that would be extremely useful from a public health perspective. For example, effective risk assessment techniques that describe the risk of foodborne viruses was a need identified by several participants. Discussions on viruses and a variety of other types of foodborne pathogens also emphasized the need for models that more effectively describe the biological processes that lead to infections and disease. Most currently available MRAs rely heavily on an empirical approach to modeling, and there was a great deal of interest in pursuing more mechanistic models. Similarly, the challenges of effectively modeling diverse subpopulations within any group of humans were discussed.

STANDARD MRA PRACTICES

One of the areas that always leads to animated discussion whenever risk managers and risk assessors get together is the need for a framework with standardized procedures for the conduct of risk assessment. This Conference was no exception. On one side, the participants were concerned that without a defined series of best practices, MRAs could be based on faulty assumptions and considerations of uncertainty and variability could be inconsistent. A framework of standardized procedures would provide a means by which risk managers could examine various MRAs with some degree of assurance of consistency of approach. The other side argued that the science underlying each risk question should speak for itself and that reliance on set protocols could lead to acceptance of assumptions or protocols without critical thinking. Both sides provided pertinent examples, and all discussants agreed to agree that a key to addressing this issue is providing effective transparency. However, transparency does not mean that one simply includes everything that was done in the risk assessment. Instead, the emphasis should be on ensuring that the reader understands the process and the results.
NEXT STEPS

From all accounts, the 1st International Conference on Microbiological Risk Assessment: Foodborne Hazards was a success and certainly met its goal of developing an international network of risk assessors. A number of central issues emerged that should be addressed to nurture this new field: (i) the critical need for effective communications and interactions, (ii) the need to keep efforts focused on the goal of improving science-based, risk-based food safety decision making, (iii) the achievement of parsimony, i.e., the effective balancing of complexity and usefulness, and (iv) the need for continued openness and transparency.

The need for a neutral setting for archiving and exchanging risk assessments and the data supporting them was identified as a critical component for building on the successes of the past 10 years. All participants encouraged the continued use of the Joint Institute for Food Safety and Applied Nutrition Food Safety Risk Assessment Clearinghouse (www.foodriskclearinghouse.umd.edu), which serves as a resource for all microbial risk assessors. Likewise, the Conference participants expressed support for periodic international meetings, and a team of international volunteers is actively exploring the organization of second and third international conferences.