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Review

A working procedure for identifying emerging food safety issues at an early stage: Implications for European and international risk management practices

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ABSTRACT

There is a need for early identification of emerging food safety issues in order to prevent them from developing into health risks. In this paper, various existing methods and procedures which can be used for early identification of safety issues are reviewed, including the monitoring of the occurrence of specific hazards within the food supply, or the incidences of food-borne diseases, as well as the combination of these data with other data or with expert opinions. Some methods, including hazard analysis critical control points (HACCP), operate pro-actively by pre-defining indicators for hazards and follow-up measures. Vulnerability assessment focuses on potential weak spots within the food supply, whilst futures research employs foresight to enhance preparedness for future hazards and risks. A Delphi survey on food safety risk analysis conducted among professionals revealed concerns with various aspects of current procedures for dealing with emerging issues, and these are discussed. The Delphi respondents also attached great value to the involvement of stakeholders and the inclusion of a broader range of data into risk analysis. Indeed, holistic systems employing indicators from outside the food production chain are now being developed. In conclusion, a four-step procedure for the early identification of emerging issues is proposed.

Contents

Abbreviations: AFFA, Australian Authorities for Veterinary Health; BSE, bovine spongiform encephalopathy; CARVER,criticality, accessibility, recuperability, vulnerability, effect, and recognisability; CDC, Centres for Disease Control and Prevention; CDTR, communicable disease threat reports; DAFF, Australian Department of Agriculture, Fisheries and Forestry; DEFRA, UK Department of Environment, Food, and Rural Affairs; EC, European Community; ECDC, European Centres for Disease Control and Prevention; EFSA, European Food Safety Authority; ER, Emerging risk; ERDSS, emerging risk detection support system; EU, European Union; Eurostat, statistical office of the EU; EW, early warning; FAO, Food and Agriculture Organisation; FVO, Food and Veterinary Office of the European Commission; GF-TAD, global framework for the progressive control of transboundary animal diseases; GOARN, global outbreak alert and response network; HACCP, hazard analysis critical control points; INFOSAN, International Food Safety Authorities Network; OIE, World Organisation for Animal Health; RASFF, rapid alert system for food and feed; SINAPSE, EU network for Scientific Information and Expertise for Policy Support in Europe; UK, United Kingdom; US, United States; USDA APHIS CEI, US Department of Agriculture, Animal and Plant Health Inspection Service, Centre for Emerging Issues; WHO, World Health Organisation.

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1. Introduction

The occurrence of various national, European, and international food safety issues over the last few decades has arguably resulted in a decline in public trust in food safety regulation and management inside and outside Europe (*e.g.* Houghton et al., 2008). Prominent examples of issues that have emerged over the last decade include bovine spongiform encephalopathy (BSE; Reilly, 1999; Smith, Young, & Gibson, 1999), genetically modified foods (Frewer et al., 2004), dioxins (Verbeke, 2001) and acrylamide (Claus, Carle, & Schieber, 2008), whilst the actual risk that these issues are known to pose to consumer health varies widely.

The process of decision-making applied to risk has been termed "risk analysis." This process entails three interrelated steps, namely *risk assessment, risk management*, and *risk communication*. According to internationally accepted principles and definitions, *risk assessment* is the "scientific evaluation of known or potential adverse health effects resulting from human exposure to food-borne hazards" (FAO/WHO, 1995). It includes "the identification of the attendant uncertainties of the likelihood and severity of an adverse effect(s) and /or event(s) occurring that may have an impact on humans, food producing animals, or the environment, following exposure" (EU, 2000). Risk assessment entails the following steps: (1) hazard identification; (2) hazard characterisation; (3) exposure assessment; and (4) risk characterisation. "Hazard" is thus defined as "a biological, chemical, or physical agent in – or property of – food that may have an adverse health effect," and "risk" as "a function of the probability of an adverse effect and the magnitude of that effect, consequential to a hazard in food" (FAO/WHO, 1995). *Risk management* is defined as "the process of weighing policy alternatives in the light of the result of risk assessment(s), together with other relevant evaluations, and (if required), of selecting and implementing appropriate control options" (EU, 2000). This includes, where appropriate, monitoring and/or surveillance activities. *Risk communication* is defined as "the interactive exchange of information and opinions concerning risk and risk management activities" among risk assessors, risk managers, consumers, and other interested parties (EU, 2000). Interaction should occur between all three components of the model (EU, 2000; FAO/WHO, 1995, 1997).

To date, the analysis of food safety issues has been confined to scientific experts in risk assessment and professional risk managers, with very limited formal input from other interested parties, such as consumer organisations, non-governmental organisations, industry, or indeed, consumers themselves (Wentholt, Rowe, Konig, Marvin, & Frewer, 2008). Furthermore, risk analysis has tended to focus on the assessment of health risk, but has taken only limited account of the potentially relevant social, economic, and ethical aspects that may, nonetheless, have direct implications for optimising risk-management practices.

To improve some of the shortcomings of the present risk analysis process, the EU 6th Framework project SAFE FOODS was initiated in 2004. The overall objective of SAFE FOODS is to change the scope of decision-making on food safety from single risks to consider foods as the sources of risks, benefits, and costs that are associated with their production and consumption. In addition, optimisation of risk governance practices should arguably take into account the social context in which decisions are made.[1] Another significant food risk issue that potentially could be improved in the traditional risk analysis approach (identified during the development of the SAFE FOODS framework) concerns the identification of emerging risks. As a consequence of failures in preventing various food safety incidents in the recent past, it is currently recognised that there is a need for rapid identification of food safety risks at an early stage. This paper aims to describe some innovations relevant to the development of a working procedure for identifying emerging food safety issues,[2] thereby extending a previously published report on indicators for such risks (Kleter & Marvin, 2008).

In the subsequent sections, different approaches for identifying emerging risks are categorised and critiqued, and recommendations are provided for improving activities in this important area. Table 1 compares and contrasts these different types of systems and their main characteristics.

2. Present early warning (EW) systems and their applicability as emerging risk (ER) systems

2.1. Hazard-identification-based systems

2.1.1. Hazard- and disease-recording systems

The safety of the European food and feed supply is aided by various early warning systems that monitor the occurrence of hazards within the food production chain, as well as the outbreak of animal and human diseases after consumption of problematic foods. Examples of monitoring systems for hazards within the food production chain include national and regional programs for the control and detection of the presence of illegal substances or unacceptable concentrations of chemicals or pathogenic microorganisms in food and feed. A notable example of this is the EU Rapid Alert System for Food and Feed (RASFF), which lists the food safety hazards identified by its members, including EU member state authorities (EU, 2008a). RASFF provides for the establishment and maintenance of a communication platform through which members can alert each other about relevant food hazards. This procedure of notification *via* a centralised database enables "early warning" systems to be made operational by allowing other members to instigate protection systems against certain hazards that may be disseminated from one member state. In addition, RASFF overviews are published weekly on a publicly accessible website, which also features annual reports that highlight conspicuous trends in the pertinent year. Another way of using RASFF data for

[1] The SAFE FOODS project (http://www.safefoods.nl) aims to develop improved inputs into food risk analysis across five aspects of food safety risk assessment, including: (i) the development of new analytical tools by adapting modern profiling technologies for use on food; (ii) the improvement of models for understanding population level health impacts of combined exposures to beneficial nutrients and natural and chemical toxicants; (iii) the design of a new working procedure for early identification of emerging microbial and chemical risks; (iv) an investigation of the role of the different EU institutions involved in the governance of food safety; and (v) the development of more effective communication strategies for the exchange of information between experts, regulators and relevant stakeholders, including the public.

[2] Reflecting research within work package 2 of SAFE FOODS.