

Parma, 28 May 2009
EFSA/AGRC/29MAY2009/AGENDA ITEM 7.3

Advisory Group on Risk Communications

European Food Safety Authority - Risk Communication Annual Review

**Jamie K. Wardman
Ragnar E. Lofstedt**

**King's Centre for Risk Management
King's College London**

Acknowledgments

We wish to express many thanks to the communications team at the European Food Safety Authority for their help providing us with extensive source materials and for their comments which have been invaluable to this review. We would also like to thank the members of the Advisory Group on Risk Communication (AGRC) and most especially Professor George Gaskell for their helpful feedback and comments. The views expressed are those of the authors as are any errors or omissions that remain.

Table of contents

Summary.....	3
1. Introduction and objectives.....	6
2. Critical issues for food risk communication.....	6
2.1 Early psychometric research on food risks.....	7
2.2 The social amplification of risk.....	9
2.3 Trust and transparency.....	9
2.4 Affect, perceived benefits and fundamental objections.....	11
3. A modern approach to organisational risk communication.....	13
3.1 Creating appropriate risk communication channels.....	13
3.2 The credibility of organisational decisions.....	16
3.3 Delivering decision relevant information.....	18
4 EFSA’s approach to food risk communication.....	24
4.1 The discovery of BSE in goats.....	25
4.2 The safety of wild and farmed fish	27
4.3 The discovery of semicarbazide in baby food.....	28
4.4 The risks of GMOs in the food chain.....	31
5. Analysis.....	33
5.1 EFSA’s creation of risk communication channels.....	33
5.2 Stakeholder representations of EFSA’s credibility.....	35
5.3 EFSA’s delivery of decision relevant information.....	37
6. Conclusion.....	39
7. Review recommendations.....	39
8. References.....	42

Summary

Overview

The European Food Safety Authority (EFSA) was established in 2002 by the European Parliament and the Council on proposal from the European Commission to help rebuild consumer confidence in the safety of the food chain following a series of food scares in Europe during the 1990s. EFSA is responsible for giving sound independent scientific advice on all matters related to food and feed safety to support the development of future legislation and policies and for the provision of risk communication in all areas of its remit.

This research was commissioned by EFSA to provide an independent critical review of the Authority's risk communication activities in relation to official opinions on the safety of foods in four cases: BSE in goats; wild and farmed fish; semicarbazide in baby food; and genetically modified organisms (GMOs). These cases were selected by EFSA for the focus of the review to reflect a variety of different communication contexts and challenges that the Authority faces in the course of its day-to-day work. Risk communication materials associated with these cases from July 2003 to March 2008 were examined as part of the review.

The review begins by providing an historical context to the issue of communicating food risk including an outline of some key issues typically associated with public responses to food risk issues such as the social amplification of risk, social distrust, and affect and emotion.

In light of such considerations the review draws upon three fundamental principles for effectively communicating risk recently proposed by Fischhoff (2005) to develop a normative framework against which to appraise EFSA's risk communications. These principles concern: 1. creating appropriate risk communication channels; 2. the perceived credibility of EFSA's communications by other stakeholders; and 3. the efficient delivery of decision relevant information.

Main Findings

EFSA's risk communications were found to be generally well managed overall. EFSA is to be particularly commended for its proactive response to the discovery of potential food risks in the cases observed. Being open and transparent about potential food risks poses many difficulties, but EFSA seems to be rising to this challenge well. For example, it is noteworthy that EFSA both acknowledged and raised awareness of the countervailing risks potentially associated with behavioural choices that might possibly arise as a result of citizens being made aware of certain food risks as in the case of the semicarbazide discovery. This is indicative of a 'sea-change' in organisational thinking and regulatory practice in Europe concerning risk communication since earlier food scandals such as BSE. In the event, EFSA appears to have succeeded in limiting the scope for potential media amplification of food risks associated with its communications. For example, the content of news media coverage was relatively proportionate and factual overall even in news articles which led with 'alarming' headlines.

The review found there to be some variability in the level of communication used across each of the four cases studied with regard to the formulation and comprehensiveness of decision relevant information prepared for public dissemination for example. There was also found to be a degree of variability in the framing of communications between EFSA and other official stakeholders. For example, in relation to the discovery of BSE in a goat the European Commission was seen to be more reassuring than EFSA. Similarly, in the semicarbazide case the UK Food Safety Authority was also perceived to have adopted a tone that was more concerning to consumers than in EFSA's communications. In this case EFSA's communications were distinguished by a focus on the countervailing risks of microbial contamination that might occur from other forms of food processing and packaging in the home as well as stressing the fact that any industry substitutes to semicarbazide should be carefully tested before market introduction.

For the most part EFSA's credibility was not publicly drawn into question except with specific regard to the GMO case. Here NGOs such as Greenpeace and Friends of the Earth criticised the independence of the Authority and the quality and comprehensiveness of scientific risk assessments. These stakeholders also appear to have conflated EFSA's role in the risk management of GM food within Europe. The steadfast refusal of some Member States to lift national moratoriums on GMOs may also have lent support to notions that EFSA had not sufficiently taken all health and environmental risk concerns into consideration in initial Scientific Panel Opinions.

As with any review it is always possible to say with hindsight that EFSA might have done more to address such issues than at the time. For instance, EFSA could have initially shown more initiative in opening public and stakeholder consultations soon after the Authority was first created particularly as EFSA has since responded by putting more consultative measures in place to foster dialogue between different stakeholders on this controversial topic. As some of these consultation activities came later in EFSA's operation it may be perceived that the Authority had to resort to reactive measures to address public criticism rather than being a more willing partner in addressing broader concerns from the start. However, it should also be recognised that whilst imperatives for greater openness and dialogue may enhance substantive discussions on such matters, these also needed to be balanced against a primary objective of EFSA to maintain independence from political debate and influence at the risk assessment/risk management interface. In these respects EFSA has since undertaken a number of initiatives to strengthen policy regarding the declaration of interests of EFSA's members and the evaluation of the quality of EFSA's scientific work.

Key Recommendations

Following these findings a number of constructive recommendations are made to help EFSA to further professionalize their risk communication activities. In particular it is suggested that EFSA should be more mindful of the risk communication needs of all of the Authority's publics. As EFSA relies quite heavily on the media for its public communications it is recommended that the Authority work in conjunction with members of the media to develop criteria for reporting food risks that will help in the efficient and effective delivery of decision relevant information to consumers. EFSA should also continue to impress upon its members the need for maintaining a proactive approach to risk communication on potentially controversial issues such as

with GMOs. That is to say, EFSA needs to remain vigilant in the face of potential social and political ramifications that may come to light, as well as scientific considerations, when dealing with emerging food risks. This might also require that the Authority restates its role in the risk assessment/risk management interface. Finally, it is suggested that EFSA may benefit from formalising internal protocols to ensure consistently high levels of communication.

1. Introduction and objectives

The European Food Safety Authority (EFSA) was established in 2002 by the European Parliament and the Council on proposal from the European Commission to help rebuild consumer confidence in the safety of the food chain following a series of food scandals in Europe such as the Belgian dioxin scare and the Bovine Spongiform Encephalitis (BSE) ‘mad cow’ crisis during the 1990s. EFSA is responsible for giving objective independent scientific advice on all matters relating to food and feed safety to support the development of legislation and policies and for the provision of risk communication in all areas of its remit. The King’s Centre for Risk Management, King’s College London, was commissioned by EFSA to undertake an independent critical review of the organisation’s risk communication activities in relation to official opinions on the safety of foods in four cases: Genetically modified organisms (GMOs), the safety of wild and farmed fish (SWAFF), BSE in goats, and the discovery of semicarbazide in food¹. The aims of the review were threefold: first, using the risk communication and perception literatures, to technically appraise and compare EFSA’s written output associated with the above four cases along with that of other relevant actors; second, to analyse which actors with regard to these cases were most successful in communicating risks and why; and third, based on this information to provide EFSA with constructive feedback to further professionalize the organisation’s risk communication activities by identifying possible improvements of the technical and ethical character of EFSA’s approach to risk communication.

The review starts by first briefly highlighting some of the critical issues identified in by prior research to shape the effectiveness of organisational risk communication efforts. The next section of the review provides an outline of contemporary academic thinking and best practice about how to proceed in light of such considerations. Insights are derived from this work and integrated into the technical review in the form of normative appraisal criteria against which descriptive observations of EFSA’s risk communication activities are evaluated in view of other stakeholder communications and wider news media coverage. EFSA’s risk communication activities for each of the four cases are presented and analysed in turn and the review concludes by providing some prescriptive recommendations for communicating food risks following the particular challenges and objectives exemplified in the four cases studied.

2. Critical issues for food risk communication

Despite the emergence and growth of risk research in environmental and technological fields perhaps somewhat surprisingly until some ten or twelve years ago comparatively little academic research had been undertaken on the provision and impact of organisational risk communication in the area of food risks (see Lofstedt 2006 for a recent review). Fortunately, risk communication researchers both from within and outside the food area have since begun to carry out a number of interesting case studies to shed further light on this topic. This work has focused particularly on public

¹ This was a desk research project focussing primarily on written communication materials and so no stakeholders or policy makers were interviewed. The four cases were selected specifically at the request of EFSA to reflect a variety of the different types of communication issues and demands placed upon the Authority. Risk communication materials examined from July 2003 to March 2008.

perception and acceptance of genetically modified foods (GMOs) (e.g. Blaine and Powell 2000; Fischhoff and Fischhoff 2001; Finucane 2002; Frewer et al 1997; Frewer et al 1998; Frewer and Shepherd 1994; Gaskell et al 1998; 2000; 2003; 2004; Grove-White et al 1997; Leiss 2001; Poortinga and Pidgeon 2005; Siegrist 2000; Walls et al 2005) and the communication of scientific uncertainty (Frewer et al 2002 and 2003; Miles and Frewer 2003). In addition, there has been a proliferation of studies examining and analysing the communication of science, risk and uncertainty surrounding the BSE crisis that affected the UK in particular, but also the rest of Europe in the mid 1990s and afterwards (e.g. Anand and Forshner 1995; Eldridge et al 1998; Fischler 2001; Powell and Leiss 1997; Setbon et al 2005). The intention here is not to provide a comprehensive review of this and other research for reasons of limited space, but instead to highlight certain points that this research has indicated are important considerations when approaching the issue of food risk communication.

2.1 Early psychometric research on food risks

The focus of early attempts by researchers and government agencies to address the issue of food risk communication followed the methods and insights generated by the 'psychometric paradigm' first depicted in work by Fischhoff and Slovic and colleagues in relation to public risk perceptions of hazards in general (see Fischhoff et al. 1978; Slovic et al. 1980). This pivotal research built upon the seminal work of Chauncey Starr (1969) and analysed the way in which people appraise and evaluate risks for themselves. It suggested that people's risk preferences or acceptance of risk reflected not so much expert assessments of the likelihood and severity of harm from a hazard as revealed for example through actuarial data, but rather that people's risk perceptions of potential hazards are multidimensional and complex being related to two primary factors in particular commonly referred to as 'dread risk' and 'unknown risk' (Slovic 2000; but see Hohl and Gaskell 2008). The risks that are most 'dreaded' tend to be those which seem to be uncontrollable, entail fatal consequences, have high catastrophic potential and are manmade rather than naturally occurring. Risk concerns loading on the 'unknown' factor reflect that the effects may be unobservable, delayed, unfamiliar or novel or if they are not fully recognised and understood by science.

Measuring people's perceptions of risk following the psychometric approach was thus thought to help an observer to develop an overall perceptual 'snapshot' of the particular risk in question that may in turn then be used to help an organisation anticipate the likely public reaction at that specific point in time. However, as the early psychometric researchers believed that a particular set of hazards under study might have an important impact on the observed dimensions of perceived risk, subsequent research has attempted to study individual hazard domains separately. This led to a number of research studies in the mid-1990s focussing more specifically on the domain of food risks (see for example Fife-Schaw and Rowe 1996; Sparks and Shepherd 1994). Food risk researchers were notably concerned that there were a number of *a priori* reasons to expect that factors developed to explain perceptions of large scale hazards (such as nuclear power plants) may not be readily applicable in the case of food risks, with Fife-Schaw and Rowe (1996) observing for example that:

- people are dependent on food more so than for many other potential hazards
- there is often individual choice when it comes to eating which depends more on personal relationships and experience than say government agencies
- many food choices are habitual and often have immediate and obvious benefits

- whilst some negative consequences (such as mild food poisoning) are encountered they can be small or go unnoticed, and so eating is not generally perceived as hazardous except in times of food scares as compared to other types of risks for which risk perceptions may be more sustained

This later research also attempted to overcome some of the methodological drawbacks of some previous psychometric studies by eliciting the structure of risk perceptions from focus group respondents rather than simply imposing a structure derived by the researchers themselves. In fact, the findings of these studies proved to be comparatively similar to those of prior psychometric research suggesting that the key dimensions previously observed for other risk domains were also broadly generalisable to the domain of food risk (Fife-Schaw and Rowe 1996; Sparks and Shepherd 1994). Interestingly, Fife-Schaw and Rowe (1996) further found that food risks that were perceived as unknown (i.e. not being previously encountered or the subject of prior risk communications) were still regarded by respondents as serious and in need of regulation, and that this may represent a default, or starting position for many food risks first entering public awareness.

Yet, despite the instructive insights generated by psychometric studies, other authors as well as the originators of this research have also pointed to the fact that individual risk perceptions are situated in a broader social and cultural context that influences how people generally encounter and (re)construct risk information. Psychometric studies only give a partial insight into how people subsequently appraise and give meaning to this information and incorporate it into the decisions they make affecting their day-to-day lives. Understanding these processes in relation to individual perceptions of food risks therefore also requires a more in-depth focus on some of the factors that make food risk communication issues particularly unique.

Elaborating from this perspective researchers have highlighted that not only is food required for life and survival so we as humans cannot escape it, but that it figures both materially and symbolically in our consumption practices; hence it is no surprise that food can become structurally associated with deeply rooted anxieties and shifting configurations of personal and social identity (Kjaernes et al 2003; see also Fischler 1988; Kjaernes 1999; Reith 2004). Moreover, Reith (2004) has further remarked upon how consumerism and socio-historical processes of governance and control within advanced neo-liberal societies can give rise to deep social tensions over patterns of consumption. For instance, food consumption practices and the social discourses that surround them are notably dynamic and inherently contradictory as food consumption is framed not only by notions of liberty, individual freedom and choice, but also increasingly by a sense of personal and social restraint and responsibility not only for one's own health and the health of others but also the environment and animal welfare. Such framings are not at once entirely compatible with one another and may often lead to social friction. In other work, Renn (2006) has recently observed that public understandings of the complexity of exposure to risk, uncertainty about the actual occurrence of presumed effects, and the resulting ambiguity that arises when these effects are evaluated differently by different social actors all pose special challenges to the communication of food risks.

2.2 The social amplification of risk

One attempt to situate the insights gained from risk perception studies within the context of broader social interaction and communication has centred on the development of a conceptual framework known as the ‘social amplification of risk’ (see Kasperson et al 1988), which has recently been applied by several researchers to analyse food risk communication (see for example several contributions to the volumes by Pidgeon et al. 2003 and Flynn et al. 2001). The first proponents of this framework attempted to conceptually model how hazard events or accidents (characterised for example by such qualities as ‘dread’ and ‘uncertainty’ indicated in psychometric studies) act as ‘signals’ giving rise to ripple effects that may extend beyond any damage or harm encountered directly and immediately to encompass many other victims. According to these authors social interactions between agents such as government officials, non-state actors and NGOs, the mass media and members of the public may serve to amplify (or attenuate) the psychological, social, physical and economic impacts of a risk incident. These outcomes arise as part of the general ongoing process of communication and exchange of information between the members of a society and can lead to detrimental effects such as the generation of stigma, which may last not only over the immediate term, but also much longer over time.

The social amplification of risk clearly affected modern European food scandals, most especially in the case of the BSE crisis which is regarded by several academics as a ‘textbook example’ of social amplification of risk at work (see Kasperson et al. 2001; Setbon et al. 2005; Flynn et al. 2002). In this case, the social amplification of risk led to the stigmatising of food and food production as well as food producers which severely impacted on national economies. Furthermore, as government agencies and public health authorities were also widely perceived to be negligent in their duty to protect the health of European citizens, this had lasting ramifications for consumer trust and confidence in the safety of the food supply chain that are still felt today (Frewer 2003; Eldridge and Reilly 2003).

2.3 Trust and transparency

Of the many variables that influence how the public perceives risk, public trust is arguably one of the most important (Poortinga and Pidgeon 2005; Lofstedt 2005; Slovic 1993; Siegrist 2000). Past research has shown a relationship between high public trust and low public perceived risk and low public trust and high public perceived risk and that once lost trust is difficult to regain (Slovic 1993). Moreover, if a highly trusted stakeholder publicly speaks out against a low trusted public body then public opinion more often tends to follow the more highly trusted party. However, if a stakeholder with low trust criticises a highly trusted public body then the more highly trusted party is more likely to retain credibility in the eyes of the public (Lofstedt 2005).

In the fall out after recent European food scandals it is generally regarded that an era of heightened distrust has emerged whereby the public have turned away from risk regulators and public health authorities to other sources of health risk information believed in many cases, however rightly or wrongly, to be more accurate and reliable than official sources. It is little surprise therefore that under the scrutiny of a 24/7 hyperbolic media environment in which various stakeholders numerously compete with official sources to promote their own points of view on food risk issues that many

regulators, government agencies, and public health authorities have thus placed a high premium on achieving and maintaining high public trust in risk debates.

One popular method for addressing public distrust of official health authorities has been to open up institutions to greater transparency. Transparency has long been regarded as a key component to modern democracy and public service reform more generally and has recently been seen as an antidote to distrust by helping to prevent secrecy and to promote public accountability (Hood et al. 2006). Indeed, the issue of wider transparency in policy making is in the eyes of many policy makers crucial to rebuilding public trust (European Commission 2001). But despite the received wisdom of this view increasing transparency is not a problem free process and a number of problems have arisen when transparency has been applied uncritically. Demands for greater transparency may for example generate scientific pluralism if scientists 'go public' with new findings leaving little time for official organisations to formulate policy responses which may lead to policy vacuums (Lofstedt 2004; Jasanoff 1990).

The growth in public transparency of governmental and private organisations can also result in information overload for recipients. The act of simply providing more information does not necessarily lead to greater understanding or promote public trust in institutions because to place trust people also need the means by which to be capable to judge the basis of new information (O'Neill 2002). According to O'Neill (2002) the full disclosure of information can actually lead to further uncertainty unless that information is sorted and assessed, but unless those institutions responsible for sorting and assessing information are already trusted there is little reason to suppose that transparency and openness are going to increase trust. Rather, O'Neill (2002) further argues that excessive demands for public transparency can in fact encourage people within organisations to be less honest or forthright and to underplay sensitive information resulting in self-censorship; the problem being that although transparency may limit secrecy in part it does not necessarily destroy deception or misinformation. In which case, it may be in the reasonable interests of outside observers to withhold their trust even when organisations have transparency policies in place.

Although transparency is plainly not a panacea for problems of distrust there are some grounds to suggest that it can be a useful risk management tool if deployed critically to support people's decision making. One object lesson to be learned from risk management crises over the past few decades is that unnecessary delays in the provision of information leading to communication vacuums, communicating risk in a restrictive 'one-way' fashion and attempting to cover-up facts about what may have happened are actions that are most likely to alienate concerned citizens, cause public distrust and deficits in the perceived credibility of government and official agencies (Powell and Leiss 1997; Lofstedt 2005). However, as O'Neill (2002) rightly observes greater transparency in the form of a flood of un-checkable information provided via one-way modes of communication is unlikely to deliver gains in public trust; rather what is needed is a means by which people can scrutinise the information they need and check the credentials of information sources for themselves. Practitioners are therefore rather better advised to spend their time proactively preparing risk communications that are responsive to the information needs of concerned citizens (see Powell and Leiss 1997).

This means that official authorities may need to make available information on request as needed to be opened up to public scrutiny, but should not constantly flood recipients with vast streams of information concerning the minutiae of an organisation's risk-

related practices, procedures and decision outcomes. As a general rule it seems that the greater the ambiguity that pervades social risk discourses (often resulting from high levels of complexity and scientific uncertainty) then the greater the requirement in democratic societies for organisations to foster more open and transparent public dialogue about the risk in question (Klinke and Renn 2002). The capability of people to critically appraise risk information when sufficiently motivated should not be underestimated. Making available and accessible information about the basis, rationale and philosophies of institutional viewpoints and decisions even in the context of alternatives is a form of transparency that people can usefully employ to make better informed decisions. Research by White and Eiser (2005) has indicated for example that information about an organisation's policies towards managing risk can improve trust in that organisation by allowing people some insight into the organisation's general outlook and performance rather than just for a specific incident. Ultimately though, public trust seems likely only to be built up incrementally. That is to say, when starting from a position of distrust, the reliability of information sources can only be critically judged based on the merits of the utility of the information they provide and their performance over time before individuals can suitably judge whether or not they would be well advised to withhold their trust in such sources presently or again in future.

2.4. Affect, perceived benefits and fundamental objections to food risks

The maintenance of public trust, though important, is not however the whole story with regard to understanding how people will respond to information about potential risks. The perceptions of people within an extended audience will typically be heterogeneous and reflect a variety of outlooks, interests and experiences. This makes the problem of differentiating, prioritising and targeting risk communication efforts a seemingly arduous and resource intensive task. People's perceptions of risk can be heightened or attenuated by a variety of contingent factors and psychological processes, but not necessarily in equal measure across different subgroups or cultures (Fischler 2001).

Research has recently re-emphasized that the effectiveness of risk communication messages in influencing consumer judgements about food can in fact be offset by perceptions of the food's benefits as well as values about science and society rather than 'lay' understandings of risk or public trust in authorities *per se* (see Gaskell et al. 2005). For example, experimental demonstrations of the 'affect-heuristic' by Paul Slovic and Mellissa Finucane and colleagues (2000; 2004) have shown that if individuals initially perceive the introduction of a new technology to have low benefits then they are also more likely naturally to infer that the risk of that technology is high; and vice versa, that if the risks are initially perceived to be high that the benefits of a new technology are accordingly assumed to be low. Similarly, work by Gaskell (2004) and colleagues (Gaskell et al. 2005) in an applied context suggests that a lack of public support for GMOs may be most attributable to general perceptions of low benefits to consumers from the introduction of this new technology. In sum, people may rightly raise the question as to why they should accept a potential risk if there are not obvious benefits to them for doing so. Gaskell and colleagues note that this poses a particular problem because considerations of the potential benefits of controversial new food technologies such as GMOs rarely figure in conventional risk communication messages by health authorities and agencies despite the prevalence of such concerns in wider social and political discourses about their introduction and use.

The different facets of what might be termed as the 'perceived benefit problem' may thus pose a particular difficulty for food safety authorities. The logical conclusion for risk communication practitioners might be to include more information about potential benefits to further offset the instrumental risk-benefit tradeoffs that people make about new technologies such as GMOs. Some recent research has advocated for example that healthier food consumption practices could be promoted by using attractive images to point out the benefits of behavioural changes (Simons and Lehnsh 2006). But where food safety authorities do tend to comment on the particular benefits of food in their communications this would typically be confined to a consideration of the nutritional value of food on its own or in relation to other foods, or perhaps a food's comparative safety being seen as a benefit. Any wider benefits to other actors in society at large such as commercial benefits through more efficient production methods or higher crop yields for food producers tend not to feature. These latter concerns which may be taken up by industry advocates are generally of a far less direct importance to consumers except perhaps with regards to their potential impact on food pricing which could have an influence on consumer intentions to purchase GM foods for example (see Moon and Balasubramanian 2003; Spence and Townsend 2006).

However, people's perceptions of risk may not directly correspond to positive information even when it is transmitted (Joffe 2003). Gaskell et al. (1999) have found for example that although European press coverage of biotechnology was more positive than that of North American press coverage, European public opinion was much more negative. As Fischhoff and Fischhoff (2001) have forewarned many novel technologies also raise fundamental objections whereby any potential risks are thought to be unacceptable because it is deemed morally or ethically wrong to incur them. Fundamental objections may be exacerbated by a technology having acquired a stigmatised status through inferential processes and social interactions (as in the case of the social amplification of risk noted above), or may be determined by individual tastes or social norms and cultural taboos (see for example Douglas 1992; Fischhoff and Fischhoff 2001). This may have in fact been the case for European public opinion, for which GM food was more readily associated with images of adulteration, infection, monster-qualities and menace than the North American public opinion (Gaskell et al. 1999; see also Tait 2001). In such instances, no instrumental benefits could possibly compensate for having to countenance those risks as part of every day living.

For some public health authority officials risk communication might arguably be utilised or tailored to address people's instrumental concerns about the potential risks of a particular food substance or food production technology. However, the issue of formally addressing the fundamental concerns that people might have is considerably more problematic. This is because attempts to manipulate affective responses by engaging in stigma reduction strategies for example, or trying to change cultural norms, practices and outlooks towards science or food consumption inevitably means taking sides in wider ethical and political struggles (Fischhoff 2001). In practice, these types of activities are often seen to be beyond the scope of many publicly appointed authorities whose remit generally requires them to maintain independence and objectivity on such matters. In many instances the risk assessment and management activities of food safety authorities have in fact been purposely separated as a means to partial out political and social influence from official positions on risk in a bid to increase the credibility of risk assessments in the eyes of the public. Furthermore, food safety authorities are notably only one link in a chain of actors that play a part in broader individual, social, cultural and political processes which impact on food consumption practices. It should therefore

be acknowledged that there are limits to the kind of influence they are able to exert on the social acceptability and desirability of different policy options in their assigned role.

The findings generated by the body of work outlined above therefore highlight many of the inherent contextual complexities and difficulties associated with the issue of communicating food risk. These concerns consequently raise key questions about what the fundamental objectives of organisational risk communication might be and the kind of activities it should fully encompass. These considerations are the focus of the next section of this review.

3. A modern approach to organisational risk communication

Many government agencies and official authorities now acknowledge that risk communication has an important role to play in helping to safeguard citizens' health and the environment as well as promoting informed debate and choice about risk. This review now turns to the question of specifying what objectives and what form the provision of organisational risk communication might actually entail. To this end, it is proposed that Baruch Fischhoff (2006) has recently put forward a conceptual scheme which succinctly captures modern thinking on the objectives and effective implementation of risk communication. This scheme centres on three interrelated principles: create appropriate communication channels; manage risks well so as to have a credible message to communicate; and deliver decision relevant information concisely and comprehensibly. The particular advantage of this scheme is that it adopts a pragmatic focus which articulates some of the main objectives that must be set and the fundamental conditions that must be fostered in order to communicate risk effectively. However, by acknowledging the interactive nature of these fundamental conditions this scheme emphasises that effective risk communication must be viewed as a multi-dimensional enterprise. That is to say, the three fundamental principles of this scheme must be considered in concert: focussing on either one at the expense of the other two is likely to hinder the effectiveness of risk communication efforts. These objectives are next elaborated upon in turn as each is operationalised in the form of evaluative criteria for this review. The elaboration of these criteria subsequently largely draws upon a body of work conducted by Baruch Fischhoff and colleagues that has contributed to the development of this scheme, as well as insights generated by other researchers within the risk communication field which are seen as complementary to this adopted approach.

3.1. Creating appropriate risk communication channels

First it is helpful here to elaborate upon how the notion of risk communication is contemporarily coming to be understood by academics and policy makers as a social process. Risk communication in its most general sense is perhaps best described as:

“The flow of information and risk evaluations back and forth between academic experts, regulatory practitioners, interest groups, and the general public” (Leiss 1996, p. 86).

Or as stated in CODEX:

“The interactive exchange of information and opinions concerning risk among risk assessors, risk managers and other interested parties.”

These descriptions are notable in reflecting the conventional wisdom that risk communication should not be construed asymmetrically as simply a ‘one-way’ form of communication from organisations to the lay public. In one-way communication authority officials commonly subscribe to the ‘deficit model’ of the public. In this model the public is typically considered to be deficient in their knowledge about a particular issue and that this needs to be remedied through disseminating more information or publicising official viewpoints derived from ‘experts’. From this perspective risk communication failure is conceived as a disruption or breakdown in the transmission of risk messages from authorities or more often the miscoding of that information by its recipients. Where there is public doubt or scepticism over risk information this is typically attributed to the public’s ignorance, scientific illiteracy, or irrationality (Sturgis and Allum 2004). However, as scholars such as Fischhoff (2006) and Powell and Leiss (1997) contend, one-way communication generates the impression that recipients are being managed, learning no more than an authority wants them to know, and as such these actions can thus result in alienating intended recipients of communications.

The two definitions of risk communication outlined above instead highlight rather the contextual nature of communication. From this viewpoint, organisational risk communication necessarily constitutes part of a broader ‘two-way’ engagement in social and political discourse including all those who become involved in a risk issue. In two-way communication, actors are regarded equally and recipients are treated like partners allowing them greater responsibility to shape how risks are managed and share what is learned about them (Fischhoff 2006). As such, public health and safety authorities are involved in a much more dynamic process of sharing information between all active parties who interpret and reinterpret that information in accordance with personal goals and contexts. Organisations thus not only have to be responsive to how others engage with their communications, they also need to be responsive to communications by other stakeholders whom might have different information needs and perspectives or insights to offer.

In practice, the day-to-day provision of risk communication by organisations encompasses a wide variety of modes and formats. These may range from the dissemination and sharing of information about risks through websites and press releases for example, to more consultative methods such as public/stakeholder meetings or dialogue and inclusive forms of deliberative decision making and ‘upstream engagement’ (see for example Wilsden et al. 2005). Recent risk communication research has indicated and largely supported a general trend towards facilitating dialogue and stakeholder involvement in risk decision making. These latter formats involve stakeholders from a cross-section of interests early and directly in helping to set risk management policies, priorities and agendas. However, contrary to popular and political opinion, engaging in dialogue though often important and essential to the policy-making process is not problem free and can be difficult to implement so it should not be taken for granted as a ‘be-all and end-all’ solution to the issue of effective risk communication (Lofstedt 2005; Fischhoff 1995).

Aside from the complications associated with uncritically widening transparency and information overload identified above, one further problem with facilitating public consultation exercises or deliberative dialogue is that it is often difficult to secure a broadly representative selection of people's views. Debates about risk can therefore sometimes become narrowly skewed by the sectional interests of groups or individuals with their own particular biases or political agendas. Work by Townsend and Campbell (2004) has argued for example that popular opinions of GM technology may be more ambivalent than was represented in the *GMNation?* public debate, a major consultative exercise recently held in the UK which found many who participated to be sceptical of GM technology. Some recent case studies have also indicated that public trust in risk managers should be considered when deciding whether to embark on public consultation programmes. For example, if the outcomes of risk management initiatives are likely found to be unfair to those affected it is important to include and represent a broader section of interests in risk management decisions.

On the other hand, if decisions are initially trusted and seen as representative of the public interest then people may question the rationale behind why they are being informed about particular decisions or being asked to become involved. There is a concern therefore that this could in fact lead to cynicism about an organisation's genuine intentions for publicising risk assessment findings or presenting particular risk management options for example, in which case a 'top-down' approach might seemingly have better sufficed (see Lofstedt 2005). Lofstedt (2005) has accordingly advised that the context of public trust should be tested for on a case-by-case basis to help determine the form and scale of public involvement. Klinke and Renn (2002) have also argued that social ambiguity rather than say the complexity or scientific uncertainty associated with a particular risk is a key condition for actively attempting to engage different stakeholders and the lay public in risk dialogue. Scientific uncertainty alone may instead require that further discourse and deliberation be undertaken between experts and may be better communicated once a policy option or response has been formulated to address that uncertainty (Frewer et al. 2002).

Officials in government organisations and agencies are therefore coming to recognise that there is no 'one-size-fits-all' policy solution to risk communication problems. Rather, understanding the nuances of different risk assessment, management and appraisal contexts and faithfully implementing risk communication practices appropriate to those contexts is essential to the effective functioning of authorities charged with responsibility for addressing food risk issues. Therefore, whilst it is advisable for an organisation to employ a common framework to underpin the preparation of coordinated and well executed communication plans, to ensure that appropriate communication channels are opened organisations also need to adopt a flexible approach. This means regularly working with different stakeholders on different communication platforms not only to help ensure the dissemination of information to target recipients, but also to increase the sufficiency of opportunities for feedback, input and comment from other stakeholders and the public where appropriate.

Summary Box 1. Creating appropriate channels

- 'two-way' not 'one-way' communication
- risk communication operationalised as a framework for learning in the face of uncertainty

- openness and transparency can be helpful if applied responsively, but are not a panacea to problems of distrust or ensuring informed decision making
- proactive avoidance of communication vacuums
- identify the context of communications and how stakeholders engage with your communications
- be attentive to risk management and appraisal context, levels of public and participatory dialogue may need to be responsive to public trust and social ambiguity
- work with a variety of stakeholders and incorporate a range of different communication platforms to facilitate appropriate levels of media/stakeholder coverage, interest, uptake and input

3.2. The credibility of organisational decisions

Renn (2003) has recently forewarned that the enthusiasm for improving risk communication procedures, as seen by the popularity associated with concepts such as two-way communication, trust-building and citizen participation should not, however, obscure the challenge of how practitioners can put such noble goals into practice or how to ensure that risk management reflects competence, efficiency and fair burden sharing. That is to say, any communication about an organisation's activities also has to be preceded by credible decisions and practices by that organisation and so the attainment of credibility in the eyes of other stakeholders and the public has therefore become a paramount objective for organisations. The issue of credibility should not however, become a 'catch-all' notion for everything that can possibly go wrong in organisational risk communication². Furthermore, it should be noted that it is not within the remit of this review to assess the actual substantive basis for EFSA's credibility *per se*. Rather, credibility as operationalised in this review refers to how the conduct of an organisation is publicly perceived in terms of the competence, efficiency and fairness/independence of organisational decisions and practices (Lofstedt 2005; Renn and Levine 1991). For EFSA this includes inquiry into how the Authority has been socially represented by other stakeholders and in the media in terms of how the assessment and communication of risk have been conducted and the value of this contribution to the improvement of broader food risk management goals in Europe, both in relation to the four case studies selected and more generally.

To elaborate a little further on these points, competence is generally regarded in terms of the proficiency and expertise of the organisational actors in question which may be based on the reputation of those involved and is commonly assessed by public perception of past performances. If risks have been poorly assessed or managed and if policies seem inconsistent then it may prompt scepticism and prove difficult for organisations to inspire confidence, in which case the credibility of communications will suffer (Fischhoff 2006). Where the competence of decision makers is brought into question an organisation may need to expend further effort to explain or make transparent the rationale behind certain organisational decisions and procedures. Otherwise the organisation may have to recruit highly respected experts seen to be more capable of fulfilling the role in question.

² We thank Baruch Fischhoff for highlighting this point.

Independence and fairness are also important elements of the credibility of risk management decisions. This may be conceived in terms of the impartiality of the decision making procedure itself or the fair distribution of outcomes resulting from the process in view of whether the decision makers took everyone's interests into account or just those of certain powerful industry bodies for example (Lofstedt 2005; Renn and Levine 1995). If it is believed that authorities have not acted independently, by putting sectional interests ahead of those of the public then this will undermine communications which may become regarded essentially as 'spin' rather than as providing an important public service (Fischhoff 2006).

Effectively deciding how to best manage and communicate risk in the interests of different sections of society with different expectations and preferences is clearly a difficult balancing act for many public health and safety authorities with only finite resources available at their disposal. For example, on the one hand, food safety authorities are seen to carry responsibility for diligently providing information about potential food risks to help safeguard consumers' health, and the failure to provide such information may not only adversely affect consumers it can also irreparably damage an authority's reputation and credibility. This has been shown by the results of poor communication in the recent history of European food scandals such as BSE, Foot and Mouth and the Belgian Dioxin scare (Loftstedt 2006). On the other hand, in providing such information food safety authorities are increasingly known to face accusations of unduly inundating consumers with an almost daily stream of information about food risks, or unnecessarily amplifying public anxieties by manufacturing health scares out of every new risk assessment conducted by health and safety authorities (see Renn 2006). History has thus generally shown that in plural societies there will always be critics on either side of any risk debate, even debates about the correct provision of risk communication. Therefore, sustained accusations of the kind above might arguably undermine the effectiveness of future communication efforts, but most especially if validated by the actions of the authorities concerned themselves.

To maintain the public's attention an organisation therefore needs to use, and be seen as using not only their own time and resources efficiently and effectively, but also the time and resources of those targeted by communications (Lofstedt 2005; Fischhoff 1998). In the first case it is important that authority initiatives reflect an efficient allocation of financial resources as people do not want to see taxpayers' money wasted or squandered on ineffective or inappropriate actions. At the same time the most efficient allocation of public spending as defined by economists (e.g. maximising aggregate net benefits and least net aggregate cost to society, or the number of lives saved by £1 million of monetary spending on 'x' activity verses the number of lives saved by £1 million monetary spending on 'y' activity) may not reflect public priorities for reasons other than economic efficiency, particularly with respect to how those initiatives directly affect individual choices and actions (Graham and Weiner 1995). Whereas it may be paramount to economists for the financial costs of a proposed action to be reasonably weighted against the degree of risk reduction, it may seem arbitrary or inappropriate to the public if decision makers rationalise actions such as whether to spend money protecting the environment versus saving lives according to how each activity may be valued in monetary terms. Public concerns expressed over such issues are likely to figure more acutely during times of economic hardship or depression, but should not be ignored at other times (Lofstedt 2005).

With respect to the second concern, health authorities must be seen to be using people's time efficiently. On the one hand this can be achieved by ensuring that communications are timely and provide the most decision relevant information as demanded sufficient to meet citizen's information needs as a particular risk situation evolves and people's thoughts and feelings of that situation evolve with it (Fischhoff 2006). Reporting well known facts or irrelevant ones whilst ignoring topics that people wish to understand better can be seen as wasting time by testing both the patience and concentration of the target audience (Fischhoff 1998). On the other hand official authorities need to be active listeners: misunderstanding or being perceived to be ignoring the concerns and wishes of others can alienate intended partners in communication. Some of the main tasks involved in providing and eliciting decision relevant information concisely and comprehensibly are subsequently the focus of the next section.

Summary Box 2. Credibility

- organisation is perceived to be competent and proficient
- decision processes and outcomes perceived to be fair and impartial
- resources for handling risk perceived to be allocated efficiently within the bounds of public priorities and values
- provide communications which are a timely and efficient use of recipient's time
- organisation is an active listener, sensitive to the concerns and wishes of communication partners

3.3 Delivering decision relevant information concisely and comprehensibly

Following Fischhoff (2006), a third fundamental principle of effective risk communication is to provide decision-relevant information, concisely and comprehensibly to support substantive improvements in understanding and decision making. One methodology that has been put forward as a way of ideally helping institutions to meet this objective is known as the 'mental models approach'. This approach involves rigorous analysis of the facts that citizens need to know in order to make the choices facing them, followed by empirical study of what they already know, and then the design, implementation and evaluation of communications to bridge critical gaps (see Bostrom et al 1992/3; Morgan et al. 2001). Many organisations responsible for improving the health and safety of citizens are often quite willing and able to determine what they conceive to be the facts that citizens most need to know where for example they have access to new risk assessment findings and scientific expertise. Unfortunately they equally often tend to have less an idea of how to communicate that information and are generally less likely to make the effort required to determine what people already know, let alone evaluate any achievements at bridging critical gaps in that knowledge (see Chess et al. 1995). By the same token, such organisations also often fail to see risk communication as a way to bridge critical gaps in their own knowledge leading to restricted opportunities for substantive improvements in decision making and understanding. Adopting what might be interpreted here as a roughly 'behaviourally realistic' view of public health and safety authorities, it seems that for whatever reason, be it available time,

resources, knowledge or motivation, organisational approaches to risk communication rarely seem to meet the prescriptive ideals suggested by the mental models approach.

Organisational risk communication is instead more commonly found to be formulated based on the intuitions of executive committees whose judgements are framed by personal experiences and sometimes supplemented by opinions, observations and findings derived from social scientific research published in academic journals or research reviews and technical appraisals such as the one presented here. This strong reliance on intuition to guide risk communication rather than a more formal assessment of public, expert and organisational knowledge and perceptions creates somewhat of a dilemma in formulating appropriate appraisal criteria for this review. On the one hand the protocols set out by the mental models approach are highly regarded in the academic community where it has been seen as setting the necessary pre-requisites for helping organisations to bridge critical knowledge between stakeholders and for developing and targeting health risk messages in a wide variety of settings. On the other hand, however, though it has been favoured by risk academics, the utilisation of the mental models approach is unfortunately seemingly not very widespread in government and business settings and as such does not yet constitute the 'industry standard' for organisational risk communication protocols. There is a concern in this review therefore that incorporating the prescriptive ideals of the mental models approach as appraisal criteria might constitute a behaviourally unrealistic benchmark against which to evaluate EFSA's risk communication activities. Furthermore, it might likely also constitute an unfair measure of the standard of practice adopted by EFSA when it is not one that is widely recognised or so commonly practised elsewhere by many other institutions or organisations fulfilling a similar role.

Therefore, whilst as reviewers we would strongly advocate adopting formal empirical protocols to help inform and guide risk communications such as those outlined by the mental models approach where resources are available, the limitations of setting this as a formal assessment criterion for this review are also recognised. Instead, a more moderate 'middle ground' approach has been adopted which tries to focus on the basic lessons that risk communication practitioners might find useful in their day-to-day work in the absence of mental models research, as indicated by previous work in this area. This is so as to maximise the utility of any insights that can be generated by the review by directing attention to where prescriptive advice would be most pertinent, applicable and practicable to ensure the conditions for substantively robust communications are met.

The remainder of this section therefore concentrates on outlining the kind of basic information and advice that previous research has indicated people might require of public health authorities when appropriately communicated to help make informed judgements and choices about food-related health risks. This information is considered here with the caveat that the risk communication field is an evolving area and so this is not meant to provide a definitive guide to practitioners. We also agree with Fischhoff (1990) that organisations need to be especially cautious about replacing empirical information that might be elicited through formal inquiry with analytical representations of people derived from academic fields such as psychology. The focus on providing information to potential recipients should also not distract from the role of risk communication as a mechanism for institutional learning in the

face of uncertainty, as emphasised in the section on opening up appropriate communication channels above.

Whilst basing risk communication decisions on understandings achieved through rigorous and objective social scientific research might be more preferable than say the more subjective bias of relying on anecdotal observations alone, academic research findings still need to be interpreted and contextualised with care. In fact there are many potential pitfalls awaiting those who draw prescriptive lessons directly from descriptive research findings, particularly when it comes to accounting for public perceptions of risk (MacDaniels 1998). To illustrate the case in point, there is some debate at present over the significance of recent research findings on judgement and decision making that has demonstrated that 'affect' and 'emotion' play a significant role in shaping the way that people perceive and respond to risk information (see Wardman 2006 for a recent discussion). The concern is that investigations into the emotional basis of how people may perceive risk may actually be taken to imply that people are 'irrational' or 'prone to panic' in response to risk information in any given situation. This belief could in turn then be used as justification for policy positions which lead to restrictions in the public provision of health risk information. This is a particular concern in light of claims made by some researchers that the issuing of risk communication by 'risk entrepreneurs' and government agencies alike can be blamed for eliciting undue fears and cohering public anxieties regardless of scientific perspectives on the actual basis for harm (see Burgess 2003 for example).

The grounds for these types of inferences need to be interpreted with care however. That is to say, general observations that people draw on emotion - or indeed deliberative analytical reasoning - to make risk judgements actually say little about what circumstances foster such responses and to what effect. In fact, the notion that risk information may induce irrationality or panic in individuals disproportionate to the actual context of risk exposure is contentious. Such assumptions appear to be rarely validated by descriptive research except in narrowly prescribed contexts even in extreme circumstances (see Sheppard et al 2006). Yet assuming otherwise without verifying the context in which such concerns are most applicable can and has in certain circumstances led public health officials to withhold vital information about risks deemed to be 'too sensitive' to potential recipients for fear of eliciting mass panic or public hysteria. In fact, purposely restricting the flow of information may by definition help to perpetuate risk communication vacuums. Such actions are actually in many circumstances more likely to promote anxiety, rumours and hearsay, whereas providing timely and accurate information can improve knowledge which in turn is more likely to help to promote coping and self-efficacy (Wessely 2005). Moreover, withholding information can be seen as adopting a paternalistic position which can ignore the wishes of those citizens concerned and therefore goes against the democratic normative imperatives for informed choice and discussion in risk debates highlighted above. Recent research conducted by Lerner et al. (2003) and Fischhoff et al. (2003) has illustrated strong public support for providing honest, accurate information even if that information was deemed likely to worry people. Communication vacuums are therefore best avoided wherever possible with the provision of reliable messages that can help people to make informed decisions about a particular risk.

In order for public health authorities to help people to make informed decisions, one task for risk communication is to foster individual understanding of the probability

and severity of the outcomes which might result from person's choosing or rejecting one option from a course of possible actions (Fischhoff 1998). Following Fischhoff (1999) 'understanding' here implies to have a certain level of cognitive control over the issues of importance which means for individuals not only to have access to relevant facts as presented to them, but also to be able to integrate these facts into what is already known about the topic. In the psychological risk literature this is referred to as integrating new information into existing 'mental models' or 'schemas' (see Morgan et al. 2000). Where people have well formulated beliefs about the expected outcomes of various actions in familiar decision contexts health and safety authorities may aid this process by communications that emphasize particular information or merely add single missing facts which once received are easily understood and translated into individual choices. On the other hand, in unfamiliar decision contexts people's stock beliefs may be poorly formulated in which case communications may need to provide more substantive information. For example, information may be needed to help broaden people's knowledge about what is happening, how and why something may be dangerous and under what conditions, whether there is a need to do something and if so what the options are (Fischhoff 1998). In some situations an organisation's stock knowledge may similarly benefit from communication exchanges with different stakeholders to elicit such information. Public health authorities are therefore well advised to determine the context for which each particular style of communication is needed.

Following Fischhoff (1998), helping people to understand the probability and severity of the risk in question may therefore require to show how different (risk) effects are interconnected. Health and safety authorities may also need to demonstrate the scientific basis for understanding how risk exposure may be harmful and to what extent by contextualising this information in both quantitative and qualitative terms. In the first instance this may mean highlighting the consequences of particular actions and explaining the mechanisms which underpin how they are related. In the second instance demonstrating the scientific basis for concern means that wherever possible numbers should be provided and explained. As Fischhoff (1998) observes, possibilities are not probabilities and if experts fail to report risk in quantitative terms then they leave people to guess what they might possibly mean by statements such as 'there is a small risk'. This is because what might be described verbally as a 'small' or 'large' risk by one person using one set of values or normative assumptions may not correspond very well to how another person understands or uses those terms for example. The utility of providing numbers is a point of contention in the risk field. In the past, simply providing or trying to explain risk with numbers has been dismissed as an ineffective form of communication. In fact, officials brandishing raw numerical data from the latest risk assessment have sometimes been criticised for presenting risks in obscure terms (see Fischhoff 1995). One reason for this criticism is that assuming that 'the numbers speak for themselves' can be taken as deliberate obfuscation of the facts rather than as being helpful which can serve to distance analysts from the public (Fischhoff 1995).

Another argument against the use of numbers has focused on the popular conception that people generally do not have an intuitively good basic grasp of numbers in any form at all. For example, Crouch and Wilson (1982) have admonished that no one is born with an intuitive understanding of 'one in a million' and that people only acquire such understanding through the use of comparisons. In an attempt to tell people what they mean by the numbers risk communication officials have thus been known to try

to make use of risk comparisons and analogies, but the use of such comparisons has in many instances been known to badly backfire (Bostrom 2006; Johnson 2003; Roth et al. 1990). Surprisingly relatively little research has been undertaken to try to understand how risk comparisons might be best used appropriately to aid successful risk communication, and to date the findings are decidedly mixed (see Bostrom 2008 for a recent review). One conclusion of such work is that the use of good risk comparisons and analogies can help to simplify communication and improve learning and experience, but that they need to be adopted with caution. Konheim (1988) amongst others has forewarned that comparing the calculated risks of one activity with another runs the risk of being perceived to trivialise people's concerns. A common example given in this instance would be to compare the risks of cancer from one activity with the risks of consuming "30 diet sodas" or "40 table spoons of peanut butter over a lifetime". Even if risk comparisons are utilised carefully so as not to oversimplify or trivialise the risk of concern, the potential success brought about by structurally aligning unfamiliar risks with more familiar risks can it seems still be undone because comparisons may also make salient the differences between risks as well as their similarities (Bostrom 2008).

The fact that current risk communication research indicates the 'jury is out' over the use of risk comparisons reiterates a concern for the need to make quantitative information available where it is practicable. People may not have a precise feeling for exact numbers however large or small, but many may still have a grasp of what basic numerical values might mean. For instance, whilst some may not, many people may have generally learned over time some intuition about what a certain probability or percentage chance of an occurrence might mean to them for example (Fischhoff 1998). For many people this can arise through their time in formative and secondary education and in the workplace and even in their day-to-day activities from viewing weather forecasts to playing games of chance for example. These forms of numeracy may not be directly applicable to understanding risk estimates, but quantitative information (e.g. how probable the likelihood of exposure and the degree of harm within a population resulting from exposure a particular risk presents numerically speaking) can be helpful because it offers one of very few means by which to give people a common denominator for judging risks. This is not to say that verbal qualifiers are not generally seen to be helpful, but they also have their own limits. Qualitative terms used to describe risks and actions taken to mitigate against potential hazards such as 'tolerable' and 'precaution' are especially value laden and hence open to (mis)interpretation because normative assumptions underpin their usage and understanding. In other words, as with 'small' and 'large' what might constitute a 'tolerable' risk or a 'precautionary' risk response to one person utilising one set of normative values may not apply or correspond very well to how risks and actions taken to mitigate them might be interpreted or valued by another person utilising a different set of normative criteria. The use of these terms therefore also needs to be elaborated upon in risk communications so that people may understand how or why they have been used and what they mean to the person using them in a particular context.

Information about how to control risk can also make information seem more salient and relevant by giving people a motive or incentive to entertain communications (Bostrom 2003). Effective decision making about risk involves not only a basic understanding of exposure and effects, it all requires concepts of how personal actions may help to increase or mitigate risk so as to be able to assess the threat of a potential hazard as well as possible responses and implications for self-efficacy (see Bostrom

2003). Fischhoff (2006) has forewarned, however, that providing confident guidance without strong evidence so that people have a sense of control can in some cases be misleading and damaging. In providing responsible communications authorities therefore ought to be candid about what is known, the quality of information being provided and significant uncertainties should be fully acknowledged. If there is conflict or ambiguity among stakeholders then information concerning the social context of communications may also need to be acknowledged along with how communications are attempting to meet expressed concerns so as not to give the impression that legitimate questions are being purposefully ignored. One final piece of practical advice that has been found to be useful is that central messages and key advice should be given at the beginning of communications and summarised at the end so as to help ‘signpost’ whether they are relevant to individuals concerned and to make salient the information deemed to be most important to making decisions (see OECD 2002). It is also helpful to provide directions to where concerned or interested parties can find supplementary materials and advice if required.

Summary Box 3. Delivering decision relevant information concisely and comprehensively

- determine the communication context
- Engaged in practices which help determine and foster understanding of the facts that stakeholders, citizens and the organisation itself most need to know
- when designing communications:
 - give the central message at the beginning
 - include both quantitative and qualitative information where possible
 - provide supplementary information including about significant risk-risk tradeoffs and substitutions as well as risk-benefit tradeoffs
 - issue behavioural advice and guidance about what might be done to enhance self-efficacy
 - highlight the risk management actions undertaken by the relevant actors to mitigate the risk
 - acknowledge the quality of information behind advice including any important uncertainties and the organisation’s policy position in that regard for example
 - be cautious of inappropriate use of risk comparisons
 - contextualise the use of qualitative risk management terms such as ‘precautionary’ and ‘tolerable’ and other technical jargon
 - explain the social context for providing advice especially where there may be ambiguity in social risk discourses (e.g. are communications wishing to raise new concerns or to address concerns that have been raised elsewhere)
 - summarise key messages and advice given
 - provide directions to where supplementary information can be found

4. EFSA's approach to food risk communication

In its role as an objective advisory on food safety issues EFSA is mandated to act on its own initiative, whilst working in close collaboration with the European Commission and EU Member States, to ensure that the public and interested parties receive coherent, rapid, reliable, objective and comprehensible information. EFSA is ultimately responsible to the EU risk managers (European Commission, Member States and the European Parliament) but the Authority's communications on food and feed safety issues are aimed towards all interested parties and stakeholders and the general public at large. It is hoped that by providing risk managers with independent scientific risk assessments of the highest quality and disseminating such advice through effective risk communications that this will help to build public confidence in the risk assessment process and food safety in the EU. More specifically, EFSA's objectives in the area of risk communication are to establish trust in the Authority as a reputable organisation dedicated to the core values of independence, openness, transparency and scientific excellence, to ensure that messages are relevant, understandable and address food safety concerns, and to enhance the coherence of information on food safety matters across the European Community. Within this remit EFSA has the following overall strategy (EFSA 2006):

- to understand consumer and public perception of food risk and risks associated with the food chain
- bridge the gap between science and the consumer for example by translating science and explaining and contextualising risk
- harness the support of key actors, such as national safety authorities, consumer associations and other NGOs as well as industry, in order to reach consumers with pertinent and effective messages
- promote coherent and consistent risk communications across the Risk Assessment/Risk Management interface through close co-ordination with the European Commission and national actors for example

Whilst striving to meet these objectives EFSA recognises that it is neither possible nor necessarily desirable to seek to address the diverse and multiple information needs of consumers in Member States through a single and unique message disseminated across Europe. EFSA has as such prioritised "influencing the influencers", that is actors who regularly engage in consumer communications, with the information they require and with messages which can be further tailored and adapted to meet specific audience needs. So for example this would include national food safety authorities in Member States as a key target along with other stakeholder groups. EFSA also recognises the media as an important conduit for reaching these groups as well as a broader audience with more targeted messages. Although the scientific advice provided by EFSA is mainly of a technical nature all of EFSA's Scientific Committee and Panel opinions and other communications are available to the public at large, notably through EFSA website. As such EFSA has also made it a priority, whilst not being able to cater to all information needs, to make communications understandable and meaningful to non-scientists within a broader public audience and relevant to those with an interest in EFSA's work and the informed lay person.

EFSA's mandate limits the Authority's role to risk assessment with no responsibility for the actual risk management practices implemented at the EU and National Member State level. EFSA may however, in addition also communicate scientific

appraisals of possible risk management options under its own initiative and if requested, which may be taken into consideration by the competent authorities responsible for making a risk management decision. EFSA also makes use of formal Advisory and Stakeholder forums, which allow the Authority to consult stakeholders such as non-institutional bodies, industry, NGOs and consumer groups, but without providing an opportunity for undue leverage of the Authority. The Authority also circulates press releases and official Scientific Committee and Expert Panel Opinions under embargo to stakeholders who might be concerned directly by a public announcement prior to their official publication date to help in outreach to their members thus allowing these stakeholders to be informed before the Authority goes to press with its scientific findings or opinions.

Having briefly outlined EFSA's general approach to organisational risk communication this review now turns specifically to the risk communication activities undertaken by EFSA in relation to the four case studies selected. An outline of the particulars of each case is provided along with a summary of EFSA's respective risk communication activities and subsequent media coverage. These accounts draw largely on primary and secondary source materials provided by EFSA concerning their communication activities such as press releases, expert Panel Opinions, external presentations and internal media reviews, as well as supplementary information publicly available from EFSA's website and accounts of these issues provided in the news media and in stakeholder communications.

4.1. The discovery of BSE in goats

In late October 2004, French authorities and the European Commission informed the European public of a suspected case of Bovine Spongiform Encephalopathy (BSE) identified in a goat in France. The European Commission immediately forwarded the data received from French authorities to the Community Reference Laboratory (CRL) so that experts could evaluate whether these new findings indicated the presence of BSE in a goat. The European Commission also requested that in the light of these new events EFSA provide advice on the safety of milk and meat in relation to TSE (Transmissible Spongiform Encephalopathy) in goats. Recognising the need to give immediate advice to consumers in light of this suspected case of BSE in a goat, EFSA issued preliminary advice on the health risks of goat milk and derived products on the basis of existing information. In a press release regarding a statement of the BSE/TSE Working Group of EFSA's Biological Hazards Panel (BIOHAZ), EFSA stated that "goat milk and goat milk products sourced from healthy animals, and irrespective of their geographical origin, are unlikely to present any risk of TSE contamination". At the same time, EFSA made clear that more data were required to assess possible risks associated with goat meat and to undertake a comprehensive quantitative risk assessment of possible risks associated with the consumption of goat meat and milk.

Later in January 2005 a case of BSE found in a goat was confirmed by the Community Reference Laboratory. In an announcement on the 28th January 2005, Markos Kypriano, the EU Commissioner responsible for Health and Consumer Protection at that time said:

"I want to reassure consumers that existing safety measures in the EU offer a very high level of protection. This case was discovered thanks to the EU testing system in place in France. The testing programme has shown us that there is a very low

incidence rate of TSEs in goats and allowed us to detect suspect animals so that they can be taken out of the food chain, as was done with this goat and its entire herd. I am proposing to extend testing further to determine whether this is an isolated incident.”

The Commission extended surveillance of the goat population in the EU with respect to TSEs including discriminatory testing to differentiate between BSE and other TSEs in sheep and goats. EFSA provided an update on its plans to assess the safety of goat meat and goat meat products with respect to BSE/TSE. In a press release on 27th January 2005 EFSA announced that in line with previous advice milk sourced from clinically healthy animals was unlikely to present any risk of TSE contamination, but recognised that important information gaps remained to be filled in order to be able to deliver a quantitative risk assessment with regards to consumption of goat meat and goat meat products, which was expected to be completed by July 2005.

When the case of BSE was confirmed in January 2005 it received significant media coverage in Europe and worldwide totalling 42 articles recorded by EFSA from all accessed sources. National media coverage in Europe was highest in France (12 articles), followed by Italy (5 articles), the UK (3 articles), Germany (2 articles), and Spain (1 article) respectively. The majority of these articles based their information on the details distributed from DG Sanco of the European Commission whilst 40% of the articles collected referred to EFSA and clarified the position that further scientific research was necessary. At the time EFSA also received a small number of phone and email enquiries concerning what was perceived by a few journalists to be a discrepancy between the statements issued by the Commission and EFSA. It seems that in this correspondence some felt that the reassurances given by the Commission that consumers should carry on eating goat meat were perhaps too reassuring based on a perception that EFSA was saying there was not enough information to draw such a conclusion and more data and further testing was required. This apparent confusion needed clarification that the Commission was not in fact suggesting that there was no risk as there is no ‘zero risk’ as such, and that the Commission was upholding its position to act as a responsible risk manager on this issue.

On 28 June 2005 EFSA published a press release and organized a press briefing to provide an update on the risk assessment by the BOHAZ Panel of the safety of goat meat and goat meat products with regard to BSE. Whilst highlighting that important information gaps remained, EFSA stated that “the likely prevalence of BSE in the wider EU goat population is very low” and that “the current risk in terms of BSE, related to the consumption of goat meat and their products is considered at this time to be small”. The amount of media coverage this time was lower, EFSA recorded 31 published articles in total following the June press release with all but two articles quoting the EFSA press release or comments made by EFSA members at the press briefing. The majority of articles reporting on the EFSA opinion reiterated EFSA’s position that the prevalence of BSE in the EU goat population was “very low” and that risk to human health related to the consumption of goat meat was considered to be “small” at that time, but that further scientific research would be undertaken as necessary.

In their communications EFSA had hoped to convey a balanced message that the risk was perceived by experts as being low and that appropriate measures were in place to manage the risk (e.g. increased surveillance), but that this included a need to continue to monitor and research the issue. EFSA aimed to be transparent and proactive in their

communications approach which involved keeping the public informed at each stage and to outline areas of uncertainty and knowledge gaps so that stakeholders, the media and the public could understand the scale of the risk and what public authorities were doing about it. EFSA felt that this was aided by adopting consistent and co-ordinated communications with the key actors involved – EFSA, the European Commission, the Community Reference Laboratory (responsible for verifying the case of suspected BSE) and the French authorities. The challenge was seen as being able to communicate to the media on EFSA’s findings regarding the results of the Authority’s risk assessment in a balanced and measured way proportionate to the actual risk so as to inform the public sufficiently and transparently without causing undue concern or over reaction. Following the absence of negative news stories and messages of alarm it was felt that EFSA was seen as reassuring and as such that the key messages contained in the announcement helped to ensure that communications did not trigger an alarm. Taken all together EFSA believed that their efforts and co-ordination with other public authorities constituted a communications strategy that helped to reassure the public that the situation was under control and managed in the public interest and thus averted what they believed might otherwise have turned out to be an unnecessary or disproportionate alarm or public panic.

4.2. The safety of wild and farmed fish

In January 2004 the journal *Science* published a research article by Hites et al. which asserted that farmed salmon was more hazardous than wild salmon and that European salmon was significantly more hazardous than North and South American salmon. Moreover, the authors also claimed that the results of the study (which was thought by the authors to be the only rigorous risk assessment of the potential human health risks of farmed salmon consumption) confirmed that consumption of farmed Atlantic salmon may pose health risks that detract from the beneficial effects of fish consumption (Hites et al. 2004). Although there had previously been some concerns in Europe with regards to the safety of fish from the Baltic sea for example, and for which previous dietary advice to consumers had been issued by national health authorities, this new research triggered heightened concerns in the popular media and in a small number of scientific publications that levels of compounds such as dioxins and heavy metals such as mercury in fish represented a human health hazard even at existing levels of consumption. Following these concerns the European Parliament requested EFSA to conduct a scientific assessment of the health risks related to human consumption of wild and farmed fish marketed in the European Union focussing on the presence and adverse effects of persistent organochlorine pollutants (POPs) and other contaminants for which analytical data existed and on the methodologies for setting safety limits.

On 18th March 2004 EFSA published an opinion regarding the possible risks to human health associated with the consumption of mercury, notably in fish principally in the form of methylmercury, along with a press release in which ‘precautionary advice’ was given to ‘vulnerable groups’ namely children and women of child bearing age. EFSA’s Scientific Panel on Contaminants in the Food Chain (CONTAM) also advised further dietary studies to be undertaken in vulnerable groups where specific intake data was lacking but it was thought that provisional tolerable weekly intake levels by European consumers may at times be close to limits set by the US NRC and those established by the Joint FAO/WHO Expert Committee on Food Additives. EFSA endorsed precautionary advice by national food safety authorities and

recommended that those vulnerable groups identified in particular select fish from a wide range of species without giving undue preference to large predatory fish such as swordfish and tuna likely to contain higher levels of methylmercury. EFSA also advised that additional dietary advice to consumers could also be sought from national food authorities in EU Member States.

After further research, on 5th July 2005 EFSA published another opinion on the health risks related to the consumption of wild and farmed fish, this time asserting that there were no differences between the two in terms of safety and nutritional value. EFSA at this time also iterated the nutritional value of consuming fish rich in long chain n-3 polyunsaturated fatty acids as beneficial to cardiovascular health and to foetal development which should therefore be weighted against potential risks. Nutritional dietary guidelines were issued suggesting weekly fish consumption of one to two portions per week would not lead to intakes of dioxins and dioxin-like PCBs which cause safety concerns except for fatty fish caught in the Baltic whilst taking intakes from other sources into account. EFSA recommended in accordance with previous advice in March 2004 with respect to methylmercury that women eating up to two portions of fish per week were unlikely to exceed tolerable intake levels provided certain types of predatory fish were avoided. Supplementary guidance on appropriate dietary consumption of fish was also provided by national food safety authorities in EU Member States.

Furthermore, EFSA stated that evidence showed there were no consistent differences in the nutrient and contamination levels of wild and farmed fish contrary to previous research (e.g. Hites et al. 2004) which had not taken into account the broad variability of factors that affect levels of contaminants in fish. As such EFSA advised that fish, whether farmed or wild in Europe had a place in a well balanced diet with respect to their safety for the consumer notwithstanding the exception of consuming fish from the Baltic Sea. In addition to the press releases and published opinions, EFSA also made available extended background and supplementary information to support their communications on this issue including a 'frequently asked questions' document. Press coverage recorded by EFSA following this press release was relatively much lower than for the other case studies with only 10 articles, the highest number was in Spain (5 articles), followed by France (2 articles) the UK (1 article), Germany (1 article) and Italy (1 article). These articles were generally factual and proportionate and based primarily upon the EFSA press release.

4.3. The discovery of semicarbazide in baby food

In July 2003, EFSA was informed by the food industry about the possible presence of the chemical substance semicarbazide (SEM) in certain foodstuffs packed in glass jars with metal lids sealed with plastic (PVC) gaskets. The discovery was made during routine analytical monitoring carried out by food manufacturers. Semicarbazide was not intentionally added during food production, rather it was a breakdown product of azodicarbonamide that had migrated from sealing gaskets used in the metal lids of glass jars and so its formation could not have been reasonably anticipated. The presence of semicarbazide was therefore not linked to a particular foodstuff, but more specifically to the type of packaging utilised for a range of products. These products included fruit juices, jams and conserves, honey, ketchup, pickles and sterilized vegetables, mayonnaise, mustard and sauces, and most notably baby food fed to

millions of children by their parents or other guardians daily. Upon receiving this information, EFSA convened an ad hoc expert group meeting of EFSA's Scientific Panel on Food Additives, Flavourings, Food Processing Aids and Materials in Contact with Food (AFC) on 24th July 2003 in order to review available data and scientific information. Semicarbazide was thought to be carcinogenic, possibly genotoxic (i.e. with the potential of damaging the genetic material of cells or DNA), and a significant level of scientific uncertainty remained regarding both levels of human exposure and the possible health implications. The group determined that it was not possible to provide a scientifically based risk assessment at the time, but drafted a report giving preliminary advice on the occurrence of semicarbazide in foods which was made available to the public on 28th July 2003. In a press release issued on that day, EFSA announced the publication of the preliminary advice of the ad hoc expert group that the discovery of semicarbazide had been made but that the conclusion of the Expert Group was that in view of the uncertainties in both the analytical and toxicological aspects it would be premature to give risk assessment advice given that further research was planned and underway. EFSA made clear that it was the Authority's intent to initiate its own short term genotoxicity studies in order to address gaps in data required to carry out a risk assessment. EFSA also advised that further information would be provided to the public following review of these future findings by scientific experts.

Following the receipt of the new research findings, as well as further data provided by industry, a second meeting of the AFC Panel was convened over 30th September and 1st October 2003 in order to review the new scientific evidence that had been made available. However, during that meeting EFSA determined that before issuing the risk assessment on semicarbazide in foods, further issues might also need to be considered particularly with regard to baby food (discussed below). Another meeting was held on 9th October in order to bring together a broader range of scientific experts such as toxicologists, specialists in microbiology and paediatric nutrition along with experts from the AFC Panel as well as the Panels on Contaminants in the Food Chain (CONTAM) and the Panel on Dietetic Products, Nutrition and Allergies (NDA). In agreement with the European Commission, EFSA's scientific experts undertook to provide advice regarding various risk management options. The implications of semicarbazide in baby food were discussed taking into account nutritional and microbiological considerations. In evaluating the different options to manage this potential risk, other substitution dangers were also considered. For instance it was thought possible that there might be nutritional concerns should suitable alternatives not readily be found by mothers wishing to discontinue using these foods. Other methods of producing baby food including the making and storing of food at home under less hygienic conditions were also thought to pose a potential health threat for young babies. The hasty replacement by industry of sealing gaskets which might not confer the same microbiological protection was also considered as possibly exposing babies to a greater health risk than the potential risk associated with exposure to semicarbazide.

Following this expert consultation, an update on semicarbazide in foods and its implications for human health was communicated by EFSA to the public on 15th October 2003. In the announcement the outcome of EFSA's risk assessment on semicarbazide in foods was made known, but EFSA also went beyond providing a scientific statement by including advice to consumers. As semicarbazide was in the food supply and could not be immediately removed EFSA perceived a need for their

risk communications to address the implications of the risk assessment for consumers as well as stakeholders and risk managers. In particular EFSA felt it was necessary to include both dietary advice for consumers and risk reduction advice to the Commission relative to manufacturing practices such that the levels of semicarbazide found in foods packed in glass jars be reduced as swiftly as technological progress would allow. The key message contained in the press release issued by EFSA on 15th October 2003 was: “No reason to change current dietary habits including for babies. Precautionary action by industry recommended for baby foods”. EFSA chose to hold a press briefing on this topic, with the participation of the Chair of the AFC Panel, Dr. Sue Barlow, in order to communicate the findings, answer questions from media and facilitate understanding of the outcome of the risk assessment and its implications.

Regional coverage of EFSA’s semicarbazide announcement was relatively widespread and generated 87 media articles worldwide recorded by EFSA in October 2003. However, it is interesting to note that there were some large regional differences in the coverage of this issue. Media coverage was highest in the UK (33 articles), but considerably lower elsewhere in Europe with Spain (5 articles), followed by France (3 articles), and Germany (2 articles). It has been noted elsewhere of the UK press coverage that although the content of articles was generally factual, balanced and reassuring that the headlines used to break the story were more alarming such as “Baby food jars in cancer toxin scare” (Motarjemi and Mortimore 2005). Furthermore, research conducted on behalf of the UK Food Standards Agency (FSA) has suggested that the communications issued by the FSA were different in tone to those of EFSA (Bailey 2007). In particular, it was suggested that whilst communications by the FSA were not recommending that parents should be concerned this message was qualified with the view that it would be understandable if they were and may therefore have undermined the primary message. This approach was viewed particularly by the food industry as having led the consumer, rather than merely presenting the facts and letting them decide for themselves. Secondary communications messages by EFSA were by comparison seen to be more concerned with the relative risks of semicarbazide and the possible microbial contamination that might occur with other forms of food packaging. Whilst the communications by EFSA and the FSA were not significantly different in substantive content, it may be possible that the UK media picked up on the difference in tone which was perceived to have been implicit in the framing of FSA messages. However, it should also be acknowledged that the FSA was responding to what it perceived to be the communication requirements of the British public following some small empirical research and so communications were deemed to be focussed on meeting a demand for supplementary information and taking consumer concerns seriously.

In conclusion EFSA felt that overall there had been a relatively small amount of media coverage across Europe for what might potentially have been a much more controversial risk issue. It was believed that although there were some notable exceptions, the content and tone of media coverage was relatively well measured and proportionate and that EFSA’s communications strategy had been successful in raising awareness without generating undue panic or alarm.

4.4. The risk of genetically modified organisms in the food chain

From the mid-1980s onwards, regulation of GM crops in Europe has been primarily associated with the invocation of the ‘precautionary principle’ following early Directives from the European Commission which upheld that preventative action should be undertaken to control potential risks to public health and the environment by requiring risk assessments for regulatory approval prior to the release of GM crops and products (see Rogers 2004 for a review). At a very early stage regulators took the view that a precautionary strategy was needed in response to the perceived failures of a reactive regulatory system for controlling pesticides in agriculture, and that by adopting precaution-based regulation this would help to allay public fears about GM technology and smooth the path of new products to the market (Tait 2001). A concern for precaution by several EU Member States has also been cited as having led to a *de facto* moratorium on the authorisation for growing or commercial release of GM crops in Europe in 1999 (Rogers 2004). Yet, in spite of the relatively stringent approach to the introduction of GM crops and food products (when contrasted with the US and elsewhere for example), it is commonly regarded that European citizen’s stance on GMOs has become increasingly negative. Indeed, the potential introduction of GM crops and food products in Europe has become generally less well received over the past two decades. Public opinion surveys have on various occasions shown that there is relatively little public faith in the virtues of GM food crops and products and significant doubt that any associated risks will be managed competently (Poortinga and Pidgeon 2003; Gaskell et al. 2003), although there is some variability in public perceptions within and between populations (Hohl and Gaskell 2008).

Set against a highly politicised and value-laden backdrop EFSA has come to occupy a pivotal role in the approval of GM technology for commercial use in food and agriculture. Before GMOs can be legislated for import, cultivation and food or feed use in the European Union they have to pass a safety assessment requested by the European Commission and Member States. EFSA’s role in these respects is to provide independent scientific advice to European Union Institutions and Member States on the risks for human and animal health and the environment. This advice is then taken into account by the requesting legislating body when giving or refusing approval for the use of GMO products. As of 12th March 2008 EFSA had issued 42 opinions on the safety of GMOs, and out of the 166 total press releases made by EFSA on all issues by that time 27 were specifically GMO related. In conducting this review it was not feasible to present a detailed case analysis on the communications surrounding each of the individual GMO opinions. Instead the analysis provides an overview of EFSA’s risk communication activities in relation to GMOs more generally.

Communications by EFSA over this time related to a number of specific issues. These included: the publication of opinions by EFSA on the safety of GM crops and food products at the request of the Commission; the opening of public consultations on the risk assessment of GMOs; responses to external criticism by Friends of the Earth (FOE); GMO technology guidance documents; the re-appraisal and reassertion of Scientific Panel Opinions in light of Member State challenges and reports; and the strengthening of cooperation and dialogue between EFSA and EU Member States on the GMO issue. Additionally, included within EFSA’s press releases the Authority made 5 ‘press statements’ on GMO related issues. This number is comparatively high as by this point only 8 press statements had been made by EFSA in all other areas. Therefore, it is clear that of all the potential food risk related issues that occupy

EFSA's time and attention the proportion taken up by GMO concerns is notably significant. This relatively high level of activity for the most part reflects the volume of opinions requested by the European Commission on the safety of applications of GM technology, but it also evidently reflects a number of social and political concerns underpinning the social acceptance of GMOs in European Union Member States following intense stakeholder interest in this issue.

During this time a number of challenges were made by NGOs and European Union Member States to the approval of GM food, feed and crops following risk assessments undertaken by EFSA which declared that they were in fact safe. For example, the safety of several GMO products was questioned by Member States such as Austria and Hungary following internal reviews which led to the imposition of restrictions on GMO import and use by those nations concerned. This was despite the fact that the safety of the GM products in question had undergone prior assessment by EFSA and found to be safe. EFSA was subsequently called upon by the Commission on several occasions to reassess the safety of the GMO products concerned in light of Member State appraisals and to determine if any further information had come to light to question the Scientific Panel Opinions previously issued. EFSA did not find sufficient cause to change its prior assessments in each case, but in the event EFSA was accused by NGOs of not having taken certain scientific issues into consideration and these instances of contestation were particularly newsworthy events and received much coverage in the media. The Commission also subsequently made several proposals to improve the scientific consistency and transparency for decisions on GMOs and develop consensus between all interested parties thereby requiring EFSA to more fully justify its scientific advice (EC 2006).

In response to these concerns EFSA has since embarked upon a number of consultative programmes and initiatives, but at this time whether these efforts will in part help to ameliorate concerns remains to be seen. Certainly, NGOs such as Greenpeace and Friends of the Earth have remained critical of EFSA's opinions on the safety of GMOs. Furthermore, the Authority has received criticism from academics such as Levidow and Carr (2007) and van Asselt and Vos (2008) for narrowing the scope of expertise and opinion in GMO risk assessment and its impact on subsequent risk management options up until 2006. What is clear is that for many early opinions and press releases in the early stages the rationales and understandings that informed EFSA's risk assessments and the Authority's subsequent communication on these issues were not fully explicated. EFSA's communications strategy also appears to have been reactive for the most part, with the Authority in several instances often having to respond to criticism rather than taking a proactive approach to addressing possible concerns. However, whereas earlier opportunities for consultation and comment had focussed on technical questions and issues such as risk assessment methodology and procedure, much more progress has since been made as later efforts have are characterised by a more active attempt by EFSA to better engage with NGOs, stakeholders and Member States and their concerns about these issues.³

³ However, it should be noted that as of 2009 the GMO debate rumbles on.

5. Analysis

5.1. EFSA's creation of risk communication channels

Adopting a policy of openness and transparency has been an appropriate strategy for EFSA. Being frank and upfront about the potential food risks and related uncertainties at each stage for example in the cases of BSE in goats and semicarbazide in foods has helped to keep stakeholders and consumers informed and up to date not only with regard to the status of the potential risks in each case, but also with what progress has been made by EFSA and any actions undertaken by the Authority along with other stakeholders to help mitigate against any potential harms to human health. These two food risk issues in particular were rightly considered to be potentially highly sensitive to consumers, especially given the recent history of the BSE scandal in Europe with regard to the goat case and the heightened sensitivity of potential cancer risks to children in relation to the semicarbazide case, which could make both cases especially newsworthy.

If we employ a hypothetical counterfactual analysis whereby EFSA had been perceived to have ignored or underplayed the importance of the discovery of BSE in goats or failed to report on the discovery of semicarbazide in baby food, then this would seem likely to have generated the impression that lessons had not been learned from the previous food scandals such as the BSE crisis. This might have then led to media amplification of the risks irrespective of scientific findings and official guidance and advice by EFSA. Such an eventuality would likely have been an early major setback to EFSA in its ambition to become seen as a reliable and trusted source of information about food risks. Instead, following EFSA's proactive approach a well tempered response was observed for the most part in both cases in that initial media coverage was reasonably high and widespread, but content was relatively measured in tone and coverage subsided reasonably quickly afterwards in each case. In the event, this was likely helped by the openness and responsiveness displayed by EFSA's communication activities at the time. EFSA provided a platform for the press to ascertain the status of these risks and ask questions to clarify any further uncertainties. A similar approach was adopted with regards to the safety of wild and farmed fish and the collaboration between all the stakeholders including EFSA, the European Commission, national health authorities and various others is commendable in these three cases and attempting to promote an informed social discourse about these risk issues. For example, it is also noted that EFSA recognised and acknowledged the potential for 'risk substitutes' (or 'risk-risk' tradeoffs) possibly arising from adopting precautionary measures in their communications and this concern was taken up by national food agencies.

However, the concern for opening appropriate risk communication channels does to some extent raise the question as to what point EFSA's responsibility for the communications produced by the Authority begin and end in relation to consumers. Whilst EFSA has worked to provide stakeholders such as national food safety authorities with the information they might need allowing them to address the cultural and national specific requirements of communications, there may well also be a need to further examine and clarify EFSA's role in targeting specific groups and the Authority's success in doing so. EFSA's present risk communication strategy in many instances adopts carefully prepared communications focussing on 'influencing the influencers' (e.g. consumer groups and the press) along with providing supplementary

information either through press conference question and answer sessions or further written materials on EFSA's website. This is sometimes an efficient way of raising awareness amongst many of the general public if well managed, but to get messages across to specific groups risk communications may need to be repeated on a number of occasions and on a number of different platforms to ensure that information is effectively disseminated and people are adequately informed. As iterated in the recent Special Eurobarometer report on "Risk Issues" (2006), risk communication often needs to be specifically targeted to be most effective. To this end EFSA's strategic approach currently places a primary responsibility on national health authorities and the news media to communicate possible risks across the EU. However, the communication requirements identified by national food health and safety authorities and the new media may diverge from those of EFSA as well as from one another. Any such divergences may therefore lead to different framings of risk issues and varying types of national response including the absence of national level communications. Message inconsistency may therefore not necessarily reflect a failure in the communications of EFSA as such, but rather that there are necessarily nuances in the ways different national authorities identify particular risk communication needs within their populaces as seen in the semicarbazide case for example. EFSA cannot take full responsibility either for national authority communications based on EFSA's opinions and press releases or indeed the uptake of risk communications by consumers across the EU, but it should make available information to consumers as and when required. To this end EFSA's website plays a vital role in allowing the public to be informed where and whenever necessary and it may be useful to conduct some survey work to examine whom uses the website, in what circumstances and how they appraise website information.

The issue of GMOs is noted for presenting a rather different series of communication challenges for EFSA. The development and use of GMOs in food and food production has notably been the subject of a long running controversy between a host of different stakeholders holding diverging scientific, cultural and political beliefs, opinions and concerns about their acceptability for commercial environmental use and public consumption (see for example Tait 2003). Attempts by EFSA to communicate scientific opinion on the safety of GMOs have therefore subsequently been made against this highly politicised backdrop of social discourse, debate and socio-political ambiguity and have as such been the subject of some public criticism by certain stakeholders (see below). Part of the challenge for EFSA in these regards has been to determine how to engage with these different stakeholders given the political aspects of those social tensions over GMOs. The Authority has within its remit operated on the basis of independence and transparency, but initially EFSA engaged only in informal interactions and exchanges with many stakeholders though this was not publicly documented in any great detail. Although EFSA has always been open to feedback, particularly through the public consultations, the avenues for input have tended to be restricted primarily to scientific matters. Only relatively recently in 2006, following a raft of public criticism from NGOs, notably Friends of the Earth (FOE) and Greenpeace, as well as concern in the Commission EFSA embarked on a well publicised formal consultation process instigating a broad social dialogue on GMOs, not only with NGOs, but also the European Commission and EU Member States. In retrospect, EFSA might have advisably instigated a formal public dialogue with some of these other stakeholders much earlier. Instead, in this case a reactive communication strategy seems to have been employed which may have created the impression that EFSA was in effect backed into a corner to meet with NGOs

following vociferous criticism rather than being a willing partner from start. The initial opportunities for feedback and input may not have therefore provided adequate scope to elicit and address some of the issues that culminated in such strong complaints later on in the process. Whatever truth there may be to that perception, as EFSA is now engaging more proactively with stakeholders this is to be acknowledged and commended as a positive activity for the Authority. Given the political constraints EFSA's present course of action with regard to formally meeting with NGOs is an appropriate response, but EFSA should recognise that this action is unlikely to address all stakeholders' concerns about the risk management or approval for use of GMOs in Europe more generally.

5.2. Stakeholder representations of EFSA's credibility

In general, the findings derived from this study suggest that the competence and proficiency of EFSA have not been brought specifically into question for any of the cases studied except with regard to GMOs. This also seems to be reflected in the respective media coverage for each case, which generally remained factual and representative of EFSA's advice when reporting on the risks of BSE in goats, semicarbazide and SWAFF. The safety of GMOs however, is an issue that has been singled out by NGO's for greater treatment as part of a vigorous anti-GMO campaign throughout Europe. In this regard EFSA has been accused of failing to provide adequate risk assessments of GMOs and being unable to redress or sufficiently follow up scientific concerns and uncertainties that have been raised by different stakeholders in relation to several of EFSA's official opinions (see Box 4). The main protagonists of this criticism were Friends of the Earth (FOE) and Greenpeace.

Box 4. Example stakeholder quotes questioning the competence and proficiency of EFSA

"...The EFSA failed to fully investigate unexpected sequences discovered in the genome after modification. Research shows that such sequences shut down neighbouring genes. The EFSA ignored guidance on allergy testing that EU scientists produced in 2003 which would lead to more thorough testing." FOE February 17th 2004

"EFSA: Failing Consumers and the Environment"

"The creation of EFSA has not improved the regulation of GE crops. The criticisms made of old legislation, before the EFSA was set up, are still valid. The data is often of poor quality and where differences and irregularities have been found, these have not been followed up sufficiently. There is no consideration of high quality data where any departures from substantial equivalence are investigated thoroughly...For now the EFSA, has most certainly not contributed to a high level of consumer and environmental protection from GE crops and foodstuffs."

"...EFSA evaluations are unsatisfactory and open to the same criticisms as the old evaluation process. GMOs are being approved despite crucial data being missing, an awareness of technical failures concerning the transferred gene sequences and evidence of technical failures...The inadequacy of EFSA evaluation procedures is confirmed by revelations published in "LeMonde" today...it is of deep concern that EFSA does not seem to be contributing to a higher standard of GMO risk assessment"
Greenpeace April 23rd 2004

Where other stakeholders did question the credibility of EFSA this was with regard to issues of fairness, impartiality and efficiency more generally. For example, BEUC expressed notable concerns about the composition of EFSA's management board and the undue influence of EU Member States along with a petition for risk assessment to remain divorced from risk management. In conjunction to these concerns Greenpeace

and FOE have complained that the scientists working for EFSA have stakes at both the EU Member State level and in one case with regard to the German Biotech industry and that EFSA Opinions to date have consistently been supportive of the Biotech industry.

Box 5. Example stakeholder quotes questioning EFSA's fairness and impartiality

"Friends of the Earth published a damning critique of EFSA... accusing it of bias and going beyond its remit to benefit the biotechnology industry. Since its conception EFSA has rejected virtually every concern raised by Member States about the safety of GM foods and crops." FOE 5th October 2005

"we are not at all confident that the Council decided for the best representation of the various interests in the EFSA Management Board. The Authority must now win our trust by the excellence and independence of its work." BEUC 3rd February 2003

"Candidates were appointed in the basis of nationality and not of competence... In appointing so many national officials to the Board, the Council did not fulfil the requirement of securing a broad range of relevant expertise... will make it difficult for the Authority to win the confidence of consumers and serve as a point of reference by virtue of its independence". BEUC 7th November 2003

In response to these allegations EFSA has seemingly only re-asserted that Panel Member views are independent rather than actively demonstrating that to be the case. This was not a particularly robust rejection of critics' claims and it is not clear at this stage whether EFSA's meetings with NGOs will ameliorate these types of concerns. BEUC was notable however for being appreciative of EFSA's efforts to provide guidance for the information needed for the risk assessment of GMOs (see Box 6).

Box 6. Example stakeholder quotes in support of EFSA

"If the EFSA is prepared to deal with issues that of most concern to customers, BEUC and its member organisations across Europe are ready to become involved and to help EFSA become a success." BEUC 3rd February 2003

"BEUC appreciate the efforts of EFSA to provide guidance for the information needed for the risk assessment of genetically modified plants and derived food and feed" BEUC 12th May 2004

In other respects the efficient and effective functioning of EFSA was brought into question by the Authority itself in two press release where significant concerns were expressed that funding restrictions and projected funding cuts would undermine the quality and quantity of risk assessments conducted by EFSA. These concerns could also damage the credibility of risk assessments conducted by EFSA if expected funding did not materialise by giving the impression that the Authority was under-resourced for the successful fulfilment of its mission.

5.3. EFSA's delivery of decision relevant information

Risk communications by EFSA were for the most part seen to deliver a reasonable standard of decision relevant information. There are however some specific points to be made in respect to each of the cases studied which are discussed below. The main exception to this relatively positive appraisal was to be found with earlier communications on GMOs both by comparison to more recent communications on GMOs and to those of the other case studies investigated. These communications in particular rarely provided background documentation and failed to report risk assessments in any great detail or contextualise opinions in light of any social and political ambiguities and concerns expressed in wider social risk discourses. For example, on a number of occasions EFSA failed to acknowledge or elaborate upon criticisms and concerns raised by EU Member States and NGOs such as with regards to some remaining scientific uncertainties associated with the safety of GMOs. Another concern is that a communication vacuum on the role of EFSA appears to have temporarily emerged which seemingly allowed NGO communications to conflate EFSA's role in the assessment of GMOs with wider concerns about the risk management of GMOs within Europe. As such EFSA may have for a time been perceived as ignoring social concerns about GMOs in these instances. That said, EFSA has made progress in more recent communications relating to GMOs by providing more comprehensive documentation and supplementary materials and with regards to the aforementioned publicised efforts to engage with other stakeholders.

In the other cases the provision of decision relevant information was generally much better following the normative concerns set out above (see Box 3). Concerning EFSA opinions about the discovery and public health risk of BSE in goat meat and milk press releases could have perhaps provided more quantitative information up front to help guide consumers; for example, relating to the possible prevalence of BSE in goat herds only one of the three press releases referenced how many goats had been tested in total. These press releases as well as official opinions could also have been more forthright in their advice to consumers as it was only generally inferred indirectly that goat meat within a certain age was thought not to be a risk and thus safe to consume. The earlier two press statements and opinions could have also summarised the key messages at the end.

The provision of decision relevant information in press releases and EFSA opinions for the safety of wild and farmed fish was similarly observed to match most of the criteria adopted by this review being generally thorough with few points to criticise. The same was found for materials relating to the semicarbazide discovery. Communications in these cases were generally found to provide the relevant facts that citizens might need to know, included quantitative and qualitative information where possible and supplementary information about substitution dangers and advice to enhance self-efficacy as well as details about the risk management actions undertaken to mitigate the risks for example. EFSA can also be commended in the semicarbazide case for seeking further views on the countervailing risks of to improve the substantive basis for decisions concerning the information and advice provided to consumers. However, the advice issued was underpinned by concerns for uncertainty and the need for 'precautionary' risk management. This could have been elaborated upon in EFSA communications to better inform recipients for example by clarifying what was meant by precaution and the rationale behind that advice. This could help to

avoid possible confusions in the media which might similarly have been repeated elsewhere by members of the public.

In this instance post-communications follow-up to evaluate of the impact of messages beyond simply utilising media analysis would be beneficial to EFSA. In such cases EFSA could for example utilise other resources and develop further relationships with stakeholders to ascertain how advice issued by the Authority was received and whether it was followed. It may have been useful if feedback could have been gathered from national food safety authorities or food manufacturers and retailers on consumption patterns following EFSA communications on wild and farmed fish and semicarbazide in food as well as consumption of goat and goat products. EFSA's website is potentially a highly valuable and accessible resource for consumers and as such website monitoring and surveys may prove to be helpful to gauge whether it is similarly regarded so by website users. It may be noted during this research that there were some broken links from some of the older archived press releases and opinions.

One concern that arose while conducting this review was that in many instances the media's delivery of decision relevant information did not always match levels that would be required by consumers to make informed decisions following the kinds of decision relevant criteria set out by this review. It is suggested that as EFSA relies very much on intermediaries to disseminate its communications it could perhaps work with what are considered to be the 'influencers' (i.e. members of the press and consumer groups and other interested stakeholders such as Member State food safety authorities) to develop guideline criteria for reporting food risk informed by social science. For instance the BBC has a set of example criteria for reporting risk (see Box 8). Similar guideline criteria more specifically tailored to the requirements of reporting food risk could be similarly developed to be used by different stakeholders. To develop such criteria EFSA could arrange an open consultation or workshop on the science of risk communication with input from psychologists and behavioural scientists on the technicalities of risk communication message design for example.

At this time EFSA cannot rely solely on the capacities of every news and media agency to follow criteria such as those employed by the BBC to ensure the quality and consistency of communications. EFSA may help foster good communications in others through continually improving the quality and consistency of its own communications, but could consider partnering with other stakeholders to develop risk reporting protocols that can be used by media reporters and consumer organisations to make sure that communications are underpinned by scientific principles to meet the needs of the general public. The intention here would not be to tell members of the media what to report, but rather that the Authority could begin a constructive dialogue between different stakeholders drawing on a variety of expertise about the kinds of information that would prove most useful to consumers and how it might be communicated.

Box 8. Example checklist criteria used within the BBC for reporting risk (Harrabin et al. 2003)

- 1. What exactly is the risk? How big is it? Who does it affect?**
- 2. How has the risk been measured? How big is the sample? Who funded the research? How reputable is the source?**
- 3. If you are reporting a relative risk, have you made clear what the baseline risk is (for example a 100 percent increase in the problem that affects one person in 2000 will still only affect one in 1000)?**
- 4. Have you asked how safe is this rather than is this safe?**
- 5. If a scientist or a victim is taking a view that runs against majority scientific opinion, is that clear in the report and in the casting of the discussion and subsequent questions?**
- 6. Have you told the audience how to find more information?**
- 7. Can you find a comparison to make the risk easier to understand?**
- 8. Have you given the audience information to put the risk in contest (for example with regard to risk-risk tradeoffs)?**
- 9. Is the scale of reporting in proportion to the extent of the risk? Will our reporting increase or decrease risks in society?**
- 10. Can we use a story about a specific risk as a springboard to discuss other related risks? (*Perhaps less applicable in the case of EFSA*)**

6. Conclusion

This review finds much to commend EFSA in their approach to risk communication. It is suggested that official actions by the Authority surrounding the cases observed are indicative of a 'sea-change' in organisational thinking and regulatory practices in Europe concerning the development of risk communication relating to food and feed safety since earlier European food scandals such as BSE and the Belgian dioxin scare. EFSA started predominantly well in addressing some very difficult risk communication problems and where there have been setbacks (for example in initially being reactive instead of proactive on the issue of GMOs) the Authority has made a great deal of progress to address shortfalls. Indeed, EFSA has not stood still in its attempts to assert itself as a reputable source of information on food risk and safety throughout Europe. It is the opinion of this review that if EFSA should continue to strive for excellence with as much commitment and dedication as it has shown so far that it will continue to make good progress in becoming a trusted, reliable and authoritative advisory for citizens and consumers, NGOs, the media, industry, the European Commission, Member States and other stakeholders alike. The recommendations which follow are therefore put forward with the aim of helping EFSA to continue to meet that goal.

7. Review Recommendations

Overall with the notable exception of early communications on GMOs, EFSA performed well, generally meeting the technical appraisal criteria set out by the review. There are however some key areas where EFSA could make important improvements and also some ways in which to invigorate the Authority's efforts to

ensure risk communications fulfil all the duties within EFSA's remit. In particular it is suggested that EFSA could be more mindful of the communication needs of the general public who are often ultimately the recipients of communications relayed by intermediaries.

- **EFSA could supplement present risk communication strategies and plans by developing more fine-grained formal internal protocols on reporting risks with regard to the type of decision relevant information that should be included in communications to help ensure message quality and consistency in delivery across different food risk areas.** The AGRC could help advise on the content of these protocols.
- **EFSA should also consider having food risk communications materials, including official Opinions, peer-reviewed in addition to other scientific experts and Expert Panel members.** A more extended peer-review process will help contribute to quality, consistency and decision relevance of messages by broadening the expertise (including behavioural science and psychology for example) which informs EFSA's risk communications.
- **EFSA is reliant on intermediaries to relay their communications and so should work with the "influencers" such as members of the press, consumer groups and national food safety authorities to ensure that risk communications are underpinned by a science-based approach.** EFSA may wish to consider holding an open workshop and/or consultation on media and risk communication supported by psychologists, decision and behavioural scientists to help develop criteria to assist the reporting of risk such as those currently employed by the BBC noted above. An outcome of this type of initiative might be to provide a document with the decision relevant requirements of consumers in mind to be hosted on EFSA website so that it could be used as a reference by all the various stakeholders reporting food risks. It is recognised that whilst it may not be an easy task to involve all stakeholders in such an initiative, and indeed if improperly handled members of the media could perceive this to be overstepping the mark, EFSA could start this process as a way of fostering a critical dialogue between stakeholders on this important issue.
- **EFSA should further consider the extent of its role in ascertaining the impact of risk communications, particularly where the Authority's communications cross over into or interact with risk management or comment on risk management options.** Whilst EFSA is not mandated to undertake responsibility for risk management of food health risks, risk management concerns are often inherent to both risk assessment and risk communication and therefore need to be more explicitly acknowledged and accounted for in EFSA's actions. The Authority could for example work more closely with stakeholders such as national food safety authorities, consumer organisations and industry where for example messages are seen to be aimed at targeting vulnerable groups (as was the case with semicarbazide and SWAFF) to more actively monitor the impact of communications on public understanding and behaviour. At present the Authority is well equipped to monitor the media impact of communications but some other forms of evaluation of risk communication messages involving members the general

public would also be most beneficial and may be a topic to consider for future reviews. Public responses to risk issues raised by EFSA do after all constitute an important measure of the Authority's impact. Such work would provide a useful supplement to initiatives such as the Eurobarometer on Risk Issues that was carried out by EFSA/SANCO.

- **EFSA has made good progress and should continue to impress upon its members the need to ensure it maintains a proactive approach to risk communications on the issue of GMOs and for any emerging risks where there is high social ambiguity and political controversy to ensure against communication vacuums.** We recognise that given the political aspects the GMO case is a particularly difficult risk communication issue for any official authority, and probably more so in many respects than the other cases analysed in this review in light of special interest group activity and public interest within Europe. It is advised that EFSA should remain vigilant of the potential social and political ramifications that come to light for all emerging food risks that come within its remit as well as scientific considerations to help the Authority to engage proactively in its communications.

- **EFSA should pay especial attention to the formulation of risk communications underpinned by high levels of uncertainty and work closely with institutional actors within the EC such as DG SANCO to ensure consistency in communications at the pan-European level.** So far the Authority has acted well in collaboration with risk managers by recognising and mitigating some of the communication pitfalls associated with both issuing scientific advice and adopting risk management measures under high levels of uncertainty, such as substitution dangers (or 'risk-risk' tradeoffs) which may arise for example when precautionary actions are undertaken. EFSA should continue to be mindful of such issues in its communications to help promote informed choices. However, it should be noted that consistency of communications messages between Member States and EFSA may not always necessarily be desirable or possible due to national and cultural variations in the demand for different types of information as seen in the case of the UK FSA and the semicarbazide case.

8. References

- Anand, P. and Forshner, C. (1995). Of mad cows and marmosets: From rational choice to organisational behaviour in crisis management. *British Journal of Management*, Vol.6
- Bailey, J. A. (2007). Review of openness in the Food Standards Agency. Food Standards Agency
- Blaine, K. and Powell, D.A.. (2000). Communicating with consumers about BT-Sweet-Corn. Guelph, Ontario: Department of Food Science, University of Guelph.
- BEUC (2003) Restrained support for EFSA. www.foodnavigator.com/Financial-Industry/Restrained-support-for-EFSA Retrieved 2009-05-27
- BEUC (2003) Press Release: Good Luck Mr. Geoffrey Podger! 03 February 2003
- BEUC (2006) Press Release: Protecting consumers, without a consumer representative? 20 June 2006
- Bostrom, A. (2003) "Future Risk Communication." *Futures*, (special volume on the future of social sciences, edited by Bruce Tonn) 35 (6)
- Bostrom, A. (2008) Lead is like mercury: Risk comparisons, analogies and mental models. *Journal of Risk Research* 11 (1/2)
- Burger, J., Staine, K. and Gochfield, M.. (1993). Fishing in contaminated waters: Knowledge and risk perception of hazards by fishermen in New York City. *Journal of Toxicology and Environmental Health*, Vol.9
- Burger, J., Plugh, K.K., Lurig, L. et al. (1999a). Fishing in urban New Jersey: Ethnicity affects information sources, perception, and compliance. *Risk Analysis*, Vol.19
- Burger, J., Stephens, W., Shane, B. et al. (1999b). Factors in exposure assessment: Ethnic and socioeconomic differences in fishing and consumption of caught along the Savannah River. *Risk Analysis*, Vol.19
- Burger, J., Johnson, B.B. Shukla, S. and Gochfeld, M.. (2003). Perceptions of recreational boat captains: Knowledge and effects of fishing consumption advisories. *Risk Analysis*, Vol.23
- Campbell, S. and Townsend, E.. (2003). Flaws undermine results of UK biotech debate. *Nature*, Vol.425, 9 October
- Crouch, E. A. C. and Wilson, R. (1982). *Risk/Benefit Analysis*. Ballinger, Cambridge
- Powell, D. A. (2000) Food safety and the consumer: Perils of poor risk communication. *Canadian Journal of Animal Science*, September, 80 (3)

- Douglas, M and Wildavsky, A. (1982) Risk and Culture. Berkely, CA: University of California Press.
- Eldridge, J., Kitzinger, J. Philo, G. et al. (1998). The re-emergence of BSE: The impacts of public beliefs and behaviour. Risk and Human Behaviour Newsletter, n.3
- Eldridge, J. and Reilly, J. (2003). Risk and relativity: BSE and the British media. In N.Pidgeon, R.E.Kasperson and P.Slovic eds., The Social Amplification of Risk. Cambridge: Cambridge University Press.
- European Commission (2001). European Governance-A white paper. Brussels: European Commission
- Fifeschaw, C., Rowe, G. (1996) Public perceptions of everyday hazards: a psychometric study. Risk Anal 16
- Finucane, M. L., Alhakami, A., Slovic, P. and Johnson, S. M. (2000) The affect heuristic in judgments of risks and benefits, Journal of Behavioral Decision Making, 13
- Finucane, M. (2002). Mad cows, mad corn and mad communities: The role of socio-cultural factors in the perceived risk of genetically-modified food. Proceedings of the Nutrition Society, Vol.61
- Fischhoff, B. (1990). Psychology and public policy: Tool or tool maker? American Psychologist, 45
- Fischhoff, B. (1998). Communicate unto others... Reliability Engineering and System Safety, 59,
- Fischhoff, B. (1999). Why (cancer) risk communication can be hard. Journal of the National Cancer Institute Monographs., 25,
- Fischhoff, B. (1999). What do patients want? Help in making effective choices. Effective Clinical Practice, 2(3)
- Fischhoff, B. (2001). Defining stigma. In H. Kunreuther & P. Slovic (Eds.), Risk, Media, and Stigma. London: Earthscan.
- Fischhoff, B., & Fischhoff, I. (2001). Will they hate us? Anticipating unacceptable risks. Risk Management 3(4)
- Fischhoff, B. (1992). Giving advice: Decision theory perspectives on sexual assault. American Psychologist,47(4)
- Fischhoff, B. (1995). Risk perception and communication unplugged: Twenty years of process. Risk Analysis, 15
- Fischhoff, B. (2006) The Psychological Perception of Risk. In D. Kamien (ed.), McGraw-Hill Handbook of Terrorism and Counter-terrorism. New York: McGraw-Hill

- Fischhoff, B. (2005). Decision research strategies. *Health Psychology*, 21(4), S1-S8
- Fischhoff, B. and Downs, J. S. (1997). Communicating food borne risk. *Emerging Infectious Diseases*, Vol.3, n.4, 7
- Fischhoff, B. (2001). Defining stigma. In J. Flynn, H. Kunreuther & P. Slovic (Eds.), *Risk, media, and stigma*. London: Earthscan.
- Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sciences*, 8.
- Fischler, C. (1988) Food, self and identity, *Social Science Information* 27 (2)
- Fischler, C. (2001). Food selection and risk perception. In (Eds) Anderson, H., Blundell, J. and Chiva, M. *Food Selection: From Genes to Culture*. Danone Institute
- Flynn, J., Kunreuther, H. & Slovic, P. (2001) *Risk, media, and stigma*. London: Earthscan.
- Friends of the Earth (2004) Press Release: EU Decision on GM Maize.
- Friends of the Earth (2005) Press Release: Austrian crop ban over-ruled.
- Frewer, L.J. (2003). Trust, transparency and social context. In N.Pidgeon, R.E.Kasperson and P.Slovic eds. *The Social Amplification of Risk*. Cambridge: Cambridge University Press
- Frewer, L.J., Miles, S., Brennan, M., et al. (2002). Public preferences for informed choice under conditions of uncertainty. *Public Understanding of Science*, Vol.11
- Frewer, L.J., Miles S., and Marsh, R., (2002). The GM foods controversy: A test of the social amplification of risk model. *Risk Analysis*, Vol.22
- Frewer, L.J., Hunt, S., Brennan, M., et al. (2003). The views of scientific experts on how the public conceptualize uncertainty. *Journal of Risk Research*, Vol.6,n.1
- Frewer, L.J. and Shepherd, R., (1994). Attributing information to different sources: Effects on the perceived qualities of information, on the perceived relevance of information, and on attitude formation. *Public Understanding of Science*, Vol.3
- Frewer, L.J., Shepherd, R. and Sparks, P. (1994). Biotechnology and food production: Knowledge and perceived risk. *British Food Journal*, Vol.96
- Gaskell, G., Allum, N. and Stares S. et al. (2003). Europeans and Biotechnology in 2002. Eurobarometer 58. European Commission: DG Research.
- Gaskell, G., Allum, N., Wagner, W., Kronberger, N., Torgersen, H., Hampel, J., Bardes, J. (2004) GM Foods and the Misperception of Risk Perception *Risk Analysis* 24 (1)

Greenpeace (2004) The European Food Safety Authority (EFSA): Failing Consumers and the Environment.
www.greenpeace.at/uploads/media/EFSA_critique_April_2004.pdf Retrieved 2009-05-27

Harrabin, R., Coote, A. and Allen, J. (2003). London: King's Fund.

Hites RA, Foran J.A., Carpenter D. O., Hamilton M.C., Knuth, B.A., Schwager, S.J. (2004). Global assessment of organic contaminants in farmed salmon. *Science* 303

Hodd, J. and Heald D. (2006) *Transparency: The Key to Better Governance*, Oxford, British Academy/OUP

Hohl, K. and Gaskell, G. (2008). European Perceptions of Food Risk: Cross-National and Methodological Comparisons. *Risk Analysis* 28 (2)

Jasanoff, S. (1990) *The Fifth Branch: Science Advisors as Policy Makers* Cambridge: Harvard University Press

Johnson, B. B. (2004) Varying Risk Comparison Elements: Effects on Public Reactions. *Risk Analysis* 24 (1),

Johnson, B. and Slovic, P. (1995). Presenting uncertainty in health risk assessment: Initial studies of its effects on risk perception and trust. *Risk Analysis*, Vol.15

Kasperson, R. Jhaveri, N. Kasperson, J (2001) 'Stigma and the social amplification of risk: toward a framework of analysis' in Slovic, P and Flynn, J (Eds.) *Risk, Media and Stigma* Earthscan, London

Kasperson, R.E., Renn, O. & Slovic P et al (1988) Social amplification of risk: a conceptual framework. *Risk Analysis*, 8,

Kasperson, R.E. and Pamlund, I., (1997). Evaluating risk communication. In V.T.Covell et al eds, *Effective Risk Communication: The Role and Responsibility of Government and Non-government Organisations*. Dordrecht:Kluwer.

Kjaernes, U. (2004). Europeans' trust in food highest for fruits and vegetables, lowest for junk food. Brussels: DG Research, News alert 5th April.

Klinke; A. and Renn. O. (2002). "A New Approach to Risk Evaluation and Management: Risk-Based, Precaution-Based and Discourse-Based Management," *Risk Analysis*, Vol. 22, No. 6

Konheim, C. S. (1988). Risk communication in the real world. *Risk Analysis* 8(3)

Leiss, W. (2001) *In the Chamber of Risks: Understanding risk controversies*. Montreal: McGill-Queen's University Press.

- Leiss, W. and Chociolko, C. (1994). *Risk and Responsibility*. Montreal:McGill-Queen's University Press.
- Levidow, L. (2007) Europeanising advisory expertise: the role of 'independent, objective and transparent' scientific advice in agri-biotech regulation, *Environment and Planning C: Government and Politics* 25
- Lofstedt, R. E. (2005) *Risk Management in Post-Trust Societies*. Palgrave MacMillan
- Lofstedt, R. E. (2006) How can we make food risk communication better: Where are we and where are we going? *Journal of Risk Research*, Vol. 9 Issue 8
- Miles, S., Braxton, D.S., and Frewer, L.J. (1999). Public perceptions about microbiological hazards in food. *British Food Journal*, Vol.101,
- Moon, W., and Balasubramanian, S.K.. (2001) "Public Perceptions and Willingness-to-Pay a Premium for Non-GM Foods in the US and UK." *AgBioForum*4 2210 -31.
- Morgan, M.G., Fischhoff, B., Bostrom, A., & Atman, C. (2001). *Risk communication: The mental models approach*. New York: Cambridge University Press.
- Motarjemi, Y. and Mortimore, S. (2005). Industry's need and expectations to meet food safety, 5th International Meeting: Noordwijk Food Safety and HACCP Forum 9-10 December 2002. *Food Control* 16. 523-529
- OECD (2002). *OECD Guidance Document on Risk Communication for Chemical Risk Management*. OECD Environment, Health and Safety Publications Series on Risk Management, No. 16
- O'Neil, O. (2002). A question of trust. BBC Reith Lectures. Retrieved June 15, 2007 from: <http://www.bbc.co.uk/radio4/reith2002/>
- Pidgeon, N.F., Kasperson, R.K. and Slovic, P. (2003) *The Social Amplification of Risk*. Cambridge, CUP.
- Poortinga, W., & Pidgeon, N.F. (2005). Trust in risk regulation: cause or consequence of the acceptability of GM food? *Risk Analysis*, 25(1)
- Powell, D. and W.Leiss. (1997). *Mad Cows and Mother's Milk*. Montreal: McGill-Queen's University Press.
- Philips Report. (2001). *The BSE Inquiry: The report. The inquiry into BSE and CJD in the United Kingdom*. London: The Stationary Office.
- Pflugh, K.K., Lurig, L. von Hagen, L.A.et al. (1999). Urban angler's perceptions of risk and contaminated fish. *Science of the Total Environment*, Vol. 228
- Reilly, J. (1998). Just another food scare? Changes in public understandings of BSE. In R.Philo ed., *Message Received*. London: Longman

- Reith, G (2004) 'Consumption and its discontents: addiction, identity and the problems of freedom', *British Journal of Sociology* 55 (2)
- Renn, O. (2006) Risk Communication – Consumers between information and irritation. *Journal of Risk Research* Vol. 9, Issue 8,
- OECD (2002) OECD Guidance document on Risk Communication for Chemical Risk Management, OECD 2002, ENV/JM/MONO 2002 18
- Roth, E., Morgan, M.G. Fischhoff, B. Lave, L. and Bostrom, A.. (1990) "What Do We Know About Making Risk Comparisons?" *Risk Analysis*, 10(3)
- Scherzberg, A. (2006) 'EU-US Trade Disputes about Risk Regulation: The Case of Genetically Modified Organisms', *Cambridge Review of International Affairs*, 19:1, 121 - 137
- Setbon, Michel, Raude, Jocelyn, Fischler, Claude & Flahault, Antoine (2005) Risk Perception of the "Mad Cow Disease" in France: Determinants and Consequences. *Risk Analysis* 25 (4)
- Sheppard B., Rubin, G. J., Wardman, J. K. & Wessely S. (2006) Terrorism and dispelling the myth of a panic prone public. *Journal of Public Health Policy*, 27(3):
- Siegrist, M. (2000). The influence of trust and perceptions of risks and benefits on the acceptance of gene technology. *Risk Analysis*, 20
- Spence, A. and Townsend, E. (2006) Examining consumer behaviour towards genetically modified (GM) food in Britain. *Risk Analysis*, 26, (3),
- Slovic, P., (2000) *The Perception of Risk*, Earthscan, UK.
- Slovic, P., (1997) 'Trust, Emotion, Sex, Politics and Science: Surveying the Risk assessment Battlefield' in Slovic, P., 2000, *The Perception of Risk*, Earthscan, UK.
- Slovic, P., Finucane, M., Peters, E. and MacGregor, D. G. (2004) Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk and rationality, *Risk Analysis*, 24(2)
- Slovic P, Fischhoff B, Lichtenstein S (1980) in *Societal Risk Assessment: How Safe is Safe Enough?* (eds Schwing RC, Albers WA) pp 181–216. New York, USA: Plenum.
- Sparks, P, and Shepherd, R (1994) Public perceptions of the potential hazards associated with food production and food consumption: an empirical study. *Risk Analysis* 14 (5)
- Starr, C. (1969). Social benefit versus technological risk. *Science*, 165(3899),
- Tait, J. (2003). More Faust than Frankenstein: The European debate about risk regulation for GM crops. *Journal of Risk Research* 4 (2)

Van Asselt, M. B. and Vos, E. (2008) Wrestling with uncertain risks: EU regulation of GMOs and the uncertainty paradox. *Journal of Risk Research* 11(1-2)

Viscusi, W.K., Magat, W.A. and Huber, J. (1991). Communication of ambiguous risk information. *Theory and Decision*, Vol.31.

Wardman, J. K. (2006) Towards a Critical Discourse on Affect and Risk Perception. *Journal of Risk Research*, 9(2)

White, M.P & Eiser, J.R. (2005). Information specificity and hazard risk potential as moderators of trust asymmetry. *Risk Analysis*, 25