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## **Developing consumer-focused risk communication strategies related to food terrorism**

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**Abstract:** An essential component of food defence, consumer-focused risk communication strategies related to food terrorism (FT) threats should reflect an in-depth understanding of consumers' perceptions, priorities, and information needs related to those threats. To support development of communication strategies, we used a mental models approach to risk communication method to design, conduct and analyse 50 semi-structured telephone interviews with US adults. Interviewees generally lacked well-defined mental models specific to FT, and, instead, drew on their perceptions of terrorism in general, accidental contamination, product recalls, and emergency preparedness. Assessments of their personal threat of FT were

influenced by their beliefs about the nature of terrorism, their confidence in government and the food system to prevent and respond to terrorism threats, and their personal control over food choices. These qualitative research results support guidance for developing and implementing consumer-focused FT risk communications strategies.

**Keywords:** food terrorism; agroterrorism; bioterrorism; food defence; risk communication; consumers; mental models; perceptions; information; public health agencies; USA.

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## 1 Introduction

An intentional attack on the food supply (hereafter, food terrorism or FT) has the potential to cause significant public health, economic and physiological harm (US Food and Drug Administration, 2003; Chalk, 2004; Lemyre et al., 2006; World Health Organization, 2008). Even an alert of a potential act of FT, were it made known to the public, could result in social and economic disruption and reduced consumer confidence in the safety of the food supply. Following the 2001 terrorist attacks in the USA, government and industry have endeavoured to close security gaps in food systems and the food supply (Franco and Deitch, 2007). As the federal agency in charge of 80% of the US food supply, FDA is responsible for protecting public health from the potentially

harmful effects of accidental, as well as deliberate or intentional, contamination of the food supply. FDA works collaboratively with its partners to coordinate food defence efforts, including prevention, response, recovery and communication (e.g., FDA, 2005). These partners include federal [primarily US Centers for Disease Control and Prevention (CDC), US Department of Agriculture (USDA) and the US Department of Homeland Security (DHS)], state and local government agencies, as well as industry, academic and public health professionals.

Communication is an essential component of food defence. Most communication initiatives have thus far focused on increasing government and industry capacity by improving coordinated communications systems, training first responders, and educating and equipping members of the food industry (FDA, 2010a). Less effort has been directed toward informing and preparing US consumers, despite recognition of the important role that consumer risk communication has in food defence (Sorenson, 2004; Tinker and Vaughan, 2004; Bruemmer, 2006). Early attempts to communicate with the public about terrorism threats in general have met with little success (Fischhoff et al., 2003). For example, the DHS colour-coded Threat Advisory System, established in 2002 as part of an initiative to increase coordination and communication among government and the public (DHS, 2009), was deemed successful as a tool to coordinate government agencies but not as a communications tool to the public (Wray and Jupka, 2004; DHS, 2009).

It is clear that proactive, consumer-focused communications are needed. Consumers' changing demographics, global connectedness, and demand for a voice in decision making, along with the exponential growth in their opportunities to seek and share information, requires a more strategic approach, one that includes a proactive and continual dialogue with consumers (Sorenson, 2004). Such an approach enables public health agencies to: foster shared understanding about the roles and responsibilities of key players (including consumers) in food defence; learn from consumers about their priorities and needs; increase their capacity to prepare for and respond to potential FT threats; and build their trust and confidence in their government leaders during difficult times.

In an effort to improve its targeted risk communication strategies, FDA has begun to identify new opportunities to provide US consumers with accessible information on food safety. FDA and its partners have collaborated to develop FoodSafety.gov as a gateway to food safety information. They have also begun to implement social networking tools such as podcasts (web-based radio programmes), blogs (web-based journals), and Twitter (FDA, 2010b).

As important as how the information is delivered, consumer-focused strategies should be built upon an in-depth and focused understanding of consumers' perceptions, priorities, and information needs related to the topic at hand (Fischhoff, 1995; Tinker and Vaughan, 2004; Thorne et al., 2006). They should also reflect an understanding of how consumers may use information and make decisions. Otherwise, communications can contain information that does not make sense to the consumer or is irrelevant.

We conducted research to help inform FDA's continued development of consumer-focused communication strategies aimed at increasing consumers' awareness and supporting their decision making related to preparing for, and responding to, an elevated FT threat. In this context, an elevated FT threat means a government-generated public alert of an incident that may be related to FT or other intelligence that suggests a significant increase in the immediate risk of an FT incident. The purpose of the research was to:

- a explore US consumers' current beliefs about FT
- b better understand what may influence consumers' decisions to prepare for and act in response to an FT threat
- c identify what information and communications channels would be useful to consumers in the event of an elevated FT threat.

The specific research questions are shown in Table 1 (Thorne et al., 2006).

**Table 1** Guiding risk communication questions

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<ul style="list-style-type: none"> <li>• What do consumers know now about FT threats that are correct and may support consumers' awareness of, preparedness for, and response to an elevated threat of FT?</li> <li>• What do consumers not know or what do they misunderstand that may be consequential to consumers' awareness of, preparedness for and response to an elevated threat of FT?</li> <li>• What do consumers want to know about FT threats?</li> <li>• What are the key factors that consumers consider when making judgements and decisions related to FT?</li> <li>• Whom do consumers trust to communicate about FT threats and why?</li> <li>• What communication methods do consumers want to receive information about FT threats?</li> </ul>
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## 2 Background on consumers' values and perceptions on food terrorism

Research suggests that when directly asked, US consumers believe there is a real threat of FT, and place a high priority in protecting themselves and their country against that threat. 77% of US consumers surveyed in 2005 believed that "deliberate chemical or biological contamination of a common food product" would occur in their lifetime, and 44% believed an attack would happen within four years (Stinson et al., 2007). Although this was slightly less than their perceived risk of terrorist attacks on transportation or through biological or chemical means, respondents assigned the highest proportion of a hypothetical anti-terrorism budget to protecting against attacks on the food supply. When asked how confident they were that US food supply is secure against terrorism, 15% were 'not at all confident', while 2% were extremely confident. Consumers' perceptions and priorities regarding FT have been shown to vary depending on gender, age, income, knowledge of the food system and other cognitive and social-contextual factors (Turvey, et al., 2007; Degeneffe et al., 2009; Lee and Lemyre, 2009). Research also suggests that US consumers are becoming more concerned and less confident in food defence (Stinson et al., 2008).

However, in light of their other concerns and daily pressures, consumers may not think about food safety or FT unless stimulated to do so (Green et al., 2003; Lupton, 2005). Nor is much known specifically about how people's perceptions about FT may influence their response to an elevated threat. In general, people perceive and judge risks differently depending on the characteristics of that risk, including its origin (natural or man-made), the degree of control, and potential impact on special populations, such as children (Slovic, 2000). Emotional response will affect decision making, usually in predictable ways (Fischhoff et al., 2003). A sense of heightened fear, insecurity and anxiety is to be expected, however strong responses of panic are uncommon, unless

people have lost trust in their authorities (Fischhoff, 2005a; Wessley, 2005). However, the novelty and complexity of FT threats and their response in the US calls for targeted research into consumers' current awareness, perceptions, priorities and information needs specific to FT.

### **3 Method**

This research was designed and analysed following a mental models approach to risk communication (Morgan et al., 2002). In this context, a person's 'mental model' refers to the complex web of beliefs that affect how an individual defines an issue, reacts to new information, and makes decisions. These beliefs may be complete and correct, or they may have gaps that are consequential to decision making. The method's goal is to characterise these beliefs and represent them in tractable form, informing the development of strategies and tools that address people's current thinking on the issue. It has been used to guide risk communication strategies related to drinking water safety (Parkin et al., 2004), climate change (Bostrom et al., 1994; Palmgren et al., 2004), immunisations (Downs et al., 2008), and others. FDA's Research Involving Human Subjects Protection committee exempted this research from full Institutional Review Board review.

#### *3.1 Expert elicitation*

The method typically begins with the development of an expert model, summarising decision-relevant current knowledge and understanding of a risk issue – in this case, experts' beliefs about what people should know about FT threats. An expert model can serve several risk management and risk communication purposes (Morgan, 2005; Eggers et al., 2009). Among them, it provides the framework for the design and analysis of empirical research into how laypeople conceptualise the risk issue.

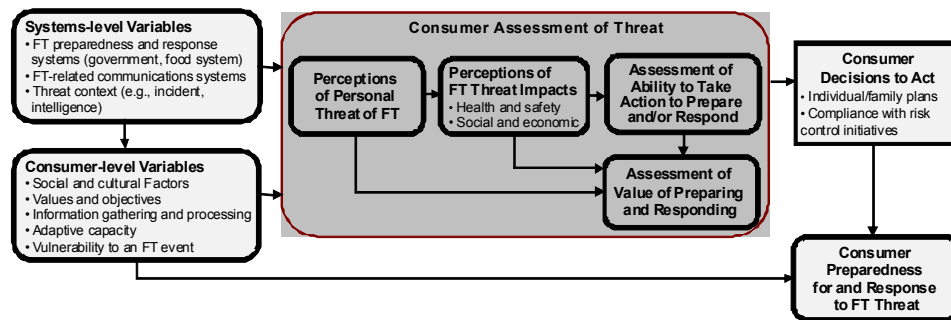
The authors facilitated a day-long workshop with 17 invited experts on 31 January 2007. Experts were identified by the study team based on the experts' professional background and experiences, ensuring a range of expertise and perspectives relevant to food defence. They represented industry, academia and government in fields related to food distribution systems, food defence, food safety, mental health, nutrition, and risk communication. Key results of the elicitation focused on:

- a the complexity of FT and its potential health, economic and social impacts
- b advancements in risk assessment and food defence
- c lack of clarity and communication regarding interagency roles and responsibilities
- d risk communication goals in advance of an elevated threat (e.g., 'Be generally well-prepared. Work with us in the event of a raised threat.')
- e reluctance by government and industry to communicate with consumers in advance, in part due to lack of clarity on communication roles, beliefs that mainstream media sets the agenda, concerns that consumers will panic, and beliefs that communicating puts experts and decision makers at risk.

The input from the workshop was integrated into an expert model summarising the influences on consumers' awareness and perceptions of the threat of FT and the degree to which consumers are prepared for and can respond to an elevated threat of FT. Figure 1 shows a simplified version of the expert model. It is presented as an influence diagram; arrows represent the influence (causally or by association) of one node on another (Morgan and Henrion, 1990). The ultimate dependent or outcome variable is *Consumer Readiness for FT Threat* and is shown as being influenced by *Consumer Decisions to Act* and a number of potential consumer-level variables.

The current research focus is *Consumer Decisions to Act*, that is, consumers' choices related to their own preparedness and response, and the range of influences on those decisions. The major construct influencing consumer decision making is depicted as the nodes contained within the subset entitled *Consumer Assessment of Threat*, which includes consumers' *Perceptions of Personal Threat of FT*, that is, how consumers perceive their individual susceptibility to FT; *Perceptions of FT Threat Impacts*, including health, economic and social impacts; *Assessment of the Ability to Take Action to Prepare and/or Respond* and *Assessment of Value of Preparing and Responding*.

**Figure 1** Expert model of influences on consumer preparedness and response to FT threat (see online version for colours)



The expert model also shows the set of hypothesised factors that influence consumers' assessment and behaviour in preparation for and in response to an FT threat. These factors included a number of 'systems' factors, such as: contextual factors related to the threat itself; government's and the food system's level of preparedness and the effectiveness of their communication systems; and the media response. The model also depicts a number of 'consumer' factors, including consumers' values and objectives and the degree to which consumers are able to prepare for and respond to FT threats [i.e., adaptive capacity (Smit and Wandel, 2006)] or the degree to which they actively seek or otherwise receive information regarding FT (i.e., *Information Gathering and Processing*). This model is generally aligned with other descriptive models of consumer response to bioterrorism events (Lee and Lemyre, 2009), with more of a focus on consumer decision making.

### 3.2 Interview procedure

In the next phase of research, one-on-one interviews with consumers were conducted by telephone. Participants were adults in the USA with children 14 years or younger living

in the household and who have regular responsibility for food shopping, based on the postulation that these consumers may be better able to discuss food safety and have more specific food safety concerns than other consumers. Two-thirds of the sample was recruited through a US marketing firm consumer internet panel, which includes tens of thousands of respondents and is broadly representative of the national population. One-third of the sample was recruited via a US marketing firm consumer telephone panel, which allowed access to a broadly representative sample of individuals with high school education attainment, its equivalent, or less.

The semi-structured interview protocol offered interviewees an agenda of topics, allowing free expression while ensuring that key issues identified in the expert model were addressed. Topics addressed the interviewee's perceptions of: the threat of FT; the preparedness and response of the food system, FDA and other government organisations; the interviewee's personal response to a change in the threat level; and information needs. A sample question was: 'what sorts of things could you imagine might happen to you and your family as a result of a food terrorism incident?' To focus their thinking, interviewees were asked to consider a hypothetical scenario involving an increase in the US Department of Homeland Security's Threat Advisory System that may be related to an FT threat. Interviewers used probing questions (e.g., Can you tell me more about that?) to elicit further explication of a thought or idea. Interviewees were allowed to respond to questions as they understood them. They were encouraged to raise additional topics and to elaborate on their perspectives. Interviewees were informed that their interview was confidential, with only aggregate results and non-identified quotes reported. They were offered \$30 for participating. All interviews were conducted in English. Interviews were recorded, with interviewees' permission, and transcribed.

### *3.3 Coding and analysis*

Interview responses were parsed into discrete segments. Each segment was assigned one or more codes that best aligned with the various expert model nodes (Figure 1). New codes were generated in cases where the model nodes did not sufficiently capture the theme as it was expressed in the segment. Descriptive keywords were also assigned to capture finer details related to a particular node. Coded segments were considered 'spontaneous' mentions if the interviewee's response was generated without being prompted to think of that particular topic and 'prompted' otherwise. Segments were coded without considering the accuracy of the statement. Initially, several interviews were coded independently by two individuals. Differences were resolved by discussion. Once the coding procedure seemed stable, a single individual coded subsequent interviews. More detailed analyses were conducted on segments, parsed by interview question, code, keywords, or in combination, in order to subjectively assess the results captured within each node and to identify other emerging themes. Analyses were performed at the level of the individual to avoid overweighting repetition. Given the sample size of this research, analyses were not performed based on any differences in demographic characteristics. Finally, the coded results were organised into mental models diagrams, using an influence diagram format that aligns with the expert model. Mental models diagrams are a mode of depicting the qualitative data that aids in the presentation of results.

## 4 Results

### 4.1 Consumers' mental model of food terrorism

Fifty telephone interviews were conducted (9 in August to October 2007 and 41 in July to August 2008). Interviews averaged 38 minutes in length. 56% of the sample was female; approximately 30% identified themselves as non-White (this datum was not collected for 18% of the sample); 42% had a bachelor's degree or higher; 56% were younger than 40 years of age; and 66% had annual incomes of \$75,000 USD or less. These demographic characteristics suggest that the research sample reflected an appropriate range of the US adult population targeted for this research.

Qualitative analysis of the research interviews suggest that interviewees in general lacked well-defined mental models specific to FT. Some spontaneously commented that they had not given much thought on the subject. When expressing their thinking on FT threats, they drew on their perceptions of terrorism, accidental contamination of the food supply, product recalls, and natural disasters (e.g., Hurricane Katrina). Their mental models of terrorism appeared to be more strongly associated with threats to air travel and public facilities than to susceptibility of the food system. When asked to imagine that the Threat Advisory System threat level had been raised to orange (high risk of terror attack) or higher, few interviewees spontaneously commented on FT. While a few commented on a general 'uneasiness' and the need to be more 'aware of my surroundings', many indicated that an increased threat alert would have little 'bearing' on their lives (unless they frequently travel). When then asked to imagine learning that the same terrorism threat may be related to the food supply, most interviewees expressed a higher level of concern. A few specifically commented that they would 'take it a little more seriously' than they would a general terrorism alert. A few offered response strategies, such as 'immediate reaction to go and buy safe food', 'avoid getting food from big chains', and 'avoid buying food' all together.

Interviewees generally did not, however, express a strong degree of anxiety when thinking about the current potential for an elevated FT threat. When asked to think specifically about the likelihood of an FT event occurring in the USA within the next couple of years, about half of the interviewees believed that there was a high likelihood of an event. Conversely, about half believed there was a low likelihood of an event in the USA, commenting on the capacity of terrorists, their confidence in the government, or offering general comments of denial – 'It's not going to happen'. When describing the potential impacts of an elevated FT threat, most commented on the potential harm to their and their family's health and safety from contamination. Some cited the potential for food shortages and food recalls. A few commented on personal fear and anxiety and possible public reaction, with varying perceptions ('big impact with the headlines'; 'mostly people being alarmist or ignorant').

As a complicating factor, interviewees had limited understanding of the food system and the roles of key government agencies in protecting the food supply. Interviewees tended to speak in vague terms about the government and the food system and many appeared to be unsure about the role of various stakeholders, such as farmers, within the food system. Some spontaneously commented that they were unfamiliar with the food system generally (e.g., 'I don't understand the chain').

When asked to think about the things they could do to prepare for, or respond to, a raised FT threat, interviewees' suggested (in order of prevalence of mention): 'stocking



up' on sufficient food and water supplies; reading labels; vigilance or being 'aware of one's surroundings'; creating and implementing an emergency or 'back-up' plan; gathering information related to the threat and response; and complying with government restrictions, communications and other initiatives. Other protective strategies included growing and/or buying food locally and practicing good food hygiene. When asked about their current personal level of preparedness, about half of the interviewees commented that they were 'very prepared' or 'somewhat prepared'. The remainder said that they were 'not very prepared' for an FT event. A few cited barriers to preparedness, such as a lack of awareness of what to do, while others said they perceived the threat as low, or commented that they "haven't put any thought into preparing for such an incident". A few questioned the value of preparing (e.g., "If I do things different, then I've already let them win").

Interviewees were asked about their information seeking related to FT. Almost all said they had never sought information specifically related to FT. A few spontaneously commented on the relative priority of seeking information on FT ("I have enough problems in my life with my kids, husband, home and family"). Few offered specific sources they would consult in preparation for FT in advance of a threat; they appeared to be more focused on seeking information in response to an elevated threat once it occurred. When asked to think about how they might first learn about an elevated FT threat, almost all mentioned mainstream media sources ('a given'), such as television 'evening news', internet news sources and headline news 'tickers'. Interviewees believed that 'government' would provide information directly through the media. However, when prompted, they were unsure which government agency would communicate. Most commonly mentioned were the US Department of Homeland Security and FDA, followed by mentions of about a dozen other federal, state and local government and non-government agencies (e.g., Red Cross). Most said they would actively seek information in the event of an incident or high alert of FT, primarily on the specific food(s) that were affected. Once alerted by the media, most commented that they would continue monitoring the television news and/or the internet ('Google', not individual sites), and consult their personal network. A few, however, said they would not be concerned unless they heard specific information about the threat.

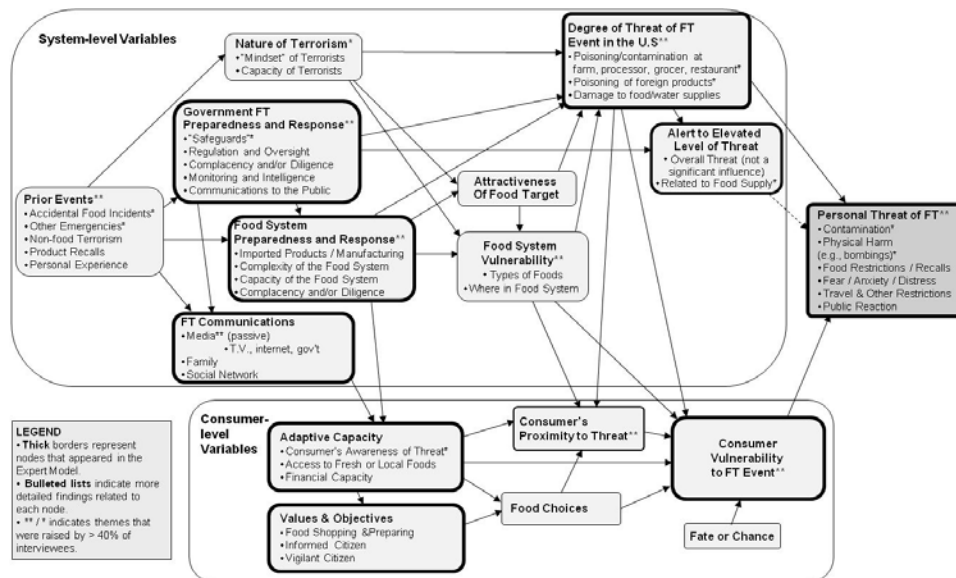
#### 4.2 *Mental models diagrams*

In order to organise the research results in a way to facilitate communications design, the coded findings aggregated across all interviews were developed into mental models diagrams. Because the consumer mental model diagram of an FT threat is very complex, the diagram has been divided into sub-models, each of which takes as their dependent variable a corresponding sub-node within the major node in the *Consumer Assessment of Threat* in the expert model (Figure 1). To preserve space, one of the sub-models is presented in this paper (the others are available upon request of the corresponding author).

Figure 2 represents interviewees' mental models of their *Perceptions of Personal Threat of FT*, that is, that an attack, or even an elevated threat of an attack, could directly affect them. *Perceptions of Personal Threat of FT* were influenced by their perceptions about the nature of terrorism, their government and the food system's ability to prevent and respond to terrorism threats, and their food choices. The model organises the aggregated interview findings into nodes (italicised in the descriptions below). Nodes

with thick borders represent those that appeared in the expert model (with slight variations in wording). The bulleted lists within the nodes provide detailed variables identified in the analysis. \*/\*\* indicates variables that emerged with higher prevalence or were conveyed with higher intensity by those interviewees who raised them. Select nodes from this model (and their corresponding research findings) are explained in more detail below.

**Figure 2** Interviewees' (aggregated) mental model of their personal threat of FT



#### 4.2.1 Nature of terrorism

Many interviewees spontaneously offered their perceptions regarding the underlying characteristics of terrorism and terrorists. Some commented on the 'mindset' or 'malicious intent' of terrorists. These interviewees tended to perceive a higher *Degree of Threat of FT Event in the US*. Some interviewees offered their perceptions of the *Capacity of Terrorists* (Terrorists "don't have the scientific knowledge, intelligence or coordination to carry out a terrorist attack on the food supply"). These interviewees tended to perceive a lower *Degree of Threat of FT Event in the US*. A few commented on the unexpected nature of terrorism, fate, randomness or chance.

#### 4.2.2 Government FT preparedness and response

Interviewees' perceptions of government (generally and not specific to any particular government agency) appeared to be a strong influence on their perceived *Degree of Threat of FT Event in the US*. Of the interviewees who rated the threat of FT event in the USA as high, many cited a lack of government preparedness (e.g., 'safeguards'). Of the interviewees who rated that likelihood as low, some spoke of their high confidence in the government's preparedness: "With all the safeguards on food, chances are it wouldn't happen". They drew heavily on their perceptions of how other *Prior Events*, such as

unintentional contamination, 9/11, and recalls of pet food, were managed. Most highlighted the need for improved preparation and response by the government and food system ('take it seriously', 'be proactive', and 'plan for the worst').

#### 4.2.3 Food system preparedness and response

Interviewees' perception of the readiness of the food system appeared to be another strong influence on their perceptions of the *Threat of FT Event in the US*. When asked to rate their confidence in the ability of the food system to respond to an FT threat, interviewees generally rated their confidence at or below their confidence in FDA and other government agencies. Their confidence appeared to be influenced by their perceptions of the *Complexity of the Food System* (e.g., 'so many unsecured steps from farm to table') the *Capacity of the Food System*, farmers, specifically; limits to the government's ability to protect against FT threats (*Government FT Preparedness and Response*); and disincentives or low motivation by the food suppliers. Some interviewees, however, expressed a higher degree of confidence in the food system, citing their positive perceptions of the *Capacity of the Food System* (e.g., 'a well oiled machine') and its people (e.g., 'they deal with the food all the time'). Interviewees' confidence in the food system was often influenced (positively and negatively) by how they perceived *Prior Events* to be managed, particularly the response to '9/11' and accidental contamination incidents.

#### 4.2.4 Attractiveness of food target

Some interviewees believed the food supply would be an attractive target for terrorism, while a few believed that food targets would not be attractive to terrorists. Their beliefs were influenced by perceptions of the *Nature of Terrorism* and the *Preparedness of the Food System*. For example, one commented: "The number of people that you could impact with any single (FT) action probably wouldn't be sufficiently dramatic to be attractive to a terrorist as a political statement". Another said: "we take it for granted that those things are going to be safe and, therefore, it makes it a little easier for people who want to terrorise to actually get to them".

#### 4.2.5 Food system vulnerabilities

There were two key factors that interviewees raised when expressing their thoughts on FT threats, which were categorised as *Food System Vulnerabilities*. One was the *Food Types* that were considered at higher risk of attack, about which there was a range of perceptions. Imported products, particularly produce from overseas, was generally perceived as being at greater risk. Some perceived fresh foods as less risky (e.g., 'less handling'), while others were unsure. Locally grown produce was perceived as being less risky by some and more risky by others. These results generally differed from other studies that suggest that consumers believe that fresh produce is more vulnerable to attack (Turvey et al., 2007; Stinson, 2008). A second factor was *Where in the Food System* the threat occurs. Interviewees commented on risks at the farm level, the point of processing, and retail. Their perceptions of this vulnerability were largely influenced by their perceptions of the *Nature of Terrorism*, and related, the *Attractiveness of Food Targets* (e.g., "They would go after a huge company that makes cereal or soup, where they could have as big an impact as quickly as possible").

#### 4.2.6 Existing consumer vulnerability

Figure 2 also includes a number of variables describing interviewees' thinking on their personal vulnerability to an FT threat, should an incident occur in the USA. Many believed that their personal vulnerability was influenced by the *Vulnerability of the Food System* and, related, their *Food Choices* (e.g., they buy foods they believe are at less risk, like local produce.) Some, however, were unsure how these risks translated to their own *Vulnerability to FT Event*. For example, one commented: "I use fewer processed and pre-processed packaged foods, where the contamination probably is likely. But I could be completely wrong. I don't know if [terrorists] are going to try to spray something on apples". Some also believed that their personal vulnerability is influenced by their *Proximity to Threat* (e.g., an interviewee in rural Michigan believed she is at less risk than people in New York City), and various factors categorised as *Adaptive Capacity*, such as one's *Awareness of FT* (through various *FT Communications* from media or their social network).

To guide the development of a communication strategy, the research results were summarised (Table 2) according to the fundamental risk communication research questions (Table 1).

**Table 2** Summary of key research findings, outlined against the questions in Table 1

<i>What do consumers know now about FT that is correct?</i>
<ul style="list-style-type: none"> <li>• The USA is:               <ul style="list-style-type: none"> <li>a susceptible to terrorism threats</li> <li>b susceptible to non-intentional food contamination, particularly microbial.</li> </ul> </li> <li>• FT could take the form of contamination of the food supply.</li> <li>• An elevated threat could be the result of intelligence or discovery of an incident.</li> <li>• The public will be alerted of an elevated threat, by the government, through mainstream media.</li> <li>• An elevated threat could result in food recalls. Secondary impacts include limited availability of food, rising food prices and decreased public confidence and trust.</li> <li>• Consumers are responsible to prepare for FT threat; the importance of emergency preparedness, including keeping sufficient stocks of food and water.</li> <li>• The importance of timely and relevant information for government officials and consumers to be able to effectively respond to FT threats.</li> </ul>
<i>What do consumers not know or what do they misunderstand that may be consequential?</i>
<ul style="list-style-type: none"> <li>• The complexity of the food system and its vulnerability to FT, including the role, responsibilities, authority and coordination of key government and industry partners; the role of the threat alert system.</li> <li>• FT threat potential other than contamination.</li> <li>• The degree of consumers' individual vulnerabilities FT based on geographic location and community demographics, including the degree of control individuals have (or do not have) in reducing their vulnerability of an FT attack through their personal food choices.</li> <li>• Where to go for information on FT (more specific than 'Google'); specific knowledge on effective (and not effective) emergency preparedness practices.</li> </ul>

**Table 2** Summary of key research findings, outlined against the questions in Table 1 (continued)

<i>What might consumers want to know?</i>
<i>Before an elevated alert (preparedness):</i>
<ul style="list-style-type: none"> <li>• The potential of an FT threat and likely scenarios on how that threat may play out.</li> <li>• How best to prepare for FT, or emergency preparedness more generally (e.g., how long they should be prepared to be self-sufficient; what and how much food to keep on hand; how best to store and rotate supplies).</li> </ul>
<i>After an elevated alert (response):</i>
<ul style="list-style-type: none"> <li>• Details about the threat itself, including whom, how and why.</li> <li>• Specific details about the food threat, including specific product types, product codes, purchase dates, locations, etc.</li> <li>• Actionable steps to respond, such as finding replacement sources of nutrition.</li> <li>• Specific information on how to detect potential contamination and be vigilant in monitoring the threat.</li> </ul>
<i>Whom do consumers trust?</i>
<ul style="list-style-type: none"> <li>• Federal government officials who are in charge – if they know who is in charge and if they have confidence in those officials to prepare for and respond to FT threats.</li> <li>• Their social network, such as family members and parent organisations who they think are more knowledgeable or have access to credible information.</li> <li>• Themselves.</li> </ul>
<i>What communication methods do consumers prefer?</i>
<ul style="list-style-type: none"> <li>• Television.</li> <li>• Internet (primarily ‘Google’). If directed, consumers will visit a particular website, such as the FDA website.</li> <li>• Pamphlets, brochures and websites focused on preparing for the potential for food threats.</li> </ul>
<i>What are the key factors that consumers consider when making judgments and decisions related to FT?</i>
<ul style="list-style-type: none"> <li>• Their family values: ensuring the health and well-being of their family.</li> <li>• Community values: patriotism and ensuring the health and well-being of Americans more broadly.</li> <li>• Their perceptions of FT and terrorism more generally.</li> <li>• Their confidence in the government and the food system to protect against, prepare for and respond to terrorism threats.</li> <li>• Their confidence in their personal control over their food choices, which influences their assessment of personal risk of FT.</li> </ul>

## 5 Discussion

Public health and consumer protection agencies have the opportunity – through their risk communication efforts – to better engage consumers in dialogue about FT. In doing so, consumers can become more active partners in the efforts to protect the food supply and

themselves against those threats. To support FDA's risk communication efforts, this qualitative research provided an in-depth characterisation of US consumers' priorities, perceptions and information needs regarding FT. The mental models research approach is uniquely suited to identify key communications needs and opportunities for a general population. It can also serve as a baseline for tracking consumers' evolving perceptions, priorities and information needs, providing insight into why beliefs may change over time. More structured quantitative research could provide more precise estimates of the prevalence of these priorities, beliefs and information needs and explore differences among population sub-groups of interest (Morgan et al., 2002).

### *5.1 Recommendations for consumer-focused risk communication*

Building on this research (summarised in Table 2) and others' (e.g., Lee and Lemyre, 2009), as well as general guidance on risk communication (Fischhoff, 1995; Thorne et al., 2006), we offer some considerations on the development of consumer-focused FT risk communication strategies and messages. These recommendations are consistent with FDA's agency-wide risk communications focus (FDA, 2009). While framed from a US perspective, they are applicable to and aligned with, risk communication initiatives internationally (Lofstedt, 2006; Thorne et al., 2006).

- *Foster awareness:* The groundwork for ensuring consumers' readiness for an FT threat begins with their awareness of that risk. This research suggests that FT is not on US consumers' radars. However, when stimulated to think about it, consumers do care, do have concerns, and can thoughtfully consider the need for government, industry and their own readiness. This suggests that there is a real opportunity to raise consumers' awareness and engage them in dialogue now. The risk of not doing so, or waiting until the situation calls for a crisis response, is that people may feel blindsided. They may be unprepared to respond and may react without a full understanding of the situation, which can lead to greater health, economic, psychological and social impacts, and risk the credibility of the food industry and government leaders (Fischhoff, 2005).
- *Provide context:* This research suggests that US consumers do not have a full picture of the food system and its vulnerability to FT. Without this context, consumers may not: understand their vulnerability as food consumers; know where to turn or what to look for in order to prepare or respond to FT; be able to appropriately interpret information they receive; or adequately gauge their confidence in the food system or their government. Communications should be designed to strengthen consumers' understanding of the food system, including the roles of key industry and government partners. They should convey the current threat of FT, including its likelihood and how it may play out, positioning those threats in context with related (and likely more salient) terrorism and/or food safety issues.
- *Communicate relevant facts:* Consumers need specific facts before, during and after an elevated threat of FT. Provided it is placed in the right context, communications should provide consumers with accurate, timely, relevant and credible information, including: the nature of specific threats (if known); the relevant uncertainty; potential health, economic and social impacts beyond direct contamination of food (e.g., food availability); specific and actionable strategies and tools, such as emergency plans

and checklists, explaining each strategy's benefits and costs so that consumers can weigh their tradeoffs. In the event of an elevated threat or an actual incident, consumers need (and want) to know the specific details of the threat and how they should best respond. Relevant facts should be communicated as they become known; for example, when food is again safe to eat (Chess et al., 2009; Hallman and Cuite, 2009).

- *Promote food safety and emergency preparedness:* This research suggests that US consumers do not have plans in place to specifically prepare for or respond to FT. In the event of an elevated threat, they will draw on their more robust mental models of food contamination, product recalls and severe weather events. Thus, a coordinated effort among public health agencies and their partners to promote food safety practices and emergency preparedness in general will increase consumers' capacity – and reduce their burden – to prepare for specific threats of FT (Tinker and Vaughan, 2004). It will also increase their capacity to respond to a spectrum of unforeseen, and more probable emergency events. In so doing, however, such communications on food safety and emergency preparedness should acknowledge FT as a potential threat to the food system.
- *Understand consumers' information needs:* Risk communicators cannot accurately predict how their messages will be understood and used, especially when the risk situation is unfamiliar to experts and consumers alike. For example, this research revealed that some consumers may be over-confident in their control over their vulnerability to FT through their food choices, a factor that was not anticipated by the experts, which could impede consumers' response to communications that suggested otherwise. Thus, communications should be systematically designed and pre-tested before being disseminated and continuously monitored and evaluated afterward (Fischhoff, 2005b; Thorne et al., 2006). Given its complexity, there is value in engaging consumers in developing and testing FT messages in advance of that threat, employing scenarios to focus people's thinking (Becker, 2004; Wray and Jupka, 2004; Casman and Fischhoff, 2008). This value increases if efforts are coordinated so as to identify common information needs spanning across a range of terrorism and food safety scenarios, thereby reducing the burden to develop specific messages (Eggers and Fischhoff, 2004; Wray et al., 2008).
- *Strengthen communications coordination among food defence partners:* Food defence requires effective coordination among a number of government and industry partners. It is essential that this coordination extend to risk communication efforts as well, ensuring a consistent and aligned framing and message. This research suggests that US consumers are confused about who in government would communicate with them about FT threats. Risk communication partners should clarify – well in advance of the threat – their respective communications roles and responsibilities and coordinate in the development of their messages. This extends to key industry partners, who can play an important role (Chess et al., 2009), for example, by communicating directly at point-of-sale.
- *Strengthen communication channels:* This research suggests that US consumers need direction on where to find information on preparing for FT or responding in the event of an attack. Communications strategies should include approaches to effectively reach consumers with the information they need, when they need it. Such

strategies should incorporate a full range of information channels, recognising that traditional media (particularly television) are still the best way to raise consumers' awareness and direct their attention. Partnering with key media outlets, public health agencies can channel consumers' information gathering to more comprehensive and credible information on their or their partners' website. Food safety initiatives that make use of social media (e.g., Twitter) may be an effective new channel for raising awareness and directing people to appropriate sources. Other channels, such as parent-teacher associations and non-profit organisations may be effective for promoting general awareness, food safety and emergency preparedness.

- *Establish credibility and trust:* Finally, this research and others suggest that even the best communications will fail if consumers lack confidence and trust in those communications (and, in particular the people standing behind those communications) (Sorenson, 2004; de Jonge et al., 2008). Consumers' trust is formed on the basis of what matters to them, and how they perceive their government leaders and the food system members act accordingly. This trust must be established well before a potential threat, and then sustained through the event (Graffeo et al., 2007). It requires continual commitment, coordination and communication by those responsible for managing the risk (Fischhoff, 2005b) and their risk communications partners.

## References

- Becker, S. (2004) 'Emergency communication and information issues in terrorist events involving radioactive materials', *Biosecurity and Bioterrorism*, Vol. 2, No. 3, pp.195–207.
- Bostrom, A., Morgan, M.G., Fischhoff, B. and Read, D. (1994) 'What do people know about global climate change? Part 1', *Mental Model*, *Risk Analysis*, Vol. 14, No. 6, pp.959–970.
- Bruemmer, B. (2006) 'Security of the food supply and bioterrorism preparedness', in Edelstein, S. (Ed.): *Nutrition in Public Health*, 2nd ed., pp.519–554, Jones and Bartlett Publishers, Sudbury, MA, Boston.
- Casman, E. and Fischhoff, B. (2008) 'Risk communication planning for the aftermath of a plague bioattack', *Risk Analysis*, Vol. 28, No. 5, pp.1327–1342.
- Chalk, P. (2004) *Hitting America's Soft Underbelly: The Potential Threat of Deliberate Biological Attacks Against the U.S. Agricultural and Food Industry*, RAND Publications, Santa Monica, CA.
- Chess, C., Reilly, M. and Cuite, C. (2009) 'Government as biosecurity communicator: the 2006 spinach advisory', *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, Vol. 7, No. 2, pp.144–152.
- Degeneffe, D., Kinsey, J., Stinson, T. and Ghosh, K. (2009) 'Segmenting consumers for food defence communication strategies', *International Journal of Physical Distribution & Logistics Management*, Vol. 39, No. 5, pp.365–403.
- De Jonge, J., van Trijp, J., van der Lans, I., Renes, R. and Frewer, L. (2008) 'How trust in institutions and organizations builds general consumer confidence in the safety of food; a decomposition of effects', *Appetite*, Vol. 51, No. 2, pp.311–317.
- Downs, J.S., Bruine de Bruin, W. and Fischhoff, B. (2008) 'Parents' vaccination comprehension and decisions', *Vaccine*, Vol. 26, No. 12, pp.1595–1607.
- Eggers, S.L. and Fischhoff, B. (2004) 'Setting policies for consumer communications: a behavioral decision approach', *Journal of Public Policy and Marketing*, Vol. 23, No. 1, pp.14–27.



- Eggers, S.L., Myaskovsky, L., Switzer, G, Burkitt, K, Fine, M. and Boninger, M. (2009) 'A descriptive model of wheelchair service delivery', *Archives of Physical Medicine and Rehabilitation*, Vol. 90, No. 6, pp.1030–1038.
- Fischhoff, B. (1995) 'Risk perception and communication unplugged: twenty years of process', *Risk Analysis*, Vol. 15, No. 2, pp.137–145.
- Fischhoff, B., Gonzalez, R., Small, D. and Lerner, J. (2003) 'Evaluating the success of terror risk communications', *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, Vol. 1, No. 4, pp.255–258.
- Fischhoff, B. (2005a) 'Scientifically sound pandemic risk communication', Paper prepared for U.S. House Science Committee Briefing: *Gaps in the National Flu Preparedness Plan, Social Science Planning and Response*, 14 December, available at [http://www.democrats.science.house.gov/Media/File/Events/05dec14Fluplan/fischhoff\\_fluplan\\_14dec05.pdf](http://www.democrats.science.house.gov/Media/File/Events/05dec14Fluplan/fischhoff_fluplan_14dec05.pdf) (accessed on 10 October 2010).
- Fischhoff, B. (2005b) 'The psychological perception of risk', in Kamien, D. (Ed.): *Handbook of Terrorism and Counter-Terrorism*, pp.463–492, McGraw-Hill, New York.
- Franco, C. and Deitch, S. (2007) 'Billions for biodefense: federal agency biodefense funding, FY2007–FY2008', *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, Vol. 5, No. 2, pp.117–133.
- Graffeo, M., Savadori, L., Lombardi, L., Tentori, K., Bonini, N. and Rumiati, R. (2007) 'Rebuilding consumer trust in the context of a food crisis', in Siegrist, M., Earle, T.C. and Gutscher, H. (Eds.): *Trust in Cooperative Risk Management: Uncertainty and Scepticism in the Public Mind*, pp.159–171, Earthscan, London.
- Green, J., Draper, A. and Dowler, E. (2003) 'Short cuts to safety: risk and 'rules of thumb' in accounts of food choice', *Health, Risk & Society*, Vol. 5, No. 1, pp.33–52.
- Hallman, W.K. and Cuite, C.L. (2009) *Food Recalls and the American Public: Improving Communications (Publication number RR-0310-020)*, Rutgers, The State University of New Jersey, Food Policy Institute, New Brunswick, New Jersey.
- Lee, J.C. and Lemyre, L. (2009) 'A social-cognitive perspective on terrorism risk perception and individual response in Canada', *Journal of Risk Analysis*, Vol. 29, No. 9, pp.1265–1280.
- Lemyre, L., Turner, M.C., Lee, J.E.C. and Krewski, D. (2006) 'Public perception of terrorism threats and related information sources in Canada: implications for the management of terrorism risks', *Journal of Risk Research*, Vol. 9, No. 7, pp.755–774.
- 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, No. 8, pp.869–890.
- Lupton, D. (2005) 'Lay discourses and beliefs related to food risks: an Australian perspective', *Sociology of Health & Illness*, Vol. 27, No. 4, pp.448–467.
- Morgan, K. (2005) 'Development of a preliminary framework for informing the risk analysis and risk management of nanoparticles', *Risk Analysis*, Vol. 25, No. 6, pp.1621–1635.
- Morgan, M.G. and Henrion, M. (1990) *Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis*, Cambridge University Press, Cambridge.
- Morgan, M.G., Fischhoff, B., Bostrom, A. and Atman, C.J. (2002) *Risk Communication – A Mental Models Approach*, Cambridge University Press, New York.
- Palmgren, C., Morgan, M.G., Bruin de Bruine, W. and Keith, D. (2004) 'Initial public perceptions of deep geological and oceanic disposal of carbon dioxide', *Environmental Science and Technology*, Vol. 38, No. 24, pp.6441–6450.
- Parkin, R., Ragain, L., Embrey, M., Peters, C., Butte, G. and Thorne, S. (2004) *Risk Communication for Emerging Contaminants (Project Number 2776)*, American Water Works Association, Denver, CO.
- Slovic, P. (2000) *The Perception of Risk*, Earthscan Publications, Ltd., London.
- Smit, B. and Wandel, J. (2006) 'Adaptation, adaptive capacity and vulnerability', *Global Environmental Change*, Vol. 16, No. 3, pp.282–292.

- Sorenson, J. (2004) 'Risk communication and terrorism', *Biosecurity and Bioterrorism: Bio Defence Strategy, Practice, and Science*, Vol. 2, No. 3, pp.229–231.
- Stinson, T.F., Kinsey, J., Degeneffe, D. and Ghosh, K. (2007) 'How would Americans allocate anti-terrorism spending? Findings from a national survey of attitudes about terrorism', *Homeland Security Affairs*, Vol. 3, No. 2, available at <http://www.hsaj.org/?article=3.2.3> (accessed on 2 October 2010).
- Stinson, T.F., Ghosh, K., Kinsey, J. and Degeneffe, D. (2008) 'Do household attitudes about food defense and food safety change following highly visible national food recalls?', *American Journal of Agricultural Economics*, Vol. 90, No. 5, pp.1272–1278.
- Thorne, S.L., Butte, G., Ramsay, L. and Chatigny, L. (2006) *Strategic Risk Communications Framework and Handbook*, Health Canada and the Public Health Agency of Canada, Thorne Butte: Decision Partners Inc.
- Tinker, T. and Vaughan, E. (2004) 'Communicating the risks of bioterrorism', in Ursano, R.J., Fullerton, C.S. and Norwood, A.E. (Eds.): *Bioterrorism: Psychological and Public Health Interventions*, pp.308–331, Cambridge University Press, New York.
- Turvey, C.G., Onyango, B. and Hallman, W. (2007) 'Consumers' perception of food system vulnerability to an agroterrorist attack', *Food Distribution Research*, Vol. 38, No. 3, pp.70–87.
- US Department of Homeland Security (2009) *Homeland Security Advisory System Task Force Report and Recommendations*, available at [http://www.dhs.gov/xlibrary/assets/hsac\\_final\\_report\\_09\\_15\\_09.pdf](http://www.dhs.gov/xlibrary/assets/hsac_final_report_09_15_09.pdf) (accessed on 10 August 2010).
- US Food and Drug Administration (2003) *Risk Assessment for Food Terrorism and Other Food Safety Concerns*, available at [http://www.doh.state.fl.us/Environment/community/foodsurveillance/preparedness\\_resource\\_1inks.htm](http://www.doh.state.fl.us/Environment/community/foodsurveillance/preparedness_resource_1inks.htm) (accessed 2 October 2010).
- US Food and Drug Administration (2005) *Strategic Partnership Program Agroterrorism (SPPA) Initiative*, available at [http://www.fda.gov/Food/Food defense/Food defensePrograms/ucm080836.htm](http://www.fda.gov/Food/Food%20defense/Food%20defensePrograms/ucm080836.htm) (accessed on 2 October 2010).
- US Food and Drug Administration (2009) *Strategic Plan for Risk Communication*, available at <http://www.fda.gov/AboutFDA/ReportsManualsForms/Reports/ucm183673.htm> (accessed on 10 February 2010).
- US Food and Drug Administration (2010a) *Food Defense and Emergency Response*, available at <http://www.fda.gov/Food/FoodDefense/default.htm> (accessed on 2 October 2010).
- US Food and Drug Administration (2010b) *Interactive Media*, available at <http://www.fda.gov/NewsEvents/InteractiveMedia/default.htm> (accessed on 18 October 2010).
- Wessley, S. (2005) 'Don't panic! Short and long term psychological reactions to the new terrorism: the role of information and the authorities', *Journal of Mental Health*, Vol. 14, No. 1, pp.1–6.
- World Health Organization (2008) *World Health Organization Terrorist Threats to Food Guidance for Establishing and Strengthening Prevention and Response Systems*, available at [http://www.who.int/foodsafety/publications/fs\\_management/terrorism/en/](http://www.who.int/foodsafety/publications/fs_management/terrorism/en/) (accessed on 2 October 2010).
- Wray, R. and Jupka, K. (2004) 'What does the public want to know in the event of a terrorist attack using plague', *Biosecurity and Bioterrorism*, Vol. 2, No. 3, pp.208–215.
- Wray, R.J., Becker, S.J., Henderson, N., Glik, D., Jupka, K., Middleton, S., Henderson, C., Drury, A. and Mitchell, E.W. (2008) 'Communicating with the public about emerging health threats: lessons from the pre-event message development project', *American Journal of Public Health*, Vol. 98, No. 12, pp.2214–2222.