CONSUMER REACTIONS TO FOOD SAFETY CRISES

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I. INTRODUCTION

Improving nutrition is essentially a process of encouraging people to make healthful choices that improve their well-being (Wansink, 2005). What happens, however, when we believe contamination, terrorism, or a genetic incidence threatens a part of the food supply? Sometimes crises influence the recall, redesign, and communication efforts of individual companies (such as Tylenol, Perrier, Pilgrim's Pride). Others, such as the threat of "mad cow" disease (bovine spongiform encephalopathy, or BSE) in beef can compromise an entire industry.

One of the dangers of food safety crises is that they can be triggered by concurrent events that can distort reality (Bartholomew and Goode, 2000). The tragedy of 9-ll triggered hypersensitive concerns about anthrax poisoning, but such concerns could just have easily been triggered by an unrelated food poisoning. Yet the behavior of consumers in a crisis situation is not always consistent with the true level of risk they face. This chapter examines how seemingly inconsistent behaviors of consumers can be explained by differences in these risk perceptions and risk attitudes. Knowing the drivers of behavior provide insights on whether the solution to the crisis lies in more effective communication efforts or in more drastic measures with respect to the product supply (such as recalls or product eliminations).

The study of risk perception has been punctuated with controversy, conflict, and paradigm shifts. Despite more than three decades of research, scientists' understanding of risk assessment remains fragmented and incoherent. Until recently, eating food has been viewed as a low-risk activity and perceived risk was primarily related to matters of hygiene. Recently, however, the safety of food supplies has been called increasingly in to question. Consider a recent chronology of food scares (Scholderer, 2002):

1996: BSE/CJD link discovered
1997: Contagious swine fever in The Netherlands
1998: Arpad Pusztai and the GM potato hoax
1999: Contaminated Coca-Cola in Belgium
1999: GM maize kills Monarch butterflies
2000: BSE hits continental Europe
2001: Antibiotics and growth hormones in German pigs
2001: Foot-and-mouth disease all over Europe
2002: *Escherichia coli* in ConAgra Beef
2002: *Listeria* in Pilgrim's Pride chicken

Prior to these food safety scares, theories of risk have been constructed with reference to environmental and technological hazards, such as nuclear power, while neglecting food issues. In this last decade, however, attention

has moved toward the study of food risk. Within this, food risk research has focused almost exclusively upon attempting to explain the divergence of opinion that exists between experts and the lay public has neglected to address why this divergence exists (Knox, 2000).

Food safety crises illustrate dramatically the need to understand why and how consumers react in the way they do. Moreover, not all crises are created equal. While crises related to BSE and hoof-in-mouth disease have received a great deal of press (Abbott, 2001), it is illustrative to note other more isolated incidents that have occurred in the recent past (Smith *et al*., 1988). Some, such as those dealing with Tylenol or Perrier, are more brand based, whereas others are more commodity-based (see Table I). While each crisis is slightly different, they all involved a state of panic that could have been reduced, if not eliminated, if appropriate efforts had been taken through precrisis planning or though postcrisis response. One reason why many of these past food scares have been reasonably disastrous has been because little thought had been given to the potential of a crisis before it actually happened. Another reason is that people have been treated as responding in a homogeneous manner (Modan *et al*., 1983; Smelser, 1962). This is absolutely wrong to do.

An important theme to this review is that people respond to food crises differently. We can still, however, achieve a reasonable degree of predictability by segmenting them into somewhat homogeneous groups based—not on demographics—but on a person's risk perceptions and risk attitude. For every crisis there will be accountable, concerned, conservative, and alarmist segments of consumers. Knowing their relative size will enable us to better predict the effectiveness of different interventions.

Yet just as all people are not alike, neither are all food crises alike. They can vary in their familiarity, severity, proximity, consequence, and the extent to which they can be avoided. This review covers a wide range of crises from bacteria contamination, to product tampering, to fears related to irradiation and biotechnology. Different types of crises will be evaluated differently by different groups of consumers. What has been done in this review is to focus on "worst-case" scenarios involving initial responses to food safety issues. These will provide the most clear and illustrative profiles of consumer response. Less extreme scenarios will elicit less extreme responses.

After showing how consumer attitudes toward food safety are formed, this review distinguishes four different segments of consumers who would be most influenced and most influential during a food crisis. Decoupling the risk response behavior of consumers into the separate components of risk perception and risk attitude shows how these different segments of consumers will react differently in a crisis situation. Using these insights, suggestions are made for precrisis preparations and postcrisis responses.

TABLE I
WHAT IS THE POTENTIAL IMPACT OF A FOOD CRISIS?

Description	Consumer reaction	What was done	Aftermath
Tylenol and cyanide (1982, US). Seven people died in Chicago after ingesting Extra Strength Tylenol (Johnson & Johnson)	Nationwide panic.	Police drove through Chicago warning people with loudspeakers. FDA advised avoidance of Tylenol capsules. J&J immediately recalled 31 million bottles and alerted consumers not to consume capsules until source of tampering was determined. The production and advertising of Tylenol capsules were stopped, and tablets were exchanged for capsules.	Copycats afterwards, 36 product tampering episodes. Tylenol was reintroduced with new tripleseal tamper-resistant packaging six weeks later. J&J offers coupons, discounts, J&J affiliates make presentations to medical community; Tylenol comeback was a success.
Edwina Currie Fiasco (1988, GB). Junior Health Minister admitted most of UK's eggs were contaminated with *Salmonella*	Demand for eggs failed. Lingering downturn of egg consumption.	Four million hens were slaughtered and 400 million surplus eggs destroyed.	*Salmonella* poisoning is a permanent problem; 30,000 cases in England and Wales every year. Health minister resigned.
E. coli poisoning (1996, Scotland). 21 people died, 500 ill	It came from a local butcher shop (who had recently won the award for Best Scottish Beef Butcher of the Year).	The butcher was asked to stop selling cooked meat products the morning after the outbreak was discovered.	Scotland's most serious food poisoning event since 1964. Permanent problem everywhere; several cases every year, affecting thousands of people worldwide.

ConAgra Beef (June 2002, US). *E. coli* in beef products, 13 deaths	Twenty-five victims total. ConAgra agreed to pay the medical and lost-wage costs of 13 victims in Colorado ($1 million each)	ConAgra recalled 354,000 pounds of beef products. Media warned about *E. coli*	Victims accepted ConAgra's payment of medical expenses, also agreed not to file lawsuits against the company
Listeria in chicken (2002, US). Listeria in Pilgrim's Pride products, 23 deaths, 120 ill	Many people affected. Eight states renewed the push to reform the laws that govern meat inspection	Meat recalled by the company (27 million pounds). Was called by media the "U.S. largest meat recall," but discovered afterwards that it was exaggerated (two other events caused larger recalls)	2,500 cases of listeriosis occur annually in the United States
Taco Shells & Starlink (2000, US). Taco shells contained 1% corn not approved by FDA for human consumption	The environmental group Friends of the Earth, which commissioned independent lab testing of the corn product, first reported contaminated taco shells. Greenpeace writes: "Taco Bell or Taco Hell?"	Taco Bell and other food companies recalled 300 products (150 brands of corn chips, taco shells, corn dogs, corn bread, breakfast cereals and polenta), but decided to continue selling taco shells obtained from the same supplier.	Thousands of Taco Bell restaurants and others filed a lawsuit alleging that a group of national and international corn and biotechnology firms acted together to cause a collapse of the U.S. corn market.
Perrier water and benzene (1990, US). Levels of benzene found in Perrier, a bottled water drink known for its purity	Few people panicked, except then-senator Al Gore: "I am not going to be satisfied until thousands of rats have consumed millions of bottles of Perrier and survived."	Perrier recalled its entire U.S. inventory (72 million bottles) and stopped production worldwide.	It was an "all-natural" health scare. The company discovered benzene occurred naturally in the spring that served as the source for Perrier, it just needed a filter change (a pack of cigarettes had up to 2000 times the level of benzene found in the tainted Perrier.)

While precrisis preparations can eliminate the crisis altogether, postcrisis responses can help manage a crisis when it does occur.

II. A FRAMEWORK FOR UNDERSTANDING PUBLIC PANIC

The study of risk perception has been punctuated with controversy, conflict, and paradigm shifts. Despite more than three decades of research, scientists' understanding of risk assessment remains fragmented and incoherent. Until recently, eating food has been viewed as a low-risk activity with the only risks or fears being related to matters of either hygiene or scarcity. Consequently, theories of risk have been constructed with reference to environmental and technological hazards, such as nuclear power, while neglecting food issues. Following a decade of "food scares," however, attention has moved toward the study of food risk. Unfortunately, it has focused almost exclusively upon attempting to explain the divergent opinions between experts and the public, and little attention has been focused on food risk and panic itself (Knox, 2000).

A basic, but misguided view of how consumers respond to a food safety crisis is often characterized in Figure 1 as a linear process: There is a crisis, there are crisis-related communications (from an company, industry, or government), consumers hear these messages, and they respond.

In reality, consumer response is more sophisticated. Different segments respond differently, and precrisis considerations (such as previous knowledge and precrisis communication) need to be accounted for. Therefore, a more complete and useful framework of how consumers respond to food crises is presented in Figure 2.

At the center of the framework is the notion that there are different segments of consumers who will respond to a food crisis in different ways. Instead of trying to define them demographically by their education level, ethnicity, or income, they are instead defined psychographically by whether they have low or high perceptions of risk (e.g., "What is the risk of this beef having BSE?") and by whether they have low or high levels of preexisting attitudes toward risk (e.g., cautious versus not cautious). Based on a combination of the risk perceptions of these consumers and their preexisting attitudes toward risk, consumers are identified as belonging to one of four different segments: accountables, conservatives, concerned, and alarmists.

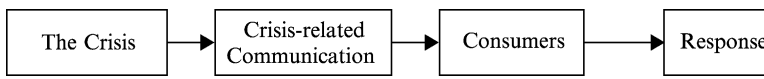

FIG. 1 Stimulus response model of crisis communications.

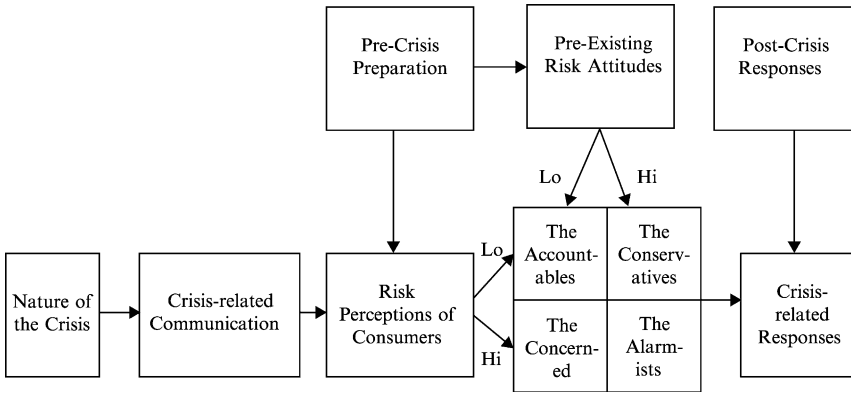

FIG. 2 Consumers responses to food safety crises.

The focus on this chapter is in understanding the four segments in the center of the framework. Following this, various efforts related to precrisis preparations and postcrisis responses are described. Before doing so, it is important to understand how consumers form their basic perceptions of risk.

III. UNDERSTANDING CRISIS-RELATED COMMUNICATION

It is important to realize that when it comes to food safety issues, it is not the dramatic, catastrophic events that are the greatest current concern. Studies by the Food Marketing Institute indicate that bacteria, product tampering, and pesticide residues top the list of the items most likely to constitute a health risk (see Figure 3). Interestingly, however, the two concerns that have increased since the late 1990s are those related to product tampering and biotechnology. Since the late 1990s, increases in food safety-related fears relate to direct human intervention. In some cases, this is intentional malevolent intervention (such as bioterrorism or sabotage), whereas other cases are nonmalevolent interventions that simply have tragic unforeseen consequences.

In recent times, awareness of food safety crises comes primarily from the media. The media can inform but also scare the public with headlines such as "Restaurants from Hell" or with the use of evocative, tabloid-selling terms like "frankenfoods." The effectiveness of the media in instilling a sense of urgency or panic in people can often be seen in the way they cover publicity-related efforts from special interest organizations, such as associations centered on the environment, animal activism, and ecoterrorism.

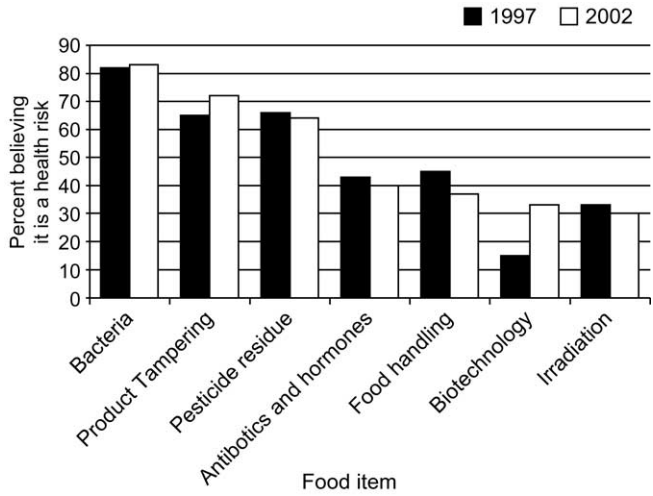

FIG. 3 Which food-related items constitute a health risk? From the Food Marketing Institute (2003).

In evaluating the effect of the media, consider the phrase "food scare." As Figure 4 indicates, it was not until the mid-1980s (with the Tylenol scandal) that the term "food scare" appeared in the media. Since then its use has become widespread, despite no greater incidence of food-related crises. This enhanced coverage of food safety is also illustrated with the dioxin scare. During that time, the Belgian government responded to this dioxin scare with a traditional telephone help line and a Web site. The help line received 3000 calls in 2 days, while the Web site received 150,000 "hits."

In communicating information about a food scare, there is recent evidence that the media might be more influential than one-on-one interactions. Empirical research conducted in April 1998 indicated that mass media had a negative impact on consumer risk perceptions, health concerns, and attitude and behavior toward meat. Compared to alarming reports of the press, personal communication (through butchers for meat products, for example) had only a small effect on consumer decision making (Verbeke *et al.*, 1999).

A. DOES THE MEDIA MAKE THE CRISIS?

Although the media can be more effective than some forms of personal communication, it is not clear whether it simply reports a crisis to be or whether it is instead instrumental in creating the crisis. Despite the allegation

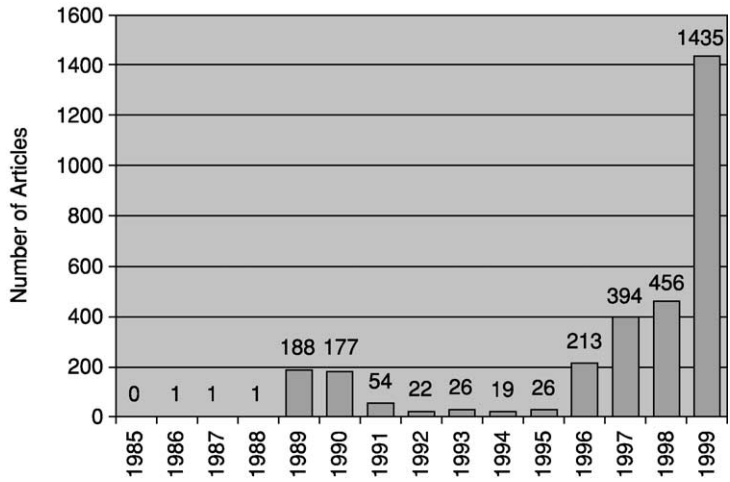

FIG. 4 English-language media articles mentioning the words "food scare." From Reuters Business Briefing Database (2003).

that the mass media tend to exaggerate risk and sometimes "blow it out of proportion," there is little empirical evidence of this. However, Frudenburg *et al.* (1996) analyzed how emotionalism influenced the actual coverage levels of 128 hazard events that were sampled systematically. Somewhat surprising to some, their analyses indicated that the reporting of events did not have a significant impact on emotionalism when compared with the driving influences of objective information, such as the number of causalities or the level of damage (in dollars, pounds, or Euros).

For many incidents (including those with nuclear or toxic hazards), the net effect of the full stories was often to lessen the emotions associated with the events. The one potential bias these researchers discovered was that media coverage tended to create an overall impression that the "responsible authorities" were acting more responsibly than might be assumed based only on factual summaries. It may be that the widespread impression of media as crisis maker may well have to do with the selective perceptions of those making the allegations than with the actual pattern of media reporting (Freduenburg *et al.*, 1996).

A cross-national study looked at how newspapers in Sweden and the United Kingdom characterize a variety of risks, focusing on 2 months around the 10th anniversary of the Chernobyl accident (Rowe *et al.*, 2000). Approximately four times as many reports about the risk

were found in Sweden as in the United Kingdom, possibly reflecting Swedish safety culture. In addition, reports about hazards tended to be alarmist rather than reassuring and rarely used statistics to express degrees of risk.

As noted earlier, food safety crises can be triggered by concurrent events that can distort reality. The tragedy of 9–11 triggered hypersensitivity about anthrax poisoning, and these concerns could just have easily been triggered by an unrelated food poisoning. Similarly, when the outbreak of health complaints happened in Belgium in June 1999, the public allegedly overreacted. This reaction was partly related to it occurring in the wake of a major food crisis (the PCB/dioxin contamination of animal feed) that had erupted shortly before.

B. SOURCE CREDIBILITY AND CRISIS COMMUNICATIONS

Factors such as hazard type and source credibility have been identified as important in the establishment of effective strategies for risk communication (Frewer *et al*., 1997). One means by which to measure credibility is the Meyer's credibility index (McComas and Trumbo, 2001). This has proven useful for measuring source credibility in the context of environmental health-risk controversies, and it would seem to be relevant for measuring food risks in a food crisis situation. A key element of this credibility index is trust.

Trust in risk information about food-related hazards is an important determinant of public reactions to risk information. One of the central questions addressed by the risk communication literature is why some individuals and organizations are trusted as sources of risk information whereas others are not. Industry and government often lack public trust, whereas other sources are highly trusted (such as consumer organizations, selected media, and physicians). Their analyses indicate that knowledge in itself does not make one a trusted source, but that trusted sources are characterized by multiple positive attributes.

A study of the perceived trustworthiness of different sources of information about food safety was reported in the Eurobarometer (1998). It indicated the trust in consumer associations was the highest, followed by national authorities. Overall, sources of information about food safety were least trusted from producers, companies, and market venders. Following is the percentage of respondents perceiving each of the information sources as completely trustworthy:

52% trustworthy—Consumer associations
27% trustworthy—National authorities

21% trustworthy—European institutions
19% trustworthy—Small grocers
18% trustworthy—Supermarkets
16% trustworthy—Market venders
12% trustworthy—Producers

Another study indicated that attitudes toward biotechnology changed depending on whether the source of information was attributed to consumer organizations, the government, or to government–consumer organization collaboration. Admission of a certain amount of risk uncertainty increased trust in the attributed source by consumers with prior negative attitudes (Frewer *et al.*, 1998).

Who could most effectively deliver a food safety message? The most trustworthy sources are consumer organizations (Van Ravenswaay *et al.*, 1992), environmental groups, and researchers, while industry is seen as the least trusted source (Borre, 1990a). In parallel findings, when Mistra *et al.* (1995) asked respondents to express their confidence about different food safety information sources, the most trusted group was university scientists, followed by independent laboratories, and consumer groups. Given this distrust toward companies, one way to help improve their credibility is to use consumer groups to corroborate, support, or deliver the appropriate message.

In further analyzing how the crisis influences consumers, Smith *et al.* (1999) discovered that confidence in all sources dropped after their announcement of a BSE/Creutz–Jakob disease (CJD) crisis in March of 1996 in Great Britain. Consumers were asked about seven different information sources, as well as the extent to which "I trust the following sources of information in terms of the advice they give about the safety of meat/BSE." Although confidence in all sources dropped, the confidence in family and friends dropped the least.

Loss of belief in science is the result of media reports of contradictory research by scientists on a wide range of (mainly health) issues and a belief that science was often used for questionable ends (cloning, developing drugs for profit, and others). Trust in medicine is diminishing following media coverage of mistakes and bad practice by doctors. These concerns influence perceptions of food and food safety: if scientists and medical researchers cannot all be trusted, this undermines the information and opinions they provide about food.

The case of BSE illustrates important issues related to trustworthiness. A study of Germany, the Netherlands, and the United States indicated a strong relationship between how these people trust information from their government and how concerned they are with eating beef (Pennings

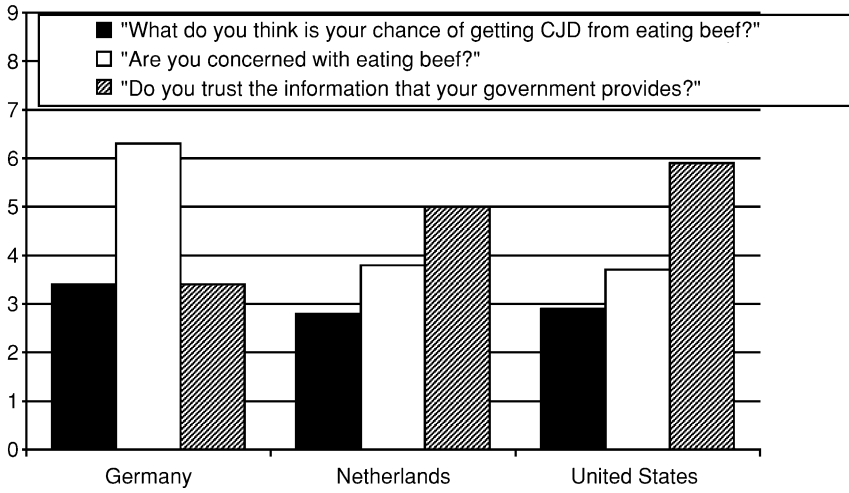

FIG. 5 As trust in government-related BSE information increased, fear decreased.

et al., 2002). Figure 5 illustrates that as trust in government-related BSE information increased, fear with eating beef decreased. This occurred even though the perceived likelihood of contracting CDJ disease was seen as relatively constant. That is, in countries where people trusted the information, such as the United States and The Netherlands, people were less concerned with eating beef than in Germany, where people did not trust information from the government. This had nothing, however, to do with the actual risk of contracting the disease because this risk was seen as constant in all three countries.

It has generally been believed that the expertise level and the trustworthiness of a source affects whether we are influenced by his or her messages. Evidence suggests that our attitudes toward a behavior like eating food (its benefits and its risks) are more related to our prior attitudes and to food neophobia than to what a trusted expert tells us.

In their study of biotechnology, Frewer *et al.* (2001) found that while overall prior attitude and food neophobia influenced both the perception of a source's expertise and trustworthiness, no source-related factor had any increased effect on the perceived benefit or perceived risk of consuming the product (see Figure 6). This finding is important because it directly contradicts the conventional belief that these benefits and risks are influenced by an information source. In some cases, they seem to be influenced more by prior views than by the messenger.

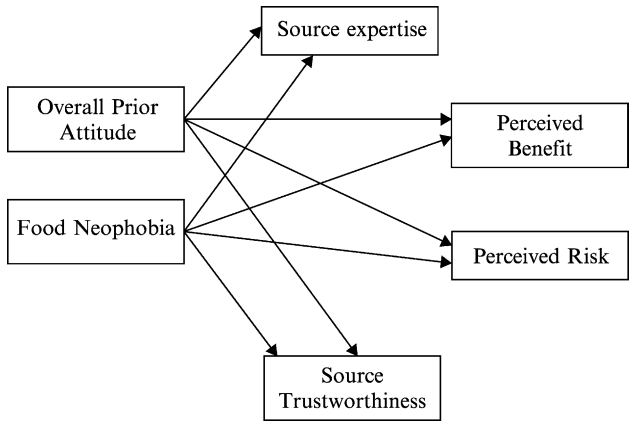

FIG. 6 How does source trustworthiness influence attitude change? From Frewer *et al.* (2001).

IV. PERCEPTIONS AND ATTITUDES: THE FOUNDATION OF CONSUMER RESPONSES

Behavior related to food crises is based on risk perceptions and on risk attitudes related to the crisis (Wildavsky and Dake, 1990). This section focuses on how these can be combined to influence behavior. When examining how people form attitudes, it is useful to examine biotechnology. It can best illustrate how attitudes are formed under conditions of uncertainty (Tait, 1988).

A. HOW PERCEPTIONS AND ATTITUDES ARE FORMED

Consumers' attitudes toward biotechnology are divided and do not appear to be moving toward consensus. When asked "What is your opinion toward biotechnology?" one mail survey of 1036 Americans indicated that 31% favored it, 18% opposed it, 26% had mixed feelings, and 26% did not care or had no opinion (Doyle, 2000). Even within each of these groups, their opinions are as diverse as the people expressing them (Fischoff *et al.*, 1978). The differential acceptance of genetically modified products among consumers can be attributed to the different ways in which they process information about biotechnology and related products. Some people carefully weigh potential benefits more heavily than risks. Others form these attitudes solely based on "sound bites" they hear on TV or at work.

Some consumers focus on the benefits of biotechnology, whereas others focus on the risks (Frewer *et al.*, 1997). Some study the issue carefully, while others view it emotionally (Anderson, 2000b). According to consumer psychology, there are two general ways or routes—central and peripheral—in which their attitudes are formed (Petty and Cacioppo, 1981). When people are motivated to understand an issue and have the ability and opportunity to do so, their attitudes will be formed through a *central route of attitude formation*. When they are not motivated to understand the issue, lack the technical or cognitive ability to understand it, or lack the opportunity to think about it, any message they hear will be processed peripherally.

In this framework, a person's values, beliefs, and information processing style all contribute to how he or she understands the benefits and risks of the biotechnology process and of specific biotechnology foods (Frewer *et al.*, 1998). These factors, in turn, combine to form a person's attitude toward biotechnology. Figure 7 illustrates the two different routes of forming attitudes toward biotechnology and emphasizes the distinction between accepting the *process* of biotechnology versus accepting the *products* of biotechnology.

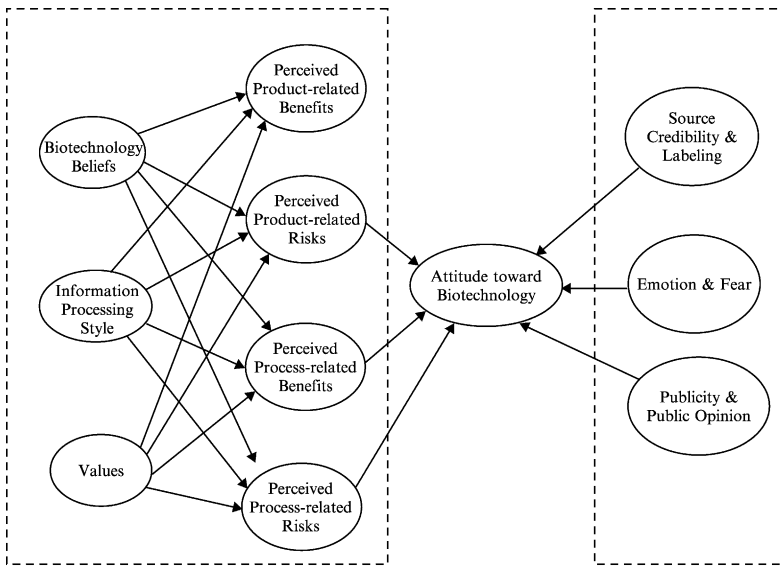

FIG. 7 Determinants of consumer attitude food risks: The case of biotechnology (Wansink and Kim, 2001).

1. *The central route to persuasion—trading-off benefits and risks*

When attitudes are formed centrally, a consumer's attitude toward biotechnology is determined by beliefs about various aspects of biotechnology weighted by the importance he or she gives to each belief (Fishbein and Ajzen, 1975). Attitude is the net sum of all positive and negative beliefs about the target weighted by their importance [attitude $= \sum$ (belief$_i$ * importance weight$_i$)]. Because beliefs are subjective, they are not always correct and can vary dramatically across consumers. Furthermore, the importance weights given to specific information or beliefs can vary across people even if they share some common beliefs. These differences can lead two people with very similar experiences and beliefs to have different attitudes toward biotechnology.

Studies have shown that many consumers generally view genetic engineering technology as a risky process (Sparks *et al.*, 1994; Wohl, 1998). Some people perceive environmental risks (threats to ecological balance and reduced biological diversity), safety risks (lack of control and difficulty in measuring safety), and ethical considerations (the discomfort with "playing God," concerns for health and welfare of animals, and religious concerns). However, if genetically modified products offer important benefits, these benefits can outweigh the perceived risks related to genetic engineering technology (Hamstra, 1995). For instance, just as there were environmental risks, there are also environmental benefits (reduced use of chemical pesticides and water and soil protection), healthcare benefits (development of medicines and "edible vaccines" along with better nutrition and food quality), and agricultural benefits (protection against diseases, increased productivity, and biodiversity and sustainability).

2. *The peripheral route to persuasion and the silent majority*

When consumers have little motivation to process biotechnology information, little ability to understand it, or little time to digest it, the peripheral route will form their opinions. The information may be too complex or too general to integrate into a belief system. For instance, Frewer *et al.* (1993) observed that while risks from microbiological hazards are often reported in quantitative terms (i.e., number of occurrences and percentage of increase or decrease), risks from food applications can instead be stated using unqualified terms such as "bad" and "thus should be avoided." If this is true, then either type of information will lend itself to being processed centrally.

This lack of access to understandable information combined with the lack of ability to process complex biotechnology information leads many

consumers to engage in more heuristically or peripheral processing when forming attitudes toward biotechnology (Bredahl *et al*., 1998). Their focus is not on the claims and arguments made in the message, but is instead on nonmessage factors or cues, such as public opinion, sound bites, emotions generated by advertising, labeling, or the credibility of spokespeople or endorsers.

This general notion that people can be aware of an issue without having specific knowledge of it is well supported. Sheehy *et al*. (1998) reported that the majority of consumers, even highly educated ones, had little or no *knowledge* of biotechnology. Their *awareness* of biotechnology, defined as "having heard of the term," was high, however. This "high awareness but low knowledge" characterization is common in the biotechnology area because genetic engineering is new and complex (Roberts, 1994). Therefore, consumers can be aware of a biotechnology application while making no associations between it and the genetic engineering process that created the novel characteristics.

B. HOW RISK PERCEPTIONS INFLUENCE BEHAVIOR

Food safety crises have the potential to dramatically illustrate the need marketers have to understand why and how consumers react to a crisis. Such crises can be seen as widespread, catastrophic, and of irrevocable consequence. The crisis of mad cow disease is a very representative example of such crises because of its economic consequences to an entire industry and an entire continent (Aldhous, 2000). To examine how different countries are influenced, Pennings *et al*. (2002) conducted two field studies with consumers in Germany, The Netherlands, and the United States that have responded differently to the crisis. They showed that the relative influence of risk perception and risk attitude on consumers' reactions depend on the accuracy of knowing the probability of being exposed to the risk. These results suggest that while clear, forthright, and consistent communication is effective in some countries, other countries require more extreme measures with respect to product supply (Dake, 1991). Decoupling risk attitudes from risk perceptions can be valuable in determining what really drives various segments of consumers in crisis situations. Knowing these drivers suggests what solutions will be most effective in controlling such crises.

Perceived risk is a key component of consumer behavior (Frewer *et al*., 1994). However, decision making and behavior are often analyzed and reported *only* in terms of perceived risk (Brockhaus, 1980; Srinivasan and Ratchford, 1991). Perceived risk, however, only partially explains actual behavior. It is only when combined with a person's attitude toward risk can we understand and predict behavior to food-related issues.

Risk perceptions refer to a consumer's estimate of how likely they will be exposed to the content of the risk ("I have a 1 in 100,000 chance of contracting a BSE-related disease if I eat beef"). *Risk attitude* reflects a consumer's general predisposition to risk in a consistent way. It is important to emphasize that risk attitude and risk perception are two different concepts. Whereas risk attitude deals with a consumer's interpretation of the content of the risk and how much he or she dislikes it, risk perception deals with a consumer's interpretation of the likelihood of being exposed to the content of the risk.

While both a consumer's risk attitudes and risk perceptions individually influence their behavior, it has been shown—in the context of BSE—that it is the *combination* of risk attitude and risk perception that has the biggest influence on behavior (Pennings *et al*., 2002). That is, regardless of one's risk attitude, there will be no change in one's behavior if a person perceives no risk in a situation. However, if a person does believe a behavior has some risk involved (such as eating beef during the BSE scare), it is their attitude toward risk (it is worth the risk to eat beef vs. it is not worth the risk) that eventually determined their behavior and not simply their assessment of the risk itself.

When risk-averse consumers perceive risk, they will exhibit risk management behavior (behavior that decreases risk exposure). However, when risk-seeking consumers perceive risk, they will exhibit risky behavior or seek out ways to increase their risk (because of the corresponding payoff). The interaction between risk attitude and risk perception represents how one intends to cope with risks in the channel combined with the risks their actions generate.

It has been claimed that people's perceptions of risk and benefit associated with particular products and applications will determine acceptance (Frewer *et al*., 1998; Slovic, 1987, 1993). This is not the case; the acceptance of a product is determined by a combination of both risk perceptions and risk attitudes.

By decoupling risk response behavior into the separate components of risk perception and risk attitude, a more robust conceptualization and prediction of consumer reactions are possible. The insights that result from decoupling risk perceptions and risk attitudes can yield important implications. Consider the two following outcomes from a program of research by Pennings *et al*. (2002):

> Outcome #1. Suppose that risk perception is the main driver of a consumer's reaction to a food safety scare. This would suggest that communicating research information effectively is a powerful tool in changing behavior. That is, providing and communicating the "true" probabilities of being exposed to the risk (when possible) will be a useful way to respond to consumers concerns.

Outcome #2. Suppose, however, that risk attitude is the true driver behind a consumer's reaction to a food safety scare. In such a case, even if probabilities of being exposed to the risk are small, an effective communication of these probabilities will have little influence on a consumer's behavior. Instead, marketers will have to focus on ways to eliminate the risk. This may involve a total recall or an elimination of the risk (slaughtering of all potentially infected cattle or recall of all potentially tainted food).

Compared to other risky activities, such as parachuting or motorcycling, risks related to food safety are unique. While some risks can be avoided, food safety-related risks can only be bypassed to a limited extent. Even when a person switches from one product to another, contaminated food still remains harder to avoid than parachuting, especially in the incipient phase where the risk is not yet known to the public and when consumers do not have full control over these risks.

As can be seen in Figure 8, risk perceptions can vary quite dramatically across segments and these perceptions are not always related to the reality of the risks. Germans perceive there is a higher likelihood of fatalities from eating BSE-tainted meat than Americans. While this can be a function of a great many things (such as media coverage and trust in government agencies), this can have a dramatic influence on behavior depending on whether a consumer is risk averse or not.

Although such tendencies are often viewed individually or by segments, it also appears that generalizations can even be made across some country segments. For instance, it appears that Germans are much more influenced by their attitudes toward risk than by their actual perceptions of risk. In a controlled scenario-based study involving consumers from Germany, The Netherlands, and the United States, these consumers were asked the extent to which they would consume beef under four different risk scenarios in

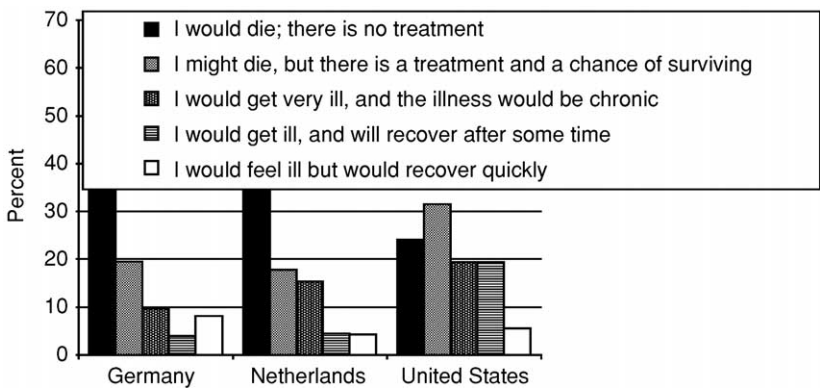

FIG. 8 Risk perceptions related to BSE vary dramatically across countries.

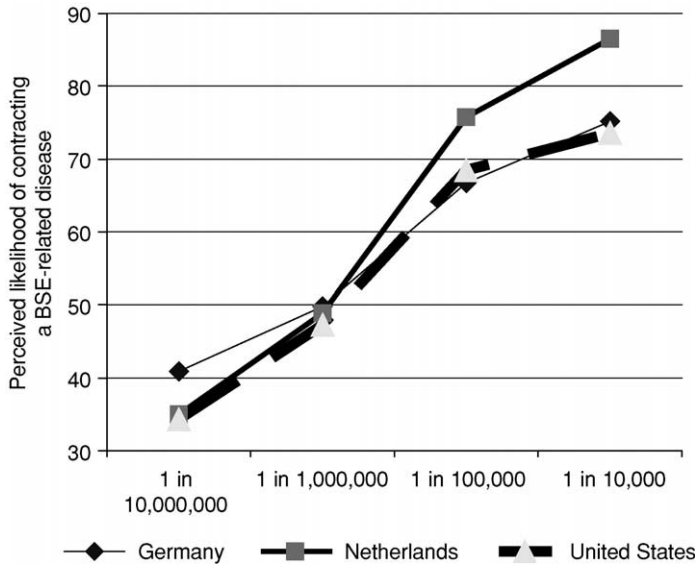

FIG. 9 Risk perceptions drive Dutch consumption of beef, but risk attitudes drive German consumption of beef.

which there was (a) 1 in 10,000,000, (b) 1 in 1,000,000, (c) 1 in 100,000, or (d) 1 in 10,000 chance of contracting a BSE-related disease. As can be seen in Figure 9, the behavior of the Dutch was most correlated with the likelihood of contracting the disease, whereas the behavior of the Germans was least correlated with the likelihood of contracting the disease (with the Americans in between). What this indicates is that another factor—risk attitudes—is a relatively greater driver of behavior among Germans than among the Dutch.

V. PROFILING CONSUMERS TO PREDICT RESPONSES

Whereas the previous section introduced the notion of the difference between risk perceptions and risk attitudes, this section shows how the different segments—or profiles—can be used to predict responses to food safety crises more accurately (Wansink and Cheong, 2002; Wansink and Westgren, 2004). This is because the risk level of any particular activity (such as getting sick from eating warm potato salad or contracting Creutzfeldt–Jacob disease from eating BSE beef) is perceived differently across different consumers. How consumers cope with perceived risk will depend on their risk attitude.

People's perceptions of risk and benefit associated with particular foods and applications will help determine their acceptance of the food.[1]

As noted earlier, *risk perception* reflects a consumer's interpretation of the likelihood they will be exposed to the illness or disease. *Risk attitudes* reflects a consumer's general predisposition to risk in a consistent way. Some people are risk averse whereas others are not. That is one reason why all people in the world do not skydive, ride motorcycles without helmets, or hang glide. It is important to emphasize that risk attitude and risk perception are two different concepts (Pennings and Wansink, 2005). Whereas risk attitude deals with a consumer's interpretation of the content of the risk and how much he or she dislikes the risk, risk perception deals with the consumer's interpretation of the likelihood of being exposed to the content of the risk.

A. FOUR PROFILES OF CONSUMERS

The following matrix (Figure 10) presents four different profiles of consumers based on their level of risk perception and risk aversion. Consumers' level of risk aversion (or consumers' attitude toward risk) can range from low to high. The higher the attitude toward risk, the more likely consumers are to refuse any risk under any condition. Simultaneously, risk perception ranges from low to high. The higher the perception of risk, the less likely consumers are to accept a risky situation. When combined to describe a consumer's profile, risk aversion and risk perception are separated into four categories.

1. The accountable segment

The low-risk aversion–low-risk perception profile corresponds to consumers who are risk seekers. They view themselves as accountable for their own behavior and what results from it. They ignore any available information

[1]The typical person is influenced by both an optimistic bias and an illusion of control (Frewer *et al*., 1994). When these are lost or compromised, panic can occur. While panic disorder can afflict an individual, panic also occurs as a collective phenomena. While it has been thought that emotional instability will lead some people to be more likely to panic, this is not always found. However, people who are emotionally unstable are more likely to attach importance to information provided during the crises than more emotionally stable individuals (Verbeke and Van Kenhove, 2002). Furthermore, some people are more likely to believe they are sick or affected than others. Feldman *et al.* (1999) examined the panic predisposition of people based on their classification by the "big five" personality factors. People were inoculated with a common cold virus, and those who were classified as "neurotic" were more likely to report unfounded illness and more symptoms than other groups. In contrast to this, "openness to experience" was associated with reporting unfounded symptoms in those with verifiable colds, whereas "conscientiousness" was associated with reporting unfounded illness in those who were not ill (Feldman *et al*., 1999).

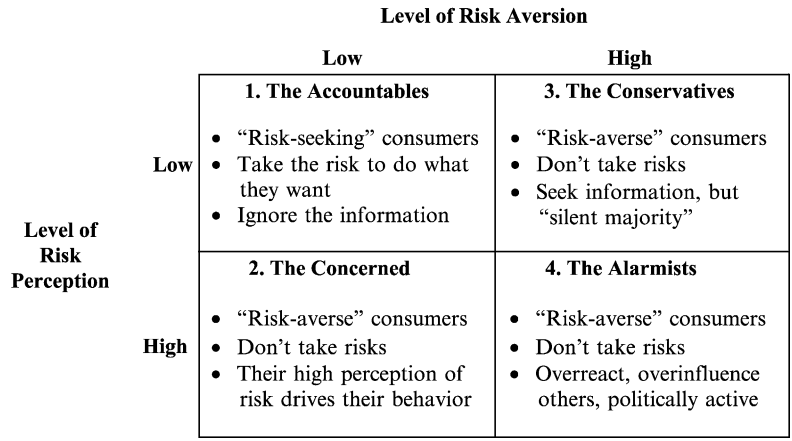

FIG. 10 Four profiles of consumers according to risk perception and risk aversion levels.

on risk and keep their habits, even though some risk may be involved in their behavior.

2. The concerned segment

This is the low-risk aversion–high-risk perception segment. The concerned segment has the risk of most behaviors in perspective. Because they are not risk averse to begin with, their behavior is dictated primarily by their perception of risk. As their perception of the riskiness of an action increases, they will eventually get to a point where they will not participate in the action at all.

3. The conservative segment

This consists of high-risk aversion–low-risk perception consumers. The conservative segment is composed of cautious, risk-averse consumers who do not take any unnecessary risks. They can also be seen as being the silent majority in many ways (Miller, 1985).

4. The alarmist segment

This high-risk aversion–high-risk perception profile corresponds to risk-averse consumers. This alarmist segment is composed of people who are prone to overreacting to many situations (Radovanovic, 1995). They are also the most assertive in their tendency to become politically involved or to actively attempt to influence others.

Although seeing the world as roughly consisting of four different profiles of consumers is helpful in predicting responses to a crisis, it is most useful

when combined with scenario planning. Scenario planning is one of the most effective methods used in preplanning military crises and it provides perhaps the best model for setting up both precautions and a response plan.

B. CRISIS-RELATED RESPONSES: WHAT COULD POSSIBLY HAPPEN?

When considering how consumers might respond to a food crisis, it is not sufficient to simply "brainstorm" and list a number of disconnected behaviors. While doing this is better than giving it no forethought, there are more appropriate methods of thinking about behavior and conducting the steps that would help minimize any unnecessary fallout from these behaviors if the food crisis occurs.

Independent of the scale of the crisis (local vs national vs global), a consumer's response can be characterized by different factors that all contribute to certain behavioral responses. A large part of predicting the response that consumers will have to a food crisis is to examine their risk profile. Consider the four consumer segments: (1) accountables, (2) concerned, (3) conservatives, and (4) alarmists. Each consumer profile segment will have a different response in case of a food crisis. Their response can be described by three characteristics: the level of aggressiveness (passive vs aggressive), the level of rationality (irrational vs rational), and the length of the response (short term vs long term). The behavioral responses for each of the four consumer profiles are described in Table II.

1. Passive vs aggressive responses

When faced with a food crisis, a consumer can respond along a continuum of passive and aggressive responses. A passive response involves simply modifying one's behavior to avoid the danger. In the case of BSE or foot-and-mouth disease, this would simply mean avoiding beef by substituting another product such as chicken or fish.

Consumers can also take a more aggressive response, which might be to demand restitution or to try and change the market structure by campaigning for new laws, guidelines, or regulatory systems. Both of these responses can critically wound an industry. In Australia, tainted metwurst caused several known deaths and resulted in an economic boycott of the entire metwurst industry. Now, many years after the fact, the industry is still decimated.

2. Irrational vs rational responses

Consumers can respond either rationally or irrationally to a food crisis given the nature of the scare. If the objective facts merit an extreme response (such as not eating the food), then such an extreme response is rational. If, however, the objective facts merit a less extreme response (such as fully

TABLE II
BEHAVIORAL RESPONSES TO CONSUMER'S RISK PROFILE

Consumer segment risk aversion/risk perception	Passive vs aggressive responses	Irrational vs rational responses	Short- vs long-term responses
The alarmists (high-risk aversion and high-risk perception)	Most likely to respond aggressively Involved politically on the food issue Overinfluence their peers to not take risks	Irrational, overreacting to food issue and risk level Extreme behavior not always justified	Most likely long term as food habits change drastically to avoid risks
The conservatives (high-risk aversion and low-risk perception)	Passive reaction, the "silent majority" Aware of potential risk but no overreaction	Most likely to behave irrationally and not to take any risks because risk adverse	Short or long term, depending on the level of risk aversion
The concerned (low-risk aversion and high-risk perception)	Rather passive Will avoid personal risk, but won't campaign for it	Most likely to behave irrationally and not to take any risks	Short or long term, depending on the level of risk perception
The accountables (low-risk aversion and low-risk perception)	Passive behavior Maintain his/her food habits	Rational Ignore information when risk perception is low	Most likely short term because both perception and aversion of risk are low

cooking the food or not eating it raw), then a less extreme response would be considered rational. Irrational responses comprise those where the reaction of a consumer is either more extreme than merited or is less extreme than merited. In the former case, they would be overreacting to the danger. In the latter case, they would be underreacting.

3. Short-term vs long-term responses

The length of a consumer's response to a problem can be either short term or long term. The response can persist for a reasonably short time, as the risk has been sufficiently eliminated through structural factors (food inspections or new standards). However, the response can last longer than necessary.

Consider trichinosis. The last case of trichinosis in the United States was reported shortly before World War II, yet the fear still persists in many

households today. Whereas the resulting impact on the pork industry has not influenced current sales of pork, the preparation of pork has been modified in what is perhaps an overly conservative manner. While it may not be necessary to still take all the precautions of cooking (or overcooking) pork, this illustrates how residue from a food scare can last long after the risk has been diminished.

Risk may be perceived differently across societal groups, and how consumers cope with perceived risk will depend on their risk attitude. Before a person is able to respond to risk, risk must first be perceived (Trimpop, 1994). Stone *et al*. (1994) modeled the identification of risks as a cognitive process of identification, storage, and retrieval. The level of risk that a food-related behavior provides depends on the consumer's risk perception (Sparks *et al*., 1995).

Perceptions and attitudes of risk are influenced not only by prior experiences, but also vary dramatically across experts. In a study by Bark and Jenkins-Smith (1993), the similarities and differences in risk perceptions (particularly regarding nuclear wastes) between 1011 scientists and engineers were examined. Significant differences were found. In contrast to physicists, chemists, and engineers, life scientists tended to perceive greater risks from nuclear energy and nuclear waste management, perceiving higher levels of overall environmental risk. They also found that independently of field research-related percentages of risk, these perceptions of risk varied with the type of institute in with the scientist is employed. Scientists in universities or state governments tend to see the risks of nuclear energy as greater than scientists who work as business consultants, for federal organizations, or for private research laboratories (Barke and Jenkins-Smith, 1993).

Table III presents selected crises of the 20th century, which ended up representing no health dangers (''fake crisis''). Nevertheless, consumer reactions often exhibited panic-like behaviors, threatening an entire industry (e.g., the U.S. apple industry in the case of the Alar apple scare). Depending on what was done by the institutions to limit the scare, the aftermath was either positive or negative for the industry or type of products involved.

VI. FALSE ASSUMPTIONS ABOUT CONSUMER BEHAVIOR TO FOOD CRISES

The area of biotechnology or genetically modified foods is an excellent context in which to examine how consumers form perceptions and attitudes toward a new technology (or even toward older technologies such as irradiation) related to food. Both proponents and opponents of biotechnology argue that their goal is to educate consumers so that they can make informed

TABLE III

EVEN CRISES THAT PRESENT NO HEALTH DANGERS CAN DEVASTATE INDUSTRIES

Description	Consumer reaction	What was done	Aftermath
Margarine (US, 1875) Described as unnatural and fraudulent substance	Consumers bought butter instead of margarine	U.S. butter lobby legislation enacted to prevent margarine being visually mistaken for butter (colored bright pink in some states and white in many others)	Took until the 1950s for margarine consumption to increase significantly inside the United States
Cranberry scare (1959, US) Use of aminotriazole, weed killer, thyroid cancer scare	Widespread panic; secretary of state for health told housewives not to buy cranberries	Ban on cranberries sales in several states right before Thanksgiving	No real threat for public health, (a human would have to consume 15,000 pounds of aminotriazole-treated berries every day for a number of years)
Beef and DES (1972, US) Diethystilbestrol-for use as a cattle growth stimulant. DES is an estrogen, and all estrogens are animal carcinogens (FDA approved in 1954) caused vaginal cancer	Sen. E. Kennedy described DES as a "known cancer-causing agent ... on thousands of American dinner tables." Consumers create groups such as the "Committee to Get the Drugs Out of the Meat" (DOOM) and criticize the FDA	The FDA ultimately banned DES use during pregnancy Hormone was still used in cattle. The FDA issued a final ban on DES in June 1979	Scientists: "estrogens occur naturally in milk, honey, eggs, at levels "thousands to millions of times higher than those found in the livers of DES-treated cattle." A woman would need to eat more than 62 tons of beef liver to match the 125-mg DES dose given to pregnant women

(*continued*)

TABLE III (*continued*)

Description	Consumer reaction	What was done	Aftermath
Artificial sweeteners and saccharin (1977, US) High doses of the artificial sweetener had caused bladder cancer in lab rats	Negative public reaction to the FDA ban. Consumers tried to stock up saccharin products against the coming ban; diabetics lobbied Congress to reverse the ban (no other nonsugar sweetener available at that time); consumers asked for a warning label on the product instead	FDA tried to ban saccharin	No studies have shown yet humans can develop cancer from exposure to sweeteners. ACSH: "the enormous doses necessary for such experiments ... may overwhelm the animal's natural defenses." Saccharin still available, but its use has decreased since 1983 (aspartame approval's year)
Coffee and pancreatic cancer (1981, US) Coffee drinkers have at least twice the chance of developing pancreatic cancer compared to noncoffee drinkers (Harvard School of Public Health)	News media jumped on the story, but didn't create the great public reaction expected	The Harvard study findings were immediately questioned by other researchers	The proportion of coffee consumption has to be more than 50%. Harvard scientists failed to confirm its original findings during a follow-up study
Alar apple scare (1989, US) Use of chemical (alar), by-product causes lung and kidney tumors in mice	Called "the most potent cancer-causing agent in our food supply" on a U.S. television program. Hysterical public reaction, general atmosphere of panic	National Research Council: "There is no evidence that pesticides or natural toxins in food contribute significantly to cancer risk in the U.S."	No real threat for public health: scientists from WHO and FAO concluded that Alar was nononcogenic in mice. Humans would have to ingest vast quantities of the product to get effects (thousands of quarts of apple juice every day). Apple growers lost $250 million, Apple processors lost $125 million

Dioxin in chicken (Belgium, 1999) Animal feed contaminated with dioxin, carcinogenic chemical by-product (herbicide)	All meat and dairy products thought at risk, people eat vegetable, fruit, mussel, and fries!	Temporary export bans on Belgian meat and poultry products by many nations	In fact, levels of chemical were extremely low
Electric blankets (1989, US) Report of possible relationship between childhood cancer mortality and power lines (high electromagnetic fields); then, *Consumer Reports* recommended that children and pregnant women avoid electric blankets	After remaining stable for many years (since mid-1940s), sales of electric blankets dropped by 11 percent	Eighteen congressmen asked that electric blankets be labeled as hazardous for children and pregnant women. As a result, all U.S. blanket manufacturers now include warnings with their products, advising that children not be permitted to use electric blankets.	1990 study: researchers reported finding a modest increased risk of childhood cancer in relation to the mother's use of an electric blanket during pregnancy. Subsequent studies of brain tumor occurrence and electric blanket use have not supported the 1990 study.
Coke scare (Belgium, 1999) Dozens of people end up at hospital after drinking Coke	Stop drinking Coke for a while in Belgium	Coca-Cola located the cause of problem in two factories and recalled 2.5 million potentially dangerous bottles. Belgian, Dutch, Luxembourg, and French governments banned all Coke drinks for a while	No long-term injuries. Coke's stock dropped by 2% after the scandal. Cost at least $150 million to restore consumer confidence. People still drink Coke

decisions (Bauer, 1960). While opponents focus on educating consumers about the risks of biotechnology, proponents focus on the benefits. However, if we consider education as an objective, neither group has been decidedly successful (Doyle, 2000). Wansink and Kim (2001) argued that part of the ineffectiveness of these efforts is due to the inaccurate assumptions both opponents and proponents of biotechnology have about consumers. This leaves their efforts often misdirected or weakly leveraged.

Proponents of biotechnology have based their marketing campaign around key assumptions about the consumer that are reflected in the way they communicate. Many of these assumptions are based on years of familiarity with "market share advertising" and a commodity promotion mindset. Such expectations self-limit their effectiveness by leading them to assume that (1) the biotechnology issue will "blow over," (2) once consumers have the facts, they will be biotechnology advocates, (3) science sells and fear fails, and (4) biotechnology is an industry issue.

Opponents or skeptics of biotechnology do not make these same mistaken assumptions. Instead, while their guerilla campaigns may have gotten attention, these strategies are embedded in grassroots experiences that lead them to make different counterproductive assumptions about consumers. Their efforts show that they assume (1) consumers want to be informed, (2) consumers need to be informed, (3) changing consumer attitudes will change their behavior, and (4) risks of the unknown are more important than benefits.

Using key principles of consumer psychology to reexamine these assumptions will better enable us to understand how consumers learn about foods that subsequently influence their reactions in a crisis situation.

A. EDUCATION FALLACIES OF OPPONENTS OF FOOD TECHNOLOGIES

Effectively educating consumers about the benefits and risks of food technologies (biotechnology, specific food processes, and food radiation) requires the proper assumptions about how consumers learn. To date, both opponents and proponents of food technologies are making assumptions about consumers that limit their effectiveness in communicating their message to the public. Without any hard evidence against the outcomes of a particular technology, opponents have tended to focus on the process itself. They have used demonstrations and publicity campaigns to target consumers and lobbying to target governmental agencies. The foundation of their approach has been to focus on ethical and social issues and the fear caused by uncertainty (Papanikolaw, 2000). These efforts, and others, suggest a set of assumptions that opponents of food technologies in general have about educating consumers. To be more effective, each of these assumptions must be revised.

1. Opponent fallacy #1. People want to be informed

Consumers vary greatly in how much they desire to "be informed" about issues. The most successful daily newspapers in the world penetrate less than 40% of the households in their market, and situation comedies generate more viewers than the average network news broadcast. While some consumers centrally process and actively formulate an informed opinion about food-related issues, others have a greater willingness to trust outside agencies to make food safety decisions for them. Sheehy *et al.* (1998) termed the first group "information seekers" and the latter group "institutionalists."

Most consumers appear to be institutionalists when it comes to food-related issues, believing that decisions about the safety of food technologies should be left to the experts (Optima Consultants, 1994). While these experts are often scientists or regulatory agencies, they can also include the moral expertise of religious groups or the perceived ethical expertise of a special interest group. In that way, whatever alternatives are presented to them will have been preapproved. Although one might assume that "institutionalists" tend to be people with less formal education, Hadfield *et al.* (1998) found that even those with advanced educational backgrounds find themselves ill-equipped or unwilling to spend time studying the issue. They welcome the opportunity to involve experts who can provide them with the conclusion to the issue and not the details it takes to arrive at that conclusion (Wansink, 2003a).

In contrast, there is a segment of consumers who do want to know about the details behind food technologies issues. When these "information-seeking" consumers want to learn of the risks and benefits of food technologies and genetic engineering, they turn first to the media and personal discussions and then to informational brochures (Borre, 1990a; Heijs and Midden, 1995). Sheehy *et al.* (1998) reported that another group of consumers acquires food-related information from magazines, government publications, consumer organizations, and research institutes. Knowing where these people go for information is important. Reading newspaper reports of demonstrations and protests is less important and less persuasive to information seekers than reading a more balanced view in a magazine or a brochure.

2. Opponent fallacy #2. People need to be informed

Unlike many other countries, the United States has benefited from a strong food regulatory system for many years. As a result, food safety vigilance is not an important issue and it is generally entrusted to regulatory organizations. One poll indicated that 83% of Americans trust the U.S. Food and Drug Administration (FDA) (Hadfield *et al.*, 1998). It is the most trusted government agency next to the Supreme Court.

For many busy people, second guessing the food-related decisions of a risk-averse government is not worth their time or effort. Food scares in the United States have been tied directly to violations of FDA standards or regulations, not to oversights or mistakes with these regulations themselves. Given this track record, many consumers believe there is no reason to distrust or second guess the regulatory system. Many consumers do not want to be informed, largely because they do not believe they need to be informed.

3. Opponent fallacy #3. Risks of the unknown are more important than benefits

Benefits are often more important than risks to consumers. Consumers become willing to accept products processed with specific technologies when they become convinced that these products offer significant benefits over other products. These benefits can include decreases in price as well as increases in product quality, such as taste and naturalness; purity, such as reduced use of chemicals; and wholesomeness, such as better nutrition (Kuznesof and Ritson, 1996). Hamstra (1995) reported that perceived benefits of biotechnology products had greater statistical influences on Dutch consumer attitudes and acceptance than perceived risks.

Even for opponents of certain food technologies, benefits often outweigh risks. Sometimes, however, *social* benefits become weighed more heavily than *personal* benefits. Sheehy *et al.* (1998) demonstrated that consumers considered genetically engineered potatoes that reduced the need for environmentally harmful pesticides as being significantly more beneficial than potatoes that had prolonged shelf life and improved taste.

History has shown us repeatedly that most principles, to most people, have a price. For example, a principle standing against the radiation that emanates from microwaves becomes a nonissue after one receives a microwave oven for a birthday present. An opponent of fur becomes a silent champion after inheriting a coat with fur trim. The "white meat only" advocate secretly enjoys beef when the price of fish becomes too expensive. A philosophical stance against biotechnology has a price even though it would not show up in consumer surveys. It is sometimes measured as a difference in cost; other times as a difference in convenience. In still others, it fades as the audience for the cause fades or becomes weary of the issue.

4. Opponent fallacy #4. Changing consumer attitudes will change their behavior

The assumption that negative attitudes toward specific food technologies will dissuade people from purchasing a product processed with these technologies seems reasonable. However, attitudes often do not predict behavior, and

food-related issues provide no exception. Heijs and Midden (1995) investigated the impact of attitudes on behavioral intentions across four examples of genetically engineered food. Intention to buy each of the foods was used as a measure of positive intentions, whereas intention to protest against the foods was a measure of negative intentions. When favorable about biotechnology, consumers indicated they would purchase the food. In contrast, attitudes did not explain a similar correspondence with the negative intention measure (Heijs *et al*., 1993). In essence, there was little relation between biotechnological attitudes and behavior. This can be attributable to the weak impact between attitudes and behavior once notable differences exist between the cost and convenience of products (Wansink and Ray, 1996).

Confusion often ensues because food technologies and processes can be complex and difficult to understand. When consumers are confused, they sometimes defer their choices until they develop proper evaluation criteria and acquire enough information. When benefits begin to outweigh risks, behavior can reverse dramatically and purchases will be made by all but the most extremely opposed segments of consumers. Likewise, as people see more and more products processed with these technologies under more realistic and normal (nonlaboratory) conditions, they will generally come to accept certain food technologies because of their familiarity (Frewer *et al*., 1996b).

Studies on biotechnology purchase decisions that used the theory of planned behavior (Fishbein and Ajzen, 1975) generally yielded results that support consumers' attitude toward biotechnology as an important determinant of purchase decisions. However, one important point to note is that the most important attitude in purchase decisions was the one toward the specific product in question, not the general attitude toward biotechnology.

The fact that consumers are not familiar with genetically engineered food products implies that they will find it difficult to imagine the types of products discussed and, even more so, to generalize in stating and explaining their purchase intentions. The predictive validity of studies on consumers' purchase decisions on genetically engineered food products can be strengthened greatly by focusing on specific products rather than investigating purchase decisions with regard to biotechnology food products in general.

B. EDUCATION FALLACIES OF PROPONENTS OF FOOD TECHNOLOGIES

Proponents have their own set of incorrect assumptions. Their basic strategy has been to focus on the advantages of the technology and on the long-term benefits that are not specific to consumers but are more focused on the "global good" aspects (Gardner, 2000). These actions, and others, suggest

a series of misperceptions or incorrect assumptions about consumers. These assumptions limit how efficient they can be in communicating to consumers (Roberts, 1994). To be more effective, each must be revised.

1. *Proponent fallacy #1. The food technologies controversy will be forgotten*

Opponents of certain food technologies generally discuss their opinions with other opponents, and proponents discuss theirs with other proponents. Therefore, proponents can underestimate the seriousness of the issue, believing that most people believe the way they do. Many firms think erroneously that a new food technology, such as biotechnology, will lose its controversy and "blow over."

This belief—or hope—was a critical mistake made by British firms (Frewer *et al.*, 1995). In 1994, public sentiment toward biotechnology was neutral if not moderately positive. The industry, therefore, took no real efforts to build public support or enthusiasm for biotechnology because attitudes toward it appeared to be improving each month (Vacek, 2000). However, although attitudes were improving, they were neither fully formed nor stable. As a result, when "mad cow disease" became an issue, the industry had not generated the appropriate level of education nor a solid enough basis of support to keep the issue in perspective and to keep biotechnology moving forward.

Some proponents in the United States believe that the improving sentiments of the nonvocal majority indicate that the biotechnology controversy will pass. The fallacy of their assumption is that they are only one "mad cow disease" episode away from losing all the technological ground that has been gained. Because of the highly sensitive nature of this issue, even a moderately unrelated event could cause an ill-informed majority to generate a fatal overreaction in public opinion. Even if the biotechnology controversy passes, proponents would be critically wrong not to continue to focus on counteracting public misperceptions and to focus on educating consumers about the benefits of food technologies.

2. *Proponent fallacy #2. Science sells and fear fails: people will be food technology advocates once they have the facts*

Consider the case when a person's attitudes have been formed through the peripheral route to persuasion. With relatively low awareness and knowledge of food technology along with no established measures of benefits and risks, his or her attitudes could be swayed easily by peripheral cues such as public opinion, publicity, sound bites, source credibility, labeling,

and emotion and fear. To this person, careful scientific reports and expertly articulated third-party testimonials will have little direct impact on their attitude toward food technology. Indeed, even a judicious FDA endorsement might have less impact than a memorable phrase or the negative portrayal of genetic engineering applications in a movie (e.g., *Species, Jurassic Park, Gattaca,* or *DNA*).

One indicator of how peripheral processing dominates attitude formation can be found in the significant role that religious and ethical influences can play dogmatically in influencing public concerns about food technology applications. For example, animal rights activists protest biotechnology on the ground that genetically modified animals might suffer vulnerability to specific diseases as the result of such modifications. Some religious groups oppose the use of biotechnology on the ground that experimenting with lives is "playing God." These religious and ethical concerns will become even more vocal as further advances in gene technology bring fear of human gene selection and cloning. Groups opposing the use of biotechnology on these grounds authoritatively dictate specific viewpoints to consumers without encouraging objective evaluation (Mitcham, 1990). Phrases or sound bites, such as "playing God," can lead one to process the issue peripherally and to label biotechnology as wrong without considering its benefits.

The fallacy that "science sells" is based on the notion that if consumers are given the facts, they will come to the proper conclusions. However, even with identical information and beliefs, people will arrive at different conclusions. A well-to-do vegetarian might believe cost savings are less important than caring for animals. A second person might focus more on how food technology increases the world food supply and slows land commercialization. A third person might focus on comparing organic gardens of yesterday to the unknown issues of tomorrow. Recalling Figure 10, attitude formation is complicated further by the fact that consumers not only have different information, but they have different values and different ways of combining this information.

3. Proponent fallacy #3. Food technology education is a trade association issue

Food technology education is not a trade association issue. The first step of food technology education is partly a branding issue. Before people will listen to a proponent's perspective, food technology must provide a clear, systematic, vivid, focused message that is potentially important to consumers. In the biotechnology marketing battle, the opponents of biotechnology clearly have the upper hand. The powerful "brand" visuals that are associated with names such as "FrankenFoods" and "Super Weeds" leave

little wonder why the public is able to latch on to "bumper-sticker logic" and be swayed toward skepticism or opposition. These vivid phrases promote peripheral processing instead of a thoughtful consideration of benefits and risks.

Trade associations, scientific organizations, and the government probably cannot effectively brand food technology in a way that leaves it clear in a consumer's mind (see Thayer, 1992). The majority of trade association efforts in this regard have not been as effective as hoped for or claimed (Wansink, 1994). The most notable examples (such as the "Got Milk" campaign) won awards, but reportedly contributed little to increase sales among nonusers. If firms are to compete with the "spin" that opponents of food technology create, they need to realize that branding food technology deserves some of their best marketing minds (Franz, 2000). It is too important to be outsourced or trusted to a risk-aversive, consensus-building trade association or government agency.

4. Proponent fallacy #4. Good for medicine means good for food

Consumers accept technology for medicinal purposes, but not necessarily for foods. These different attitudes toward medicine and food can be explained by the way the situation is framed—or perceived—by consumers. As Kahneman and Tversky (1986) have shown, people show a risk-taking tendency when the outcome is seen as the reduction of a loss ("I do not want to be sick"), but show a risk-aversive tendency when the outcome is identified as a gain ("I want to be healthy").

In general, technological applications in the medical domain fall in the loss reductions category. For example, the benefit of a new medicine developed with biotechnology can be generally believed as improving the lost health of an already ill patient. The benefits of a food product produced with biotechnology, however, are perceived as improved nutrition and quality for a product that already has satisfactory quality and nutrition from a consumer's point of view. Thus, it is seen as an increase of a gain or benefit.

If the differences in the acceptance of food technologies across application domains are due to differences in how the benefits and risks are perceived or framed, how can opinions be changed? Consumer acceptance of food-related technology may be improved by framing the benefits in terms of the reduction of potential dietary hazards instead of framing them in terms of enhanced nutrition or quality (Wansink and Ray, 1996). The reduction of these gains and losses is food specific. As these benefits and losses become more evident, they can be promoted on a food-specific level (e.g., broccoli) or on a category-specific level (e.g., green vegetables). Similarly, an environmental position would take the same approach. In this case, consumer

acceptance could be improved by framing the benefits in terms of the reduction of destructive pesticides and waste instead of framing these benefits in terms of enhanced ecological balance.

A large part of the confusion consumers have about biotechnology is based on the misguided assumptions proponents and opponents of biotechnology use when communicating to them. It is the prior successes that proponents and opponents have had in related fields that lead them to make many of the wrong assumptions about consumer behavior that limits their effectiveness, but food safety issues are different. Its tremendous potential and risks dictate that assumptions be changed because the stakes are too high for too many people. Contrary to what proponents think, the biotechnology controversy will not be forgotten, nor will all people become advocates when they see the science, nor is this simply a trade association education issue. Contrary to what opponents think, many people do not care to be informed about the details of biotechnology, and the risk of biotechnology will not keep them from enjoying the personal or even social benefits of it.

For both opponents and proponents, continuous education is critical even if it appears that many consumers are not interested in the issue. While a person can be uninterested in a topic, there are different times in their life or different windows of opportunity when they are open to learning about new ideas. Continuous education keeps informed consumers informed and offers disinterested consumers the opportunity. The more effort that is invested into consumer education, the less risk there is that consumers will overreact on the basis of emotion, fear, memorable phrases, or unfounded benefits.

The education strategies suggested here may read as though they are relevant only for large institutions, companies, or well-organized political action groups. However, the same basic concept—understanding the processing style of your target and how it influences attitudes—is relevant to individual researchers and scientists who want their research to have more impact. Whether it be in the way researchers write, in the way they organize public and professional talks, or how they are interviewed by the media, knowing these principles will prevent them from making the same well-meaning, but misguided, mistakes of companies and well-organized activists.

Through commercial applications, biotechnology may improve health, agriculture, farming practices, and the quality of foods. However, along with the array of potential benefits are potential risks and uncertainties surrounding the commercial applications of biotechnology. Public support for a controversial food technology is crucial for deriving any benefits associated with the technology (Blane *et al.*, 2002).

VII. USING PRECRISIS PREPARATION TO MANAGE RESPONSES

The components for managing the stigma associated with potential future food safety issues involve the following precrisis preparations: (1) promoting a hierarchical understanding of food production, (2) integrating distinct communication channels, (3) accommodating consumer needs and concerns with packaging and labeling, (4) positioning products as comparable alternatives, (5) addressing public concerns, and (6) creating a single information authority.

A. PROMOTE A HIERARCHICAL UNDERSTANDING OF FOOD PRODUCTION

There are wide differences in the knowledge consumers have about food technology (Hamstra, 1991, 1993). When combined with the fact that consumers also have different information-processing styles, this suggests that the most effective communication strategies to disseminate food technology information would take a stepwise approach (Wansink *et al*., 2002). That is, consumers first need to accept the processes of food technology, and only after that can they adopt specific products. Therefore, having information and confidence about food technology is necessary before they can accept products made using these technologies.

To accomplish this, a hierarchical model of communication strategy is proposed. As illustrated in Figure 11, it will first be necessary to disseminate general information such as what food technology is and what would be affected by it. Consumers must have some basic level of knowledge about food technology in order to process more specific and detailed information. Next, information about food technology used by specific industries can be communicated and better understood. Once the technology or process itself is understood and accepted by consumers, then information about the benefits and risks involved with specific products can be conveyed more effectively. This way, consumers will be able to develop a knowledge base on which they can make educated decisions regarding specific food products (Wansink and Chan, 2001). Figure 11 illustrates how the hierarchy of communication objectives can be structured in relation to the level of consumers' food technology knowledge.

B. INTEGRATE DISTINCT COMMUNICATION CHANNELS

Consumers acquire food safety-related information from various sources, such as government publications, consumer organizations, research institutes, and the media (van Ravenswaay and Hoehn, 1991; Young, 2000). Because

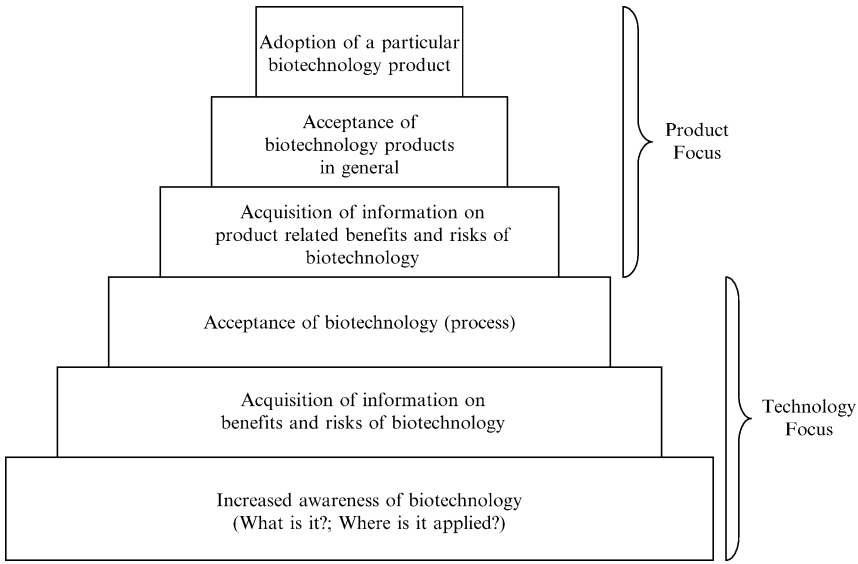

FIG. 11 Layered hierarchy of "take-aways."

consumers perceive that there are conflicts among these sources, the resulting confusion can lead to rejection or deferral of acceptance of food technology products. An integrative and coordinated communication effort by the multiple information sources is essential in increasing consumer acceptance. Government, universities, other research institutions, the industry, and the media all have a distinct but primary role to play in the management of a crisis.

Consider new technologies such as beef hormones and biotechnology (see Table IV). Although the media has long been a prime information source for consumers, it is less of a source of biotechnology information. The effect of the mass media in disseminating biotechnology information has been inhibiting (i.e., distributing news about biohazards) rather than facilitating. A variety of strategies to use mass media as the key information source should be considered creatively. This would include advertising campaigns promoting biotechnology and public relations in forms of articles or programs that disseminate biotechnology information via various media formats.

C. ACCOMMODATE REASONABLE CONCERNS WITH LABELING

There are at least three functions of labeling products, such as those produced with unfamiliar technologies: (1) protect consumer choice, (2) provide information on product ingredients for health reasons (e.g., allergies), and

TABLE IV
ONGOING CRISIS: POTENTIAL HEALTH DANGERS UNKNOWN OR NOT YET PROVEN

Description	Consumer reaction	What was done	Aftermath
GM food (ongoing) Scientists fear that GE plants and fish can contaminate wild populations, increasing weed problems and unbalanced ecosystems, and create new allergens or toxins. Supporters say yields and quality are increased	Refusal to buy GM seeds from several countries Societal groups and consumers ask for labeling	Attempt to label GM products in EU	Ongoing
Hormone-fed beef (1989, EU) In U.S. beef production, growth implants and bovine growth hormone (somatotropin) administration increase lean accretion and decrease fat deposition	Europeans do not want hormones in beef, Americans don't mind	EU ban U.S. hormonefed beef, stating that economic, environment, and consumer concerns must be considered in addition to the scientific evidence	May 2000: EU propose a definitive ban on estradiol in farm animals, U.S. refuses to comply with WTO if passed

(3) encourage companies to provide safer products by having disclosure requirements. While the main function of labels is the provision of information, the last function suggests that labeling may function as a cue for product safety. Some consumers may use such labeling to avoid products processed with specific technologies. In contrast, consumers may perceive explicit labeling as a sign of the manufacturers' confidence in product safety, as they are willing to display such information even though disclosure is not required by law (Wansink, 2003b).

Care must be taken, however, in how such products are labeled. Results of the 1991 Euro-barometer survey, for instance, reported an interesting finding related to labeling biotechnology products. Results indicated that the way biotechnology products are labeled influenced both perceptions of and attitudes toward such products. The survey was conducted using a split

ballot in which half of the respondents were questioned using the word "biotechnology" and the other half were questioned using the term "genetic engineering." Twice as many respondents in the "genetic engineering" condition thought that the technology would make their lives worse than respondents did in the "biotechnology" condition. Clearly, consumers have predisposed attitudes toward particular terminology such as "genetic engineering." Regardless of the reasons behind these attitudes, it is important to accommodate the uneasiness invoked through the terminology. To do so, manufacturers should seek to avoid the use of potentially negative terms either through omission or the use of alternate terminology.

Consumers generally view product labeling as an important source of information when developing attitudes toward food technology products. Therefore, any labeling and product packaging should reflect the positive aspects of the industry and methodology involved in production. If reasonable, consumer advocacy organizations and research institutions could be utilized as endorsers for the products or technology as they are viewed as most trustworthy.

In the meantime, it is important to provide consumers a sense of control over their choices. Even though consumers are ill-equipped with knowledge, they still desire control in choosing what they eat. The use of labeling to provide food technology information in product preparation should be considered. Labeling of food technology products serves not only as an informational function but also as a safety signal. Food technology communication strategies should provide consumers with criteria for evaluating food technology products. Consumers will become more comfortable and confident in accepting the technology as their confusion about how to choose their food diminishes. In deciding whether or not to label, the issue of how to label also becomes an important consideration.

D. POSITION PRODUCTS AS COMPARABLE ALTERNATIVES

When contemplating product positioning in their product at the individual store level, marketers should seek to align products with their nontechnological counterparts (Wansink, 2002). This avoids the assignment of a stigma on the products as being "fake" or "synthetic" (Wansink, 2003c). Even so, this is not as important as when targeting food technology-savvy markets wherein differentiation techniques can even work as an advantage.

Additionally, efforts should be made to "tie in" the products with brands and images that are highly regarded and which can further reinforce the natural aspects of the food (Wansink, 1994). Through the use of brand equity leveraging, innovative promotion, and product pairing, these products can achieve an air of familiarity, quality, and conventionality (Wansink, 2005).

E. ADDRESS PUBLIC CONCERNS CORRECTLY

Controversy over safety and ethical issues involved in the use of certain misunderstood technologies is a persistent problem that often continues to haunt all those involved even after the product or technology has been largely accepted. Food technology is advancing into the future and some of the current safety issues may become nonissues. However, current public concerns are grounded on what has happened with past misuses, especially regarding biotechnology. Concerns may be partially due to the fact that living organisms are adaptive and their change is neither predictable nor controllable (Table V).

Therefore, in the long run, the food technology industry and researchers, as well as the government, should try to safeguard potential hazards. First, objective measures of potential risks of hazards involved in food technology and related products must be developed. Without such measures, it will be impossible to convince consumers of the safety of new technologies (Frewer and Shepherd, 1994). Second, some legal and self-regulatory protection devices must be put in place by the government and industry. Third, and most importantly, a code of ethics that guards against the potential misuse of food and biotechnology must be established and adopted by those

TABLE V
REVISING CURRENT ASSUMPTIONS ABOUT CONSUMERS AND NEW FOOD TECHNOLOGIES

	Current assumptions	Better assumptions
Proponents of food technologies	Controversies will be forgotten	Continuous education is critical
	Once people have the facts, they will be advocates	For the majority of consumers, facts may mean less than memorable phrases
	Science sells and fear fails	The emotion of feared technologies often wins over logic
	Technology-related education is a trade association issue	Specific technologies are an issue of branding and education
Opponents of food technologies	People want to be informed	Many consumers do not care to be informed
	People need to be informed	Only active decision makers believe they need to be informed
	Changing consumer attitudes will change their behavior	Product benefits can cause a person to act differently than their philosophical position would indicate
	Risks are more important than benefits	Benefits are more important to most people than risks

who participate in that field. Smart marketers can coordinate with key industry groups to build a wider base of understanding, influence, and safety. Consider the following cooperative efforts.

1. Self-regulation by food and biotechnology industry

Generally, consumers perceive food technology information provided by the industry to be the least credible, and they are most distrustful of an industry-regulated safety system. The biotechnology industry is the major provider of biotechnology products that consumers make choices about. Therefore, it is critical for the industry to earn consumers' trust. A self-regulatory effort by the industry may help gain consumers' confidence. The industry should strive to develop objective measures for the risks and benefits of products and establish self-regulated safety measures of the processes used.

2. Role of government as the safeguard

Despite some doubt regarding the efficiency of the government, many focus groups and surveys indicate that consumers believe the government should play an important role in providing regulation and safety protection with respect to food technology. These provisions and assurances of safety by the government will contribute to the elimination of some of the concerns consumers hold about food-related issues in general, particularly about biotechnology issues. The government should take the responsibility of setting the direction and pace of development in order to prevent questionable or premature application of certain food technologies.

3. University and research institutions

Universities and other research institutions account for the majority of genetic engineering and food technology research and development. Therefore, they are well positioned to play a safety-assurance role as well as provide up-to-date information on technological advances and applications. While industry sponsorship raises some concerns, the public views academic institutions as a credible and trustworthy source of information. This being said, a more active effort to establish and maintain integrity and impartiality of research by these institutions is important.

F. CREATE A SINGLE INFORMATION AUTHORITY

The U.S. war on terrorism both domestically and abroad has underscored the importance of having a single federal agency whose position it is to oversee the safety of the nation against terrorism. Analogously, in the

context of food safety, it is appearing increasingly important to create a single federal agency position in the United States that oversees the safety of the nation's food supply. According to a 2000 Food Marketing Institute position paper, "The public is never in more need of assurance than when a food safety crisis arises . . . Because it is rare that single agency has committed jurisdiction over the entire scope of a major food safety problem, it becomes impossible to find a spokesperson who can rapidly clarify the facts and reassure the public." What instead usually happens is that consumers are faced with a lengthy delay while our overlapping bureaucracies search for experts and attempt to create a coordinated response. The longer this takes, the more consumer confidence erodes and fear increases (Lee, 2002).

In addition to coordinating information, this source could also spearhead related efforts, such as those proposed in the National Safety First Initiative. In these such initiatives, the basic premises involve issues related to safety criteria, verification standards, follow-up standards, and safety leadership standards (Golodner, 2002; Kapuscinski, 2002).

VIII. MANAGING REACTIONS TO FOOD CRISES THROUGH CRISIS-RELATED RESPONSES

The way marketers respond to food crises should take into account whether a country's food consumption is influenced more by risk perceptions or by risk attitudes. The relative influence of risk perception and risk attitude on consumption depends, among others, on the accuracy of knowing the probability that negative health side effects could occur from eating food products.

A. COMMUNICATION EFFORTS: HOW SHOULD INSTITUTIONS RESPOND TO FOOD CRISES?

If the probability of contracting a disease is not accurately known, research indicates that different policies are appropriate for different types of countries. Consider the BSE crisis. In countries such as the United States, tough measures are required to prevent a BSE crisis, as risk attitudes drive consumption and little can be done to change consumers' risk attitudes. This means testing and eliminating suspected food products. In countries such as Germany, both risk perceptions and risk attitudes drive consumer behavior. This not only suggests the need for tough measures, but also extensive and responsible dissemination of accurate information by the government, industry, and media. In contrast to the United States and Germany, Dutch consumer behavior is driven mainly by risk perceptions. In this case, honest and consistent communication by both the government and

the food industry is more effective than a mass recall and destruction of food products.

If the probability of contracting a disease is known accurately (or becomes more accurate), risk perception can become a more important driver of food consumption than risk attitude. In low-risk situations, messages from the government, the food industry, and the media will have a notable impact on helping consumers respond to the food crisis. In contrast, with high-risk situations, tough measures—recall or elimination—are also necessary. In the case of strongly risk-aversive consumers, however, any level of risk is treated as a high-risk situation. As a result, tough measures and information are important in even low and mildly risky situations. On the production side, an ounce of prevention is worth a pound of cure, but on the policy side, an ounce of information is worth even more.

In food crisis situations, the potential for stigmatization is tremendous (Frewer *et al.*, 1996a). Well-publicized outbreaks of food-borne pathogens and the emotionalism related to agricultural biotechnology are two recent examples of how science, policy, and public perception interact. Current risk management research indicates that it is essential for authorities (either industrial or governmental) to communicate effectively and provide evidence that they are reducing, mitigating, or minimizing a particular risk (Powell, 2000).

B. DEVELOPING RISK MANAGEMENT MEASURES

Risk management measures can be separated into genuine risk management measures and ingenuine, "auxiliary," risk management measures. While only the former should be considered seriously, the latter is reviewed briefly lest a responsible marketer or public policy official finds himself or herself leaning in ill-advised directions.

As alluded to in the BSE illustration given earlier, genuine risk management measures can focus on systematic hazard removal based on the HACCP system or on some other alternative or more appropriate system. In some cases, this can involve the isolation of the cause of the problem. In other cases, it can involve the conservative elimination of all suspected contaminants. Concurrent with this is the importance of reporting these efforts in a proactive means and keeping consumers informed about decisions, processes, and progress.

Ingenuine efforts are classified as "auxiliary" risk management efforts and typically involve doing nothing about the cause or concern of the problem, but simply trying to displace negative attention. These often take the form of denial, blaming a scapegoat, redefining a hazard, or claiming ostensible stakeholder consensus. While no one in a noncrisis situation would advocate

such underhanded efforts, such events become astonishingly common in crisis situations. It is then important to realize that there may be more of an unintentional reliance on these in the heat of the moment than what one would want. Being forewarned is being forearmed.

Consider the following case study. Garibaldi Smallgoods was the metwurst category leader in south Australia until 1991. In 1991, a bride and some guests fell ill with food poisoning after eating Garibaldi salami at a local wedding reception. Following this, the company director assured the health commission that they would set up a quality control program, upgrade their processes, provide precise end-product specifications, and provide proper coding and labeling of all batches. In January of 1995, however, 1 child died and 24 other people were hospitalized due to Garibaldi metwurst, which was contaminated with *E. coli* O111. While Garibaldi indicated they would remove all product from the market, they were slow to do so and resisted turning over their information regarding meat sources and quality assurance procedures. On January 31, they agreed to turn over the information, if a request was made in writing. The following day, a 4-year-old child died from the illness. As a result of the Garibaldi case, metwurst category sales in Australia fell to less than 10% of the level achieved before the incident and have never fully recovered since then. Consumer trust in the product was destroyed and retailers were reluctant to stock it (www.Food-Crisis.com 2003).

C. DEALING WITH POTENTIAL COMPLICATIONS

Even in the face of a well-planned emergency response plan, complications can arise. One common area where this happens is with systematic hazard removal. When existing evidence is poor, HACCP will require extensive risk assessment and may not be as easy to implement as one would hope. Nevertheless, it is important to realize that the resources allocated to risk assessment have important signal value to the public. Depending on the level of resources dedicated to a cause, an absence of investment can either cause a further increase in the perceived risk or lead to a feeling of frustration that nothing is being done. A perceived balance needs to be maintained.

In some cases, a hazard may turn out to be more severe or more widespread than previously stated. When this occurs, information sources whose previous statements are proven wrong may lose their credibility.

There are also potential complications that can occur because of proactive consumer information. In these cases, information that is intended to educate the public may also have unintended signal value, suggesting the existence of previously undisclosed or underestimated hazards. Indeed, information that is intended to restore consumer trust may actually raise

consumers' suspicions, pointing to a hidden agenda of the information source. In such a situation, consumers are more likely to stick with the previous risk judgment and trust the information sources to the degree in which the provided information matches their personal risk judgments.

IX. CONCLUSIONS

The accelerating growth of new food technologies and their applications are indeed causing interference with consumer understanding. Incomplete understanding of food technology is leading to divided opinions. By providing a theoretical framework for understanding what factors affect consumers' acceptance of food technology, there are clear implications for labeling, promoting, publicizing, advertising, and pricing technological food products. A two-phase strategy for managing public opinion—focusing on precrisis interventions and postcrisis responses—is the key planning tool, which provides structure for the more tactical efforts.

It is critical to understand that not all consumers are created equal. They include the (1) accountable segment (who ignore any available information on risk and keep their habits, even though some risk may be involved in their behavior), (2) the concerned segment (who are not risk averse to begin with so their behavior is dictated primarily by their perception of risk; as their perception of the riskiness of an action increases, they will eventually get to a point where they will not participate in the action at all), (3) the conservative segment (who are cautious, risk-averse consumers who do not take any unnecessary risks), and (4) The alarmist segment (who are prone to overreacting to many situations). Addressing specific efforts toward each of these segments helps guarantee that generic efforts will not be wasted.

Managing the potential problems associated with any food safety issue involves the following five precrisis preparations: (1) promote a hierarchical understanding of food production, (2) integrate distinct communication channels, (3) accommodate consumer needs and concerns with packaging and labeling, (4) position products as comparable alternatives, and (5) address public concerns correctly. The responses following the crisis relate to open communication, risk management measures, and dealing with the potential complications that may arise.

Certainly not all crises are alike. As noted earlier, they can vary in their familiarity, severity, proximity, consequence, and the extent to which they can be avoided. Different types of crises will be evaluated differently by different groups of consumers. One group may respond to biological fears with the same panic as others view bacteria contamination. Viewing individual consumers as segments is the key to predicting the impact of any food

crisis on consumers. The crisis can change, but for every crisis there will be an accountable, concerned, conservative, and alarmist segment of consumers. Knowing their relative size will enable us to better predict the effectiveness of different interventions.

As noted at the beginning of this chapter, studies related to perceived risk have only recently turned toward issues of food safety. Consequently, many of the studies presented in this chapter were exploratory in nature and many of the observations that are made are based on one or two studies on a topic and not on a broad set of converging findings. This area is ripe for studies that systematically test some of the general predictions here across a wide range of food safety issues both natural and technological.

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