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Review

Designing effective messages for microbial food safety hazards

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ABSTRACT

Despite numerous food safety information campaigns and educational efforts, microbial foodborne illness remains a significant source of human disease. New food safety messages transmitted using new media are required to enhance food safety from farm-to-fork. A review of the literature reveals that targeting a segment of the population and understanding knowledge, attitudes, and perceptions of the individuals comprising that segment can lead to successful communication of food safety messages. Messages found to be effective are relevant to the target audience, contain reliable information, are rapidly distributed at appropriate times, and are repeated. Those containing information that is easily received and understood have also been found effective. The use of media commonly accessed by today's consumers is also valuable. Evaluation of the effect of all aspects of food safety messages and media, as measured through observation of recipients' actions, is required to validate the effectiveness of food safety communications.

Contents

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1. Introduction

The majority of microbial foodborne illnesses are thought to be preventable if food safety principles are understood and practiced throughout the entire food chain from production to consumption. A weak link anywhere from farm-to-fork can have devastating and far-reaching effects (Sewell & Farber, 2001). The impact of a food safety hazard can be amplified by the nature of current food processing and distribution systems (Lammerding & Paoli, 1997; Woteki, Facinoli, & Schor, 2001). To reduce the incidence of foodborne illness, interventions are necessary throughout the food safety continuum (Wong et al., 2004). Despite the efforts of food safety information campaigns and educational efforts, food remains a prevalent vehicle of disease (Redmond & Griffith, 2003). New food safety messages using new media may effectively modify dangerous human behaviors in the food safety system.

1.1. Risk communication in food safety

Communication about possible problems in the food supply is based in risk communication theory—a science-based approach for providing information about the safety of food in situations of a perceived or real risk. A FAO/WHO expert consultation on the application of risk communication to food standards and safety matters (1999) stated that the goal of risk communication is to provide meaningful, relevant and accurate information, in clear and understandable terms targeted to a specific audience. Upon review of the risk communication messages considered most persuasive by Frewer, Howard, Hedderley, and Shepherd (1997), statements providing direction were considered the most persuasive, as well as statements to which individuals could personally relate. The messages considered least persuasive included those containing information not directly related to the individual, statements with unfamiliar words such as *Campylobacter*, and statements that contained unnecessary dates (e.g. "the link between food poisoning and bacteria came in 1888…"). Methods of evaluation to measure behavior change resulting from food safety messaging must also be identified and incorporated into a successful communications strategy (McComas, 2002).

2. Understand the target audience

Effective health communication programs identify and prioritize audience segments (Freimuth, Linnman, & Potter, 2000). Andreason (1995) suggests that understanding specific target audiences' needs and perceptions are necessary to build an effective communication campaign with the goal of changing behavior. Any message developed with regard to a specific audience must be tailored to the audience's needs, concerns, and interests (Lundgren, 1994). For example, McGregor (2001) has indicated that the values of Canadians are not identical to those of Americans and it is therefore not appropriate to substitute an American food safety educational program, like Fight BAC!™ in Canada without first testing the effectiveness of the program. Successful communication results from investing time and effort to understand what people know and believe and what they expect from the communications process (Jardine, 2003).

2.1. Determine consumer knowledge and attitudes

A third Joint FAO/WHO Consultation was held on the Application of Risk Communication to Food Standards and Safety Matters in February 1998. The consultation identified several principles for effective risk communication, including knowing the audience—understanding the motivation, opinions, concerns and feelings of the individuals and groups that make up the audience and designing effective risk communication messages. Several strategies for effective communication were also identified by the Consultation. These included determining the public's perception of a hazard, determining the knowledge and behavior of the public regarding the risks involved, and understanding the public's motivations to act on the hazard. Covello (2003) suggests finding out what people know, think or want done about risks using techniques such as interviews, discussion groups, information exchanges, toll free numbers and surveys. Efforts to communicate are wasted if people already know the information or if the information is deemed irrelevant (Fischhoff & Downs, 1997).

2.2. Consider sociocultural factors

Authors of a UK study reported that the willingness to change behavior is determined by perceptions and beliefs, and acknowledged the need to learn more about consumer attitudes and behaviors (Wilcock, Pun, Khanona, & Aung, 2004). Food choices and risk perceptions around food are motivated by culturally relevant ethical concerns (Knox, 2000). Food issues are highly personal and involve health and nutrition, economics and security, and represent deeply held values (Probart, 2002). Cultural and social factors that could hamper risk communication need to be addressed as part of the process of designing messages for target audiences (FAO, 1999). Hudson and Hartwell (2002) conducted a study on the food safety awareness of older people in their homes in the UK using focus groups and semi-structured interviews. A feeling of complacency existed among respondents as age and experience were interpreted as reflecting knowledge. Another study in the UK (Shaw, 2004), which discussed the beef-on-the-bone ban implemented by the British government during the bovine spongiform encephalopathy (BSE) crisis, revealed that consumers preferred a policy that provided information about known risk (however partial) and allowed consumer freedom of choice.

2.3. Recognize individual perceptions

One key to effective message development is the recognition that individuals are unique, and that each person will respond to a message using his or her own filters of knowledge and experience (Lundgren, 1994). For example, Fein, Lin, and Levy (1995) determined that if a person thinks they have recently experienced foodborne illness, they are likely to increase their food safety awareness, concern and knowledge. Mazzacchi, Lobb, Traill, and Cavicchi (2008) found in a study of European consumers that trust in food safety information could not be linked to socio-demographic characteristics and it was, therefore, not possible to target specific socio-economic groups with food safety messages. The authors suggested that to be effective, messages should target audiences based on psychological characteristics. Results of an Australian study on predictors of consumers' food and health concerns similarly indicated that consumers' opinions about food issues are more likely to be adequately explained and predicted if psychographic variables are considered as opposed to demographic variables. The psychographic variables studied included personality traits, personal values and shopping styles (Worsley & Skrzypiec, 1998). Food safety messages need to be personalized enough to provide a framework for individual action, while recognizing the practical constraints of tailoring a message to each member of a target audience (Powell et al., 2002).

2.4. Identify appropriate media for distribution

McDermott et al. (2003) suggest communicators define the target audience to suggest appropriate channels for dissemination

of outreach materials. The World Health Organization (2002) asserts that specific needs of a target audience are met by determining which media are best for delivering messages to that audience. The level of trust that an individual has in the source of information affects the acceptance of the message regarding food safety. Audiences should be reached though familiar channels (Freimuth et al., 2000). A study by Buzby and Ready (1996) indicated that 40% of the respondents did not trust the accuracy of food safety information in any form, including government publications and food labeling. People relied on cookbooks more than on government sources for food safety information (Buzby & Ready, 1996). A decade later, survey respondents were found to obtain information on food safety primarily from newspapers and TV/radio; word-of-mouth, magazines and labels were also used as sources of information (Ralston, Brent, Starke, Riggins, & Lin, 2002). Consumers at that time attributed safer handling of meat and poultry to media coverage of food safety practices while revealing that consumers do not actively seek food safety information but do pay notice to recommendations provided by the media, particularly television (USDA FSIS, 2000). In a separate study, television, radio and print media were found to be the most effective ways of providing food safety information to a North American audience (USDA FSIS, 2002a). Studies also suggest that information be disseminated through books, magazines, cooking shows and web sites (USDA FSIS, 2000, 2001). Internet distribution of food safety information for consumers is increasing in the UK (Redmond & Griffith, 2006) and reflects a growing interest in the use of the Internet as a tool for communication of health-related information (Korp, 2006). The use of the Internet as a source of food safety information has not been well studied, but a 2002 survey ($n = 1006$) by the American Dietetic Association and ConAgra Foods found that an increasing number of Americans (26.6% of those surveyed) were visiting the Internet for information on food safety topics (Cody & Hogue, 2003). An Agriculture and Agri-Food Canada survey in 2006 ($n = 1600$) also found one in eight Canadians to use the Internet as a source of such information (Ipsos-Reid Corporation, 2006). This trend is expected to continue (Powell, Surgeoner, Wilson, & Chapman, 2007).

3. Rapidly create a reliable message relevant to the audience and repeat it

Research on health and related behaviors has suggested that individuals make rational decisions about such behaviors when they are aware of, and have some knowledge about, the risks associated with particular actions (Redmond & Griffith, 2003; Levy, 2002). Communication of risks involving food may be best received at teachable moments, following outbreaks of foodborne illness (Miles, Braxton, & Frewer, 1999). Timeliness is imperative in effective risk communication to overcome entrenched perceptions that are broadly dispersed in the social environment (Powell, 2000; Powell et al., 2007). Messages based on current and emerging issues must be developed and shared in a timely fashion accompanied by timeless, basic food safety information, such as the importance of hand washing (Woteki et al., 2001). Accurate evidence-based information from credible sources is the cornerstone of effective health communication programs (Conley, 1998; Freimuth et al., 2000).

3.1. Challenge complacency

Despite rapid dissemination of reliable information, awareness of specific pathogens and procedures to ensure levels of food safety does not impact consumers' willingness to change behavior (McIntosh, Christensen, & Acuff, 1994; Unklesbay, Sneed, & Toma, 1998). An effective food safety message goes beyond relaying information to influence a person's attitude and behavior (Durant, 2002). At a time when constant repetition that the food supply is very safe is widespread, Costa (2001) concludes that individuals must be convinced of the food safety threat in order to use safe food preparation methods. Effective food safety messaging must challenge complacency and food handlers' false perceptions of assurance (Levy, 2002). Redmond and Griffith (2004) reported that recognition of personal responsibility for food safety is a prerequisite for implementation of proper food safety behaviors. People with an "it will not happen to me" attitude may ignore risk communications, assuming that these messages are targeted at a more vulnerable population (Miles et al., 1999; Sparks & Shepherd, 1994). It is thus important to address perceptions of food safety risk and the notions of optimistic-bias and the illusion of control (Redmond & Griffith, 2004).

3.2. Acknowledge perceptions of risk

The public's view of risk accounts for context, cultural factors and local conditions. Individuals prefer information that can be used to determine the personal relevance of a potential risk confronting them. Regardless of the steps taken by others ensure a safe food supply, the choice to pursue food safety ultimately resides with individual perceptions (Knight & Warland, 2004). In a study by Shaw (2004) to understand food risks related to microbiological safety and bovine spongiform encephalopathy in the UK, personal risk management strategies reflected the importance of risk as a factor influencing food choice, preparation and consumption. Some people were indifferent to food safety risks and felt that other factors were more important in food preparation such as tradition, habit and enjoyment of certain practices such as licking a bowl of uncooked cake mix (which may contain Salmonella from raw eggs used in the mix). Many felt their practices had caused them no harm. Taste preferences proved more important than motivation to avoid foodborne illness in a study of reported hamburger preparation habits (rare or medium-rare versus more well-done choices) (Ralston et al., 2002).

3.3. Enhance personal perception of risk

Perception of risk plays a significant role in personal decisions and behaviors (Gordon, 2003). Educators should strive to raise awareness of personal risk associated with foodborne illness (Fraser, 2002). To make risk messages interesting and relevant to target audiences, a third Joint FAO/WHO Consultation was held on the Application of Risk Communication to Food Standards and Safety Matters in February 1998 suggested emphasizing the human rather than the statistical aspects of a story. This can be accomplished by reporting how many people have become ill (Covello, Sandman, & Slovic, 1991; Shaw, 2004; USDA FSIS, 2001). Identifying individual victims further enhances public perception of personal risk (Covello, Peters, Wojtecki, & Hyde, 2001). Consumer-based focus groups have suggested that effective messages include words that affect a person at an emotional level (USDA FSIS, 2001). Additionally, female audiences may become engaged through concern for their young children (Shaw, 2004). Through an assessment of informing expectant mothers of the risk from *Listeria monocytogenes* it was suggested that words like 'miscarriage' and 'stillbirth' be used (USDA FSIS, 2001). Risk perception may also be influenced by the perceived severity of the consequences of food risks (Shaw, 2004). A message is also more likely to be received correctly and effectively if viewed by the receiver as a surprise (Shannon, 1948).

3.4. Use narratives

Messages based on stories, and those that are meant to elicit fear about individual practices, have more impact on the desire to use safe practices than presenting consequence-based statistics alone (Morgan, Cole, Struttmann, & Piercy, 2002). Slater and Rouner (1996) report that individuals who do not believe in the information prior to receiving a message perceive narratives to be more persuasive than statistics. Psychologist Howard (1991) argues that narratives and storytelling are effective methods for conveying information because there is a better understanding of one's place in a system when an individual sees himself or herself as an actor within the context of a story. Stories reinforce facts and provide a context for using theoretical information (Lordley, 2007).

3.5. Associate with lifestyle of audience

Leventhal, Singer, and Jones (1965) found surprising and fearful messages to be more convincing than bland, informative messages, but did not evoke a change in behavior unless provided alongside personal and practical advice that related to the audience's lives. Food safety educators need to incorporate everyday context into food safety communications (Wilcock et al., 2004). For example, a survey involving four focus groups regarding barriers for the use of food thermometers by consumers indicated that ordinary meals should be highlighted over special occasion meals (Baldwin Group, 2001). Messages intended to promote safe food handling practices must also promote feelings of competency (or self-efficacy) to adopt proper practices (Gordon, 2003). Levy (2002) indicates that practice-specific information will likely be more effective than general information, while Covello (2003) says to identify specific actions that individuals can take to protect themselves. Anderson et al. (2004) recommends that effective food safety educational programs should be based on valid, reliable and evidence-based data relating to actual food handling and preparation behaviors (Anderson et al., 2004). Common food handling errors should be the focus of these messages over less frequent handling errors (Hillers, Medeiros, Kendall, Chen, & DiMascola, 2003).

3.6. Use social marketing

In 2000 the US Department of Agriculture's Food Safety and Inspection Service (USDA FSIS) launched the Thermy the Thermometer™ campaign, to encourage consumers to use a food thermometer to ensure that meat is thoroughly cooked (USDA FSIS, 2008). The campaign is based on social marketing (USDA FSIS, 2008), which offers a consumer-based approach to promote a socially beneficial behavioral change in specific populations (Lefebvre & Flore, 1988). The key feature of this approach is to understand consumers' wants and needs, and to manufacture products that enable consumers to better solve their problems. Social marketing works to change behavior by utilizing research to construct messages specifically for target audiences (Durant, 2002). Upon evaluation by the USDA FSIS after implementation, effective messages used by the campaign were identified as: "*Use a thermometer to help keep your children healthy and safe,*" "*Using a food thermometer is the only sure way to know your food has reached a high enough temperature to destroy foodborne bacteria*", and, "*Use a thermometer to enhance food quality*". By targeting parents of children (children are a high-risk age group) and by using the themes of food quality (as opposed to food safety) and eating bacteria for dinner, the Thermy™ messages have been persuasive (USDA FSIS, 2002b). Griffith and Redmond (2006) have observed changes in the behaviors of food handlers after the use of multiple food safety interventions developed using a consumer-oriented, social marketing approach. However, the authors suggest that interventions developed using this approach provide continuous interventions or interventions at staged intervals in order to expand and maintain changes (Griffith et al., 2006).

3.7. Reinforce food safety messages

To be effective, food safety messages must be reinforced on a regular basis. This can be accomplished by utilizing multiple strategies and channels to distribute the messages (Freimuth et al., 2000). Food safety information may be provided in written, verbal, or visual formats, but will be most effective if used in combination with each other (Durant, 2002). Surveys indicate that consumers, in particular, use a diversity of sources for food safety information (Ralston, Starke, Brent, & Riggins, 2000). Food safety messages reach consumers directly through brochures, labels and advertising and indirectly though newspapers (reporting on foodborne illness outbreaks and recalls), magazine and cookbooks (Ralston et al., 2000). Doing risk communication early is of little benefit if it is not also done often (Powell, 2000).

4. Ensure clarity

According to Michael Sansolo from the Food Marketing Institute who spoke at a 1997 US national conference devoted to developing food handling education programs, messages must be consistent, clear, and direct. Important points should be highlighted throughout the material and easily retrieved. To further ensure clarity, food safety communications should be of reasonable length and depth. Past research has shown the provision of too much information to be a common problem (Foster & Käferstein, 1985). Food safety messages that are burdensome to receive or decipher are easily disregarded.

4.1. Use clear language

Information should be targeted to an audience's estimated level of comprehension to be most efficient (Covello, 1995). Best practice conventions include attention to reading skills and to key elements of the message such as vocabulary, sentence construction, format and other factors that may increase or limit access to written information (Rudd, Comings, & Hyde, 2003). Use clear, non-technical language appropriate to the target audience (Covello, 2003). Studies show that many consumers appear to lack an understanding of basic food safety terms (FDA & USDA FSIS, 2000; Redmond & Griffith, 2003). One study found that up to 75% of consumers are unfamiliar with the term "cross-contamination" and the actions associated with cross-contamination (FDA & USDA FSIS, 2000). It has also been found that people are unfamiliar with the terms: separate, pathogens, cook to proper temperatures, danger zone, two-hour rule, and refrigerate promptly (USDA FSIS, 2000). A misunderstanding of key terms and concepts could nullify the impact of attempts to inform consumers (FDA & USDA FSIS, 2000).

4.2. Include graphics

It is important that the audience is able to understand the message immediately, and not question it's meaning (Lundgren, 1994). Use graphics and other pictorial material to clarify messages (Covello, 2003). Further, visual models creating a strong association between a symbol and an action, such as a thermometer and thoroughly cooked food should be used (Schiffman, 1995). If possible, avoid words by using only visual images to convey meaning (Lundgren, 1994).

4.3. Maintain consistency

A further factor that encourages compliance is consistency of information (Covello & Allen, 1988). In the Thermy™ campaign launched in 2000, final cooking temperatures recommended for consumers differed from recommended food service final cooking temperatures, which may cause confusion (PFSE, 2000). Additionally, claims by the Thermy™ campaign that using a thermometer was the only sure way of knowing that food is thoroughly cooked conflicted with claims by the Fight BAC!™ campaign also implemented in the US at that time that red meat is cooked when it is brown or gray, chicken is cooked when the juices run clear, and fish is cooked when it flakes with a fork (Durant, 2000; PFSE, 2000). Contradictory messages can cause confusion and create distrust in the information itself and also in the agencies disseminating such information (Covello, 1988). The Thermy™ campaign was launched by the USDA FSIS in light of new evidence that color was not a reliable indicator of the doneness of ground beef (USDA FSIS, 2004). The Fight BAC!™ campaign by the Partnership for Food Safety Education failed to update its recommendations for years after this information became available (PFSE, 2000). This suggests that frequent, routine assessment of available information could reduce inconsistencies among food safety messages. When multiple formats are used to distribute risk information, it is vital that all messages are consistent (Powell et al., 2002).

5. Test and evaluate messages

A Joint FAO/WHO Consultation on the Application of Risk Communication to Food Standards and Safety Matters in February 1998 suggests adding an evaluation component to any risk communication strategy, and testing the clarity and understanding of the messages with a representative segment of the target audience. Covello (2003), who published revised best practices for a public health risk and crisis communication plan based on earlier work in the field of risk communication, suggests pre-testing prepared messages. McDermott et al. (2003) encourage communicators to pretest developed materials with target audience in the context in which they will be distributed and revise based on the results.

Following distribution, evidence-based evaluations must be done to determine the effects of food safety programs on individuals' food safety knowledge and behaviors (Briss et al., 2000). It is important that these evaluations be conducted using direct observation as clear discrepancies have been identified between observational and self-reported data in studies of food-handling behaviors (Anderson et al., 2004; Clayton, Griffith, & Price, 2003; DeDonder et al., in press). Clayton et al. (2003) suggest that intentions to perform safe food handling are not always manifested, as some actions during meal preparation are not under volitional control. In an observation of the cooking behaviors of adolescents, DeDonder et al. (in press) noted that such absent-minded behaviors as brushing the hair from one's face contributed to increased instances cross-contamination. Direct observation can be used to capture an individual's actual behavior and place the behavior in context (Gittelsohn, Shankar, West, Ram, & Gnywali, 1997).

There is also a need to evaluate whether food safety educational programs are addressing the most salient food safety behaviors (Medeiros, Hillers, Kendall, & Mason, 2001). Food safety communicators must also be aware that new pathogens will emerge and known pathogens will re-emerge in response to changes in food production and distribution methods, microbial genetic adaptations, changing population demographics, changes in food preparation and consumption patterns, and influences of global commerce. This variation in pathogens of concern underlines the need for continual re-examination of the food safety guidance provided to consumers (Hillers et al., 2003).

6. Conclusion

Each audience brings unique challenges to the development and transmission of food safety information. The public consists of a wide range of vastly different lifestyle situations that must be considered if messages are to be effective. Individuals at high risk of disease and death by foodborne pathogens—and their caretakers—deserve heightened attention from food safety communicators within, and in addition to, communication with the general public. The setting in which the information is received also an important consideration as the multiple food preparation environments from the farm to the fork each necessitate different delivery mechanisms and content to compel the target audience to practice microbiologically safe food handling. The key message for any food safety communicator is that food safety is complex, and it requires constant vigilance, commitment, and compelling communications.

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