



## Identifying baseline food safety training practices for retail delis using the Delphi expert consensus method

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### ABSTRACT

With the seriousness of foodborne illness risk in the deli industry, more emphasis is being placed on food safety training for deli employees. It is critical to identify the minimal, baseline training that must be given to every new employee in order to keep the public safe from foodborne illnesses. Food safety objectives (286) were obtained based on the 2009 United States Food and Drug Administration Food Code and four online food safety training platforms, and were screened by expert Beta panelists to 75. These were presented to 15 experts currently working in or managing retail delis in a three round modified Delphi technique by means of Qualtrics survey software. Delphi is a unique method to develop group consensus for what should be included in subject matter where precise information is not readily available. In the first Delphi round none of the objectives, including those from the FDA Model Food Code, reached the consensus level. A 5-point Likert scale was used to identify the relevance of each deli specific, food safety objective. The results of our statistical analysis were presented to the expert panel before each subsequent Delphi round, so that by the third iteration, 53% of the panelists agreed with the inclusion of particular deli specific training objectives. Fifty-eight of the 75 training objectives achieved at least a 70% consensus rate. None of the current online food safety training materials addresses deli specific content. The results of this research could serve as a guideline when food safety instructors in deli operations develop their own training materials or to identify key concepts in existing training platforms.

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### 1. Introduction

In the U.S. each year an estimated 9.4 million episodes of foodborne illness, 55,961 hospitalizations, and 1351 deaths caused by 31 major pathogens occur annually (Scallan et al., 2011). Of these foodborne outbreaks 66% are associated with restaurants and 9% with catered events (Jones et al., 2004). As many as 4 in 10 people in the U.S. eat in restaurants on any given day, and 1 in 6 eats more than 5 meals per week in restaurants (Garman, Jones, & Kennedy, 2002). The public spends billions of dollars each year eating ready-to-eat (RTE) foods from delis, where sliced meats account for almost 40% of deli sales (Anonymous, 2000). In 1998, consumers were found to purchase deli foods an average of 2.5 times per week, an increase from 1.2 times per week in 1994 (Anonymous, 2000). In 2002, a multi-state outbreak of listeriosis linked to deli turkey meat affected 54 persons and caused 8 deaths and an additional 3 fetal

deaths (Gottlieb et al., 2006). While the source of the *Listeria* was traced back to the turkey processing plant and resulted in subsequent changes in U.S. regulatory policy, behaviors and conditions within the retail deli operation that may have contributed to the spread of this foodborne outbreak were not addressed. Consumers have demonstrated that they will hold all segments of the food supply chain, including restaurants and delis, accountable for foodborne illnesses (Connally, 2009, p. 7). In 2003, the largest single source epidemic of hepatitis A was associated with Mexican green onions served at Chi-Chi's restaurants; this outbreak sickened more than 650 people and four died (CDC, 2003). The outbreak was attributed to poor sanitation, and the total compensation paid by Chi-Chi's was \$50 million (Connally, 2009, p. 7).

*Listeria monocytogenes* has emerged as one of the greatest food safety concerns due to the increase in consumption of RTE foods that are especially vulnerable to post-process contamination (Garrido, Vitas, & Garcia-Jalon, 2009; Lianou & Sofos, 2007). Foodborne illness caused by *L. monocytogenes* is especially dangerous for pregnant women because it can cause miscarriage, fetal death, death of the infected newborn infants or if the infant survives,

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a life-time of impairment and additional medical care (Painter & Slutsker, 2007). Older adults and those with weakened immune systems may also suffer severe illness or death (Painter & Slutsker, 2007). Since *L. monocytogenes* can grow at refrigerator temperatures, a few viable cells can grow to an infective dose at retail or in customers' refrigerators, given sufficient time (FSIS, 2003). Out of the 20 categories of RTE foods, deli meats were identified as having the greatest risk for causing listeriosis in the latest risk assessment (FSIS, 2003). This risk assessment specifically estimated that approximately 90% of human listeriosis cases in the U.S. are caused by eating contaminated RTE deli meats (FSIS, 2003).

The deli environment is a high risk area for *L. monocytogenes* cross-contamination because this organism adheres by biofilms to food-contact surfaces commonly found in delis such as stainless steel, refrigerator gaskets and cutting boards (O'Toole, Kaplan, & Kolter, 2000). Commercial deli meat slicers have also been identified as a potentially high risk vehicle for cross-contamination (Lin et al., 2006). A study from National Alliance for Food Safety and Security of supermarkets and independent retailers in the U.S. found that 1.2% of deli meats sliced at retail were positive for *L. monocytogenes* as compared to 0.2% of those that were commercially packaged under continuous USDA inspection (Draughon, 2006). Although deli managers strive for safe food handling practices, high employee turnover and time constraints for employee training often poses a problem (Crandall et al., 2011).

One of the biggest challenges for retail food service managers is staffing due to the high employee turnover. According to Ebbin (1999), employee turnover in a sample of full-service restaurants was approximately 78% in 1997. Nearly ten years later, another study showed that employee turnover rate had risen to 107% in a selected sample of restaurants (Berta, 2006). German and Hawkes (1990) reported an average employee turnover rates in delis in their study was 67%. These high employee turnover rates may increase the risk and certainly negatively impact the effectiveness of food safety training because food service managers are in a consistent cycle of new employee training (Grujic, Grujic, Durasinovic, & Pavlovic, 2010). This makes it critical to identify the minimal, baseline training that must be given to every new employee in order to minimize the risk to consumers from foodborne illnesses from delis.

The goal of this research was to identify base-line food safety information specifically for delis that should be included in any minimal deli food safety training program. Specifically, the objective was to reach consensus on the most important food safety objectives that deli managers should address in developing minimal training materials.

## 2. Materials and methods

### 2.1. Content analysis

First, the researchers identified training objectives found in the 2009 FDA Food Code (FDA, 2009) and created a summary description for each category. In addition, four food safety training platforms including the National Restaurant Association Education Foundation ServSafe®, Food Marketing Institute Super Safe Mark®, Training Achievement Programs®, and Alchemy Systems were reviewed and their current on-line training objectives identified. A content analysis was conducted using the objectives of the four food safety training platforms to examine the number of positive words used to describe the training objectives identified in FDA Food Code. Objectives identified by multiple food safety platforms were consolidated into one objective and worded so as to have the same meaning. Two hundred and eighty six objectives were identified and incorporated into questionnaires to survey deli experts.

### 2.2. Beta test

A pilot study was initially undertaken with six deli employees and 6 managers from a small regional supermarket chain to reduce the list of 286 objectives identified in the content analysis. The goal was to eliminate objectives that were not directly applicable to delis. In this pilot study experts were asked to eliminate the objectives that were not applicable to the retail deli industry specifically and add any that were not included in the matrix but in their experience had been shown to be important. For example, possible hazards of vending foods were eliminated because it did not pertain to the deli environment. After gathering the data, totals for each objective were tabulated. Objectives which were eliminated by at least three panelists were not included in the final evaluation matrix used in the Delphi sessions. A series of questionnaires were then designed based on the final evaluation matrix to better define panel member opinions of what food safety objectives were specific to deli operations.

### 2.3. Delphi panel

One method of identifying baseline training materials for new employees is to survey knowledge experts through the Delphi survey technique. The Delphi technique is used to elicit and refine group judgments in order to improve the quality of estimates especially when exact knowledge about an issue is not available (Henson, 1997). The Delphi method was developed by Dalkey and Helmer (1963) and the Rand Corporation and is typically conducted in two or more rounds; where the results of the first round are incorporated in the revised presentation in the second round to allow the responders to reassess their original evaluation (Linstone & Turoff, 1975). The multiple-level feedback allows and encourages the expert Delphi panel to reassess their initial judgments about the information provided in previous iterations (Hsu & Sanford, 2007). This technique offers a unique method to develop group consensus for subject matter where precise information is not readily available (Dalkey & Helmer, 1963). Traditional surveys attempt to answer "what is" while the Delphi method attempts to answer "what should be" (Miller, 2006). The Delphi technique has been used in food science for several applications including the ranking of consumer food-handling behaviors associated with the prevention of illnesses caused by pathogens, to estimate the incidence of foodborne *Salmonella* in the UK and the effectiveness of alternative control measures and to identify the views of key stakeholders on an evolving food risk governance framework (Henson, 1997; Hillers, Medeiros, Kendall, Chen, & DiMAscola, 2003; Wenholt, Rowe, König, Marvin, & Frewer, 2009).

#### 2.3.1. Delphi panel recruitment

Several researchers have suggested a Delphi panel size between 8 and 15 is sufficient (Cavalli-Sforza & Ortolano, 1984; Novakowski & Wellar, 2008). Therefore, 15 expert panelists were recruited from a regional supermarket chain in Arkansas and a regional supermarket chain in Texas. A subject expert is a group of 'specialists' in their field or someone who has knowledge about a specific subject (Linstone & Turoff, 1975). To select appropriate experts for the Delphi panel, researchers should follow a procedure governed by explicit criteria (Keeney, McKenna, & Hasson, 2011). According to literature regarding Delphi panels, the following elements are the key requirements in selecting a Delphi panel: 1) expertise which is defined as knowledge and practical engagement with a certain topic, 2) capacity and willingness to contribute to the exploration of a particular problem, 3) assurance of sufficient time to dedicate for the multiple Delphi rounds from experts, and 4) written communication skills (Chaffin & Talley, 1980; Keeney et al., 2011).

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