

Overview of Food Safety Issues in School Foodservice Operations in the United States

Junehee Kwon[†]

Department of Nutrition and Food Sciences, Texas Woman's University, USA

ABSTRACT

Millions of people in the US suffer from foodborne illnesses each year. In the US, multiple government agencies work separately or together to ensure the nation's food safety for different audiences. FDA plays a key role in ensuring food safety in foodservice operations by providing the Food Code. School foodservice operations must follow the FDA guidelines on food safety and make sure that foods produced in school foodservice are safe. Despite the continuous efforts, school foodservice operations were responsible for numerous foodborne outbreaks. Currently, school foodservice operations serve younger children (< 5 years) and children with medical conditions which make the food safety extremely important. There are many programs that foodservice operators can use to train and educate their employees. ServSafe[®], state or local food safety education programs, Serving It Safe, and HACCP workshop are common programs that can be used to train their staff. HACCP is a preventative program that can prevent foodborne illnesses before they occur. Although there are many benefits of utilizing HACCP and training programs, a majority of school foodservice directors and managers still did not implement HACCP nor perceived their food safety training is adequate. Most reasons why not implementing HACCP program are lack of trained personnel, time, and financial resources in the school foodservice systems. The gap between what people know and what people do is another challenge identified as an obstacle for food safety programs. Despite safe food sources in the US, continuous training is necessary to remove human errors and ensure food safety in the school foodservice systems. Future research is recommended to reduce the gap between food safety knowledge and behavior. Foodservice operators and researchers may apply the systems developed in the US to their food systems. (*J Community Nutrition* 5(4) : 239~245, 2003)

KEY WORDS : food safety · school foodservice · HACCP.

Introduction

In the United States (US) alone, it is estimated that 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths are caused by foodborne pathogens each year (Mead et al. 1999). The damage caused by foodborne illnesses on the economy and the quality of people's lives are enormous, and the importance of food safety cannot be overemphasized. Efforts to ensure the nation's food safety have continued over several decades. Moreover, since Food Safety Initiatives in 1997, more attention to food safety has been given from food manufacturers to foodservice operators. Lately, the US

government is more concerned than before due to the possibility of intentional attack-bioterrorism-against the US food system.

A majority (79%) of outbreaks reported from 1973 to 1987 attributed to food prepared in restaurants and other foodservice establishments (Nies, Van Laanen 1995). Regardless of the financial goals of foodservice organizations (i.e., commercial or institutional foodservice), food safety must be considered as one of the most important operational objectives. In institutional foodservice facilities where a relatively large number of clients are served on a regular basis, ensuring food safety is imperative. The major institutional foodservice operations include hospital and long-term care, business and industry, primary schools (Kindergarten through 12th grades), and college and university foodservices. Among these institutional foodservice facilities, this article focuses on various food safety issues related to school foodservice facilities. Specific topics include : Current status of food safety in school foodservice, efforts to ensure food safety in

[†] **Corresponding author** : Junehee Kwon, P.O. Box 425888 Department of Nutrition and Food Sciences Texas Woman's University Denton, TX 76210, USA
Tel : 001-1-940-382-5539, Fax : 001-1-940-898-2634
E-mail : JKwon@mail.twu.edu

school foodservice operations including HACCP, and challenges in ensuring food safety in school foodservice.

1. Current status of food safety in school foodservice

1) Vulnerability of the customers

Each weekday in the US, millions of children eat breakfast and/or lunch served at school. The National School Lunch Program served over 28 million children per day in 2002, which accounts for nearly 10% of the total population (United States Department of Agriculture[USDA] 2003). The majority of these students served are (5 years old whom generally have not been considered as an at-risk population. However, a recent survey showed that over half of school foodservice facilities serve foods to at-risk populations. These at-risk populations who are more vulnerable to foodborne illnesses include students who bear medical conditions requiring diet modifications and young children (<5 years old) being served at preschools and daycare centers (Kwon 2003).

Researchers indicate that such vulnerable groups can consume same affected foods but become more severely ill and/or suffer from more serious and long-term consequences (The Institute of Food Science & Technology 1998). On February 18, 2001, eleven children and their families from Finley Elementary School in Washington were awarded \$4.75 million for an E. coli O157 : H7 foodborne outbreak due to undercooked taco meat. Children were affected by short-term and long-term health consequences due to bacterial infection requiring serious treatment including kidney transplant for a 4-year-old boy. This case illustrated the importance of ensuring food safety in school foodservice where at-risk population is being served. In addition, with this case, the jury placed the total responsibilities in the foodservice operator not the supplier of the infected foods. This further indicates that safe food handling at the foodservice operation is more important than any other steps in the food system.

2) Financial situation of school foodservice operations

Food safety training and education need was recognized as one of top five training topics recognized by managers. However, there were many more training needs identified by school foodservice managers including cost effectiveness and employee motivation and retention (Sullivan et al. 2002). Each school foodservice, also as known as the Child Nutrition Program, is operated on an individual school district

basis, and the majority must be financially self-supporting. Large school districts may have more ample financial and human resources than smaller districts and be available to support a food safety training program. However, the majority of school districts are small with less than five schools in the district (National Center for Education Statistics [NCES] 2002), and these small districts may not have sufficient resources for implementing such programs or supporting their staff to receive external food safety training. With decreasing participation rate and government support, most of school foodservices operate with very streamlined financial and human resources.

2. Efforts to ensure food safety in school foodservice operations

A review of foodborne outbreaks reported to the Centers for Disease Control and Prevention (CDC) revealed that over 600 outbreaks occurred from 1973 to 1997 in school foodservice facilities (Daniels et al. 2002). Among these outbreaks, the etiology of only 40% of the cases was identified, and food sources that caused the outbreaks were not identified in 45% of the cases (Daniels et al. 2002). Known causes of such outbreaks included improper food storage and holding temperatures and food contamination by food handlers (CDC 1990 ; Daniels et al. 2002 ; Kim, Shanklin 1999). Cross-contamination from cutting utensils and food handlers' hands (Snelling et al. 1991 ; Zhao et al. 1998) and poor hand-washing and glove use (Gilmore et al. 1998) were also identified as possible causes of foodborne illnesses. The CDC recognizes that most foodborne illnesses are preventable. Training and certification of food handlers were identified as a possible solution to reduce foodborne illnesses at schools as well as purchasing safe foods (Daniels et al. 2002).

1) Reducing microorganisms in foods purchased for school foodservice

One of many efforts to make the foods served at school cafeterias safer is purchasing ingredients that are free of harmful microorganisms. USDA mandated in 2000 that ground beef product supplied to child nutrition system should be free of salmonella. There have been numerous occasions that USDA recalled food products such as ground beef supplied to school foodservice facilities because they failed to pass the test for salmonella and/or E. coli. This approach has been criticized by meat processors who indicated that USDA expectations are unrealistic in the current meat pro-

cessing environment (Ingersoll 2000, June 15), and caused USDA to reconsider the rule in 2001 (Kaufman 2001). USDA concluded that the cost of ensuring no salmonella in the ground beef was not justified because there are less expensive measures for the food safety in the school foodservice. Purchasing irradiated ground beef was suggested as an alternate method to purchasing ground beef with no salmonella and will be an option for school foodservice operators when they purchase ground beef in January 2004 (Roos 2002 ; R. Wantland, personal communication, October 27, 2003).

In addition to attempting to reduce the level of harmful microorganisms in raw meat items, purchasing pre-cooked meat, poultry, and fish items also became popular. The rationale behind buying pre-cooked items is to reduce the risk of the foodborne illnesses by reducing possible undercooking of meat and poultry products. Almost all chicken nuggets and other chicken, beef, and fish items are purchased as pre-cooked forms in school foodservice (Kwon 2003). However, recent *Listeria* outbreaks in pre-cooked meat products (CDC 2002) and anecdotal incidents of finding undercooked products among pre-cooked items warn consumers and foodservice operators that purchasing such foods is not the final answer to preventing foodborne illnesses. In addition to purchasing safe food products, food handlers' personal hygiene and food handling practices must meet safety requirements to ensure safe foods for consumers.

2) Food safety education for school foodservice personnel

Several options are available for food safety training for school foodservice personnel. Research showed that over 80% of school foodservice directors have one or more of following food sanitation certifications : State or local food safety programs (46.9%), ServSafe® (45.3%), Hazard Analysis Critical Control Point (HACCP) workshops (30.7%), and Serving It Safe (SIS) (16.1%) (Kwon 2003). ServSafe® certification program developed by the National Restaurant Association is one of the most reputable, popular, and nationally recognized food safety training programs in the US. ServSafe® requires 16 hours of classroom training and an exam after completion of the program. Many state and local sanitation education programs are often adopted ServSafe® curriculum and developed state sponsored food safety program.

Some states mandate all foodservice employees to hold food handler's certificates. The degree of training for such program varies greatly from watching one-hour video to attending 8 - 16 hour sessions. All of these certification programs contain some training on HACCP as a part of the curriculum and requirements for continuing education in food safety for maintaining certification status.

SIS is a 10-hour food safety training program developed by USDA and National Food Service Management Institute (NFSMI) based on ServSafe® curriculum. SIS is geared toward school foodservice personnel, and the training materials comprise basic food safety training including HACCP (The American School Food Service Association [ASFSA] 2002). ASFSA reported that nearly 60% of its members, most of whom are school foodservice personnel completed SIS. ASFSA members include supervisory and non-supervisory members of school foodservice systems. SIS is being recommended by ASFSA, NFSMI, and USDA for school foodservice programs as an inexpensive and comprehensive tool to teach food safety.

Each program follows a similar premise and covers similar contents based on the *Food Code*. The main difference among different education programs is hours of training required for the certification. Depending on the allowable time, different levels of training is given. Typically, when state and local authorities require holding a certification for all foodservice personnel, the length and extent of the training program is shorter than voluntary training programs such as ServSafe® and SIS.

3) Hazard analysis critical control point (HACCP) for school foodservice

Implementation of a self-inspection system such as the HACCP program has been also identified as a preventative measure for foodborne illnesses (Department of Health and Human Services [DHHS] 2001 ; Notermans et al. 1995). HACCP is defined as "a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement, and handling, to manufacturing, distribution, and consumption of the finished product" (National Advisory Committee on Microbiological Criteria for Foods 1998, p.1248). HACCP is considered one of the best ways to prevent foodborne illnesses because the entire food flow is investigated, and preventative measures are identified and

reinforced(USDA, Food and nutrition Service[FNS] 2002).

Many steps are required for a successful HACCP program, from purchasing to service of foods : Identifying hazards and critical control points ; establishing critical limits, monitoring procedures, corrective actions, verification procedures, and record-keeping procedures. Table 1 describes the HACCP procedures and provides examples for each procedure.

Because HACCP is a highly customized system, a school

foodservice director must select a HACCP planning team with the director, managers and supervisors, cooks, and other key personnel involved in production and services(USDA, FNS 2002). Thorough investigation of hazards throughout the complete product flow is the indispensable starting point of a successful HACCP program. The HACCP team must review their menus, food supplies, clientele, and other hazards that are likely to occur during the flow of food(Food and

Table 1. HACCP Development Procedures and Examples of Activities(Modified from USDA, FNS, 2002)

	Examples of activities
1. Identify hazards based on menu, preparation procedures, and clientele characteristics	<ul style="list-style-type: none"> a. Review menus and identify potentially hazardous foods that are more vulnerable to causing food safety problems. b. Evaluate clientele and identify risks related to clientele profile (e.g., high-risk population). c. Evaluate preparation, cooking, holding, chilling and reheating procedures as appropriate. Identify hazards that likely exist in each procedure, and prioritize the severity of consequences if violated.
2. Identify critical control points(CCP)* for individual food items	<ul style="list-style-type: none"> a. Cooking for raw meat, poultry, fish, and egg products b. Holding for hot food items on the serving line c. Chilling for cooked items to be re-served or modified (e.g., boiled chicken for chicken salad) d. Reheating for a prepared hot food item that is stored under refrigeration e. Storing for potentially hazardous foods that will not be cooked further (e.g., potato salad)
3. Establish critical limits for each CCP identified in the previous step	<ul style="list-style-type: none"> a. Minimum internal cooking temperatures for safety: <ul style="list-style-type: none"> i) Ground beef : 155 F for 15 seconds ii) Chicken breast : 165 F iii) Roast beef, medium : 145 F for 3 minutes iv) Egg dishes : 165 F v) Ground chicken & turkey : 165 F b. Minimum holding temperature for hot food : 140 F c. Safe chilling procedure : Chill from 140 F to 70 F within the first 2 hours, then to 41 F or lower in the following 4 hours d. Reheating temperature for the hot foods : 165 F e. Storage temperature for potentially hazardous foods : 41 F or lower
4. Establish monitoring procedures	<ul style="list-style-type: none"> a. Identify the responsible person who will monitor CCPs and the timing of monitoring(e.g., The cook will check the internal temperature of the chicken nuggets to ensure proper doneness ; The cafeteria supervisor will check the holding temperature on the hot food table every 2 hours). b. Identify how the monitoring will be recorded.
5. Establish corrective action for each violated critical limit	<ul style="list-style-type: none"> a. Continue cooking until internal temperature reaches the safe level. b. Reheat hot foods to 165 F for 15 seconds if food temperature has fallen under 140 F on the hot food table within less than 2 hours. c. Discard hot foods if holding temperature has fallen under 140 F on the hot food table, and more than 2 hours has passed since the last safe temperature recorded. d. Reject the shipment if the temperature of a potentially hazardous food at receiving was >41 F.
6. Establish verification procedures	<ul style="list-style-type: none"> a. Examine records and make sure employees are writing down actual, valid data. b. Perform internal inspections or request routine inspections by public health department.
7. Establish record keeping procedures	<ul style="list-style-type: none"> a. Keep records for an adequate time period for possible challenges. b. Decide how and how long written record will be maintained. c. Determine person-in-charge so that record keeping procedures will be performed properly.

*CCP : A procedure in a specific food system where loss of control may result in a health risk(DHHS 2001)

Drug Administration[FDA]), 1998 ; USDA, FNS 2002). The first step, identifying hazards, may be the most critical and time-consuming process. Based on risks identified, the subsequent steps are completed to meet the needs of a particular foodservice operation (Table 1).

Despite the proven benefits of HACCP, school foodservice operations are lagging behind in implementing HACCP programs (Giampaoli et al. 2002 ; Hwang et al. 2001 ; Youn, Sneed 2003). Recent findings showed that only 22% of school foodservice directors implemented a comprehensive HACCP program, and only 11% had formed a HACCP team (Youn, Sneed 2003). Hwang et al. (2001) found that 33.5% of school foodservice managers/directors indicated that they did not know about HACCP, and an additional 26.1% knew about HACCP but did not have plans to implement a HACCP program. Lack of time to establish and manage a HACCP program in addition to a lack of training funds were identified as possible reasons for unwillingness to implement HACCP (Giampaoli, Sneed et al. 2002 ; Hwang et al. 2001).

4) Food safety regulation agencies in the US

Multiple government agencies of the US are currently involved in ensuring the nation's food safety : USDA, DHHS as in the FDA and CDC, Environmental Protection Agency, and Department of Homeland Security, the latest addition to the executive branch of the US government. Different agencies have different emphases and areas where they ensure food safety. Among these agencies, the FDA is predominantly involved in ensuring food safety in foodservice establishments by providing the Food Code, a science-based food safety reference that can be adopted for state and local codes (DHHS 2001).

3. Challenges in ensuring food safety in school food-service

Youn, Sneed (2003) suggested that all foodservice employees need food safety training as a prerequisite for HACCP. Although food handler certification programs may provide basic food safety knowledge, a lack of financial resources worsened by reduced government support and lunch participation may discourage school foodservice directors from training themselves or their staff on HACCP (Carter et al. 1999). Complexity and length of time required for HACCP implementation may also discourage school foodservice managers and directors from initiating a training program.

These obstacles and difficulties may exist more in small- to medium-sized school districts (R. Wantland, personal communication, January 27, 2003). Recent survey results showed that 58.1% of school foodservice directors did not implement HACCP in their foodservice facilities. When asked reasons for not implementing HACCP, 15.8% responded that they are not familiar with HACCP, and 23.0% responded that their staff are not familiar with HACCP. Additional 34.1% indicated that there is a lack of time and financial resources to implement HACCP (Kwon 2003).

Even with food safety education and training, an additional challenge remains : The gap between people's knowledge and behaviors. Researchers found that people did not follow safe food handling practices even though they knew the proper handling methods. Only 7.7% of survey respondents reported checking internal temperature of ground meat items when 23.7% knew checking internal temperature is the safest way to check the doneness of ground beef products. Over 90% knew cutting boards must be sanitized after using it for raw meat items, but about 20% reported they do not follow the procedure (Kwon et al. 2002).

4. Conclusion and recommendations for future research

Despite plenty of food safety systems and research, school foodservice facilities lag behind with preventative program such as HACCP. Many operators choose to use foods with low levels of microorganisms or pre-cooked products to reduce the foodborne illness risks. However, throughout the food system, there are many possibilities for foods to become unsafe. School foodservice operators must plan and follow through sound food safety inspection program that can meet the individual facility's needs followed by employee training.

Future research is recommended to identify ways to improve food handling behaviors of school foodservice directors and personnel on HACCP and safe food handling practices. Research on motivating employees to follow the safe procedure and to close the gap between food safety knowledge and behaviors will be beneficial. Based on findings, suggestions should be made to eliminate obstacles and improve motivation. As a result, adequate knowledge can bring about safe food handling procedures. In addition, development of easy educational materials such as interactive instructional tools may be recommended to assist foodservice directors with tight resources.

The US government considers food sources in the US are safer than foods produced anywhere else in the world. However, foods can be contaminated in any points even after obtaining the safest foods by human errors, and foods may be imported from the global market where the US government has no control of ensuring food safety. With environmental challenges such as existences of antibiotics-resistant microorganisms and increased high-risk populations (i.e., the elderly and the immuno-compromised), safe food handling practices are more important than ever. With coordinated efforts between researchers and extension services, food safety message has been spread to most parts of the food systems. What is left is how to realize what people know into how they handle foods. Continuous research and innovative training efforts must be continued to ensure safety of foods served in the school foodservice operations.

Much resource has been invested to ensure food safety in the US. Research results have been communicated via printed materials as well as through internet. However, the food system in the US is different from other countries, and the food safety system developed by the US researchers may not fit well with systems in other countries. The information presented in this paper may be used as a reference for developing food safety systems in other countries.

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