

Assessment of Educational Needs and Current Practices of Front-line Grocery Employees in the
Deli and Bakery

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ABSTRACT

Grocery store associates in the deli-bakery departments serve and prepare an increasing amount of ready-to-eat foods. This increases the need for a detailed, effective food safety training program in retail grocery establishments to prevent food borne illness. This research examines food safety knowledge, training preferences, needs, and current practices of grocery stores deli-bakery employees in Southwest and Southern Virginia. This research had two phases. Phase I: employees completed a thirty-four question needs assessment survey concerning background, food safety training needs, preferences and knowledge. Phase 2: 15 employees (from phase 1 locations) food behaviors were observed for approximately six hours each (89.05 hours total). Observational data collection focused on glove use, cross-contamination, and hand washing. The results showed that most grocery food handlers desired hands-on, interactive and one-on-one training that occurs frequently, but is short: less than two hours in length. Overall, most grocery food handlers had general safe food handling knowledge; however, the observational behavior data indicates behaviors do not reflect their knowledge. Greater than 95% understanding was found on the subjects of hand washing and glove use; however, these items were observed practiced incorrectly the most with bare hand contact with ready-to-eat foods and lack of hand washing prior to glove use. The creation of short, hands-on or interactive trainings for retail grocery food handlers that focuses on changing food handling and preparation behaviors may be more effective than current training.

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CHAPTER ONE : Introduction

Assessment of Educational Needs and Current Practices of Front-line Grocery Food

Handlers in the Deli and Bakery

Introduction and Justification

According to the Centers for Disease Control and Prevention (CDC) an estimated 76 million cases of food borne illness occur each year in the United States. Although the majority of these cases are mild and only last one to two days, food borne disease still accounts for 325,000 hospitalizations and 5,000 deaths annually (CDC, 2009). Almost half of reported food borne illness cases were attributed to unsafe employee practices in the food service environment in a surveillance report (Olsen et al., 2000). One way to decrease the number of illnesses caused by foods annually is by having the people that work with foods, especially ready-to-eat (RTE) foods use safe food handling and preparation practices.

With Americans more and more pressed for time, there is a higher demand for RTE or convenience foods that require very little preparation in the home (Binkley and Ghiselli, 2005). As a result of this trend, grocery stores are offering prepared, RTE meals such as fried chicken, rotisserie chicken, entrée salads, subs, and many side dishes such as corn, green beans, or mashed potatoes with gravy. Grocery store employees working to prepare these types of foods need food safety training comparable to that of a restaurant food handler to ensure safe food preparation (FDA, 2004; Binkley and Ghiselli, 2005).

Food can easily be contaminated by a food handler. The top risk factors for food borne illness contracted from food handlers are improper holding time and temperature, poor personal hygiene, and contaminated equipment/prevention of contamination (FDA, 2000; FDA, 2004).

These three categories have shown a consistently high rate of noncompliance in institutional food service (hospitals, nursing homes, and schools), restaurants (fast food and full service), and retail food stores (FDA, 2004). All of these factors can be attributed to the food handler. Having workers that are knowledgeable and practice safe food handling can greatly decrease the risk of food borne illness. Therefore, the delivery of effective food safety education is essential to preparing safe food.

For food safety training to be effective, it must influence knowledge gain and change food handling practices. Research has been conducted to examine what influences change and results in the food handlers' adoption of training practices and good food safety habits in food service and restaurant operations (Chapman et. al, 2010; Roberts et. al,2008; Egan et.al, 2007). However, no studies have evaluated the effect and preference of training methods for frontline grocery store employees in the deli and bakery departments. This research will provide insight into the food safety training needs as well as training preferences of grocery store food handlers. The results will influence future development of more effective training for these workers. More effective training may ultimately result in decreased incidence of food borne illnesses.

This research has two phases. Phase I consists of a needs assessment evaluating the grocery food handler's background, training preferences and food safety knowledge. Phase II, consists of observational data collection, where a trained evaluator examines the actual food safety practices in the workplace (deli or bakery). Data from this study will give insight into knowledge and actual practice gaps and help researchers develop food safety education and training for the retail food industry.

CHAPTER TWO: Literature Review

Food Safety and Food borne Illness in the United States

The food supply in the United States is viewed as one of the safest (Roberts, et al, 2008). There are many preventive programs in place along the farm to fork continuum to help increase the safety of the food supply. Farms have recommended guidelines to follow such as Good Agricultural Practices (GAPs) (VDACS, nd). These guidelines provide recommendations for issues concerning worker health and hygiene as well as issues about pre- and post- harvesting safety of crops. Processing facilities follow Good Manufacturing Practices (GMPs) which include recommendations on issues such as food handling procedures, storage conditions, and labeling. Food is also subject to inspection on the farm, in storage at warehouses, for sale in the store, and at any step in between (VDACS, nd). Retail stores, food service operations, and restaurants train employees in safe food handling practices. These facilities are inspected by the state health department. In Virginia, the Virginia Department of Health is responsible for this inspection (VDH, 2009). The last group, consumers, are the target of numerous food safety programs such as FightBAC® which emphasizes the importance of and teaches the concepts “Clean, Separate, Cook, and Chill” to reduce food borne illness. Consumers also are informed about recalls and outbreaks from television ads, newspaper stories, and grocery store signs (FMI, 2008 b).

Many federal agencies are involved in keeping the food supply safe through inspections and regulations such as the Food and Drug Administration (FDA) or the United States Department of Agriculture (USDA) and state agencies such as departments of health or departments of agriculture. Additionally, there are private organizations, often industry or commodity specific such as the National Restaurant Association and United Fresh Produce

Association ,that contribute to food safety through magazines, workshops & training, and conducting research to keep people aware of current food safety issues (National Restaurant Association, 2009 a; United Fresh, 2009).

Despite these efforts, an estimated 76 million people are affected by a food borne illness annually. Of these, 325,000 hospitalizations occur and approximately 5,000 deaths. Food borne illnesses can be caused by microorganisms (bacteria, viruses, parasites, and molds) or chemical irritants. The most common food borne illnesses are caused by microorganisms such as *Campylobacter*, *Salmonella*, *E. coli* O157:H7 and Norwalk-like virus (CDC, 2009). The severity of food borne disease can range from being completely asymptomatic to requiring hospitalization or death. The people most at risk for a food borne illness are the young, the elderly, and the immunocompromised (CDC, 2009).

Risk Factors Contributing to Food borne Illness:

As determined by the FDA's National Retail Food Team. The common risk factor categories contributing to food borne illnesses in food are: 1) foods from unsafe sources, 2) foods held at improper holding temperature and time, 3) inadequate cooking of food, 4) poor personal hygiene, and 5) contamination of equipment (FDA, 2000; FDA, 2004). Observations of food handlers in the FDA's research found 40 % out of compliance rates in cold food holding and ready-to-eat (RTE) foods that required time and temperature control. Proper hand washing was found to be out of compliance 34 % in hospital food service operations and 73 % for full service restaurants (FDA, 2004). A trend was noted with all food service operations (hospitals, nursing homes, and schools) having higher compliance of hand washing than both quick-service and full service restaurants (FDA, 2004). Proper procedures for cleaning and sanitizing surfaces and utensils were observed to be out of compliance 40 % of the time (FDA, 2004).

Consumer Perception of Food Safety

There has been extensive media and public attention concerning recent outbreaks of food borne illnesses. Consumers are becoming more aware of the issue of food safety, and they are becoming more concerned about how their food is being handled (FMI, 2008 b). Data from the Food Marketing Institutes' 2006 U.S. Grocery Shopper Trends report stated that 82 % of shoppers were "confident" that the food they buy at the grocery store is safe and 72 % of shoppers were "mostly confident" that the food purchased at grocery stores is safe. One year later, the report stated a decreased confidence in grocery stores food safety (FMI, 2008 b). This 2007 report indicated that 66 % of shoppers were "confident" that the food they buy at the grocery store is safe and 51 % of shoppers were "mostly confident" that the food purchased at grocery stores is safe (FMI, 2008 b). These numbers indicate that consumers are becoming more aware of food safety issues and questioning the safety of their food (FMI, 2008 b).

Confidence in restaurant food safety shows a parallel trend of decreased trust in food safety. Restaurant confidence is even lower than in grocery stores restaurants (FMI, 2008 b). The 2007 Trends report stated that only 42 % of consumers are completely or mostly confident of the safety of restaurant food. Additionally, 10% of consumers were not at all confident in the safety of the foods they consume in restaurants (FMI, 2008 b).

Consumers themselves can play a big factor in controlling food borne illness. The attention they give to selecting food items and getting them into their home can make a difference. In a 2006 study by Jevsnik et. al, consumers were asked to answer questions regarding their opinions towards food safety and food quality in stores using a 1-4 scale with 1 = never, 2 = sometimes, 3 = often, and 4 = always (Jevsnik et. al, 2007). These results are shown in Table 1. The data showed that 54 % of consumers always checked the expiration dates and 30

% of consumers often checked the expiration date. In checking packaging integrity, 49 % of consumers always check and 26 % of consumers often check to see if a package is damaged. Consumers view sales associates serving ready-to-eat foods, bread or raw meat to often have clean hands, wear protective hairnet, wear clean clothes, and use clean utensils (Jevsnik et. al, 2007).

Table 1

Respondent' opinions toward food safety and food quality elements during purchase

Query	Response	Rating
How often do you check		
	if the package is damaged?	3.15
	the date of durability?	3.35
	the temperature in a store where yoghurts, cheese, fresh meat, etc are kept?	1.45
In your opinion how often have sales assistants, who are serving you delicacies, bread or raw meat,	clean hands	2.86
	a protective hair net	2.75
	clean working clothes	2.94
	clean utensils (knife, cutting board, etc	2.79

Table taken from Jevsnik et al., 2007

Table 2 illustrates how consumers handle their perishable cold meat items from the time of purchase (getting the meat from the cold holding environment until arriving home). Purchasing meat at the end of shopping decreases the potential for temperature abuse; however, only 10 %

of respondents reported doing this (Jevsnik et. al, 2007). To help keep perishable food products at safe temperatures, items should be placed in an isolated bag or cooling container after being purchased and during transport home. Interestingly, 67.7 % of respondents never checked temperatures in cold areas though 55 % of them were aware that the correct temp range was 1-5° C (Jevsnik et al, 2007).

Table 2 Respondents' food safety practices from purchase to home.

Query	Response	%
During the shopping trip, at what stage do you purchase raw meat/tofu?		
	Straight away when I enter the shop	14.4
	Sometime during the shopping	36.4
	At the end, when I have already purchased all other items	9.9
	Depends	36.1
	I don't know	3.2
Do you ever use an isolated bag or cooling box to carry your frozen or refrigerated foodstuffs home (e.g. ice cream or raw meat)		
	Yes	15.3
	No, I did not think of that	51.7
	No, I do not think it is necessary	33.0
At what temperature should		

raw meat/tofu in a retail refrigerator unit be stores		
	Less than 1 °C	5.4
	1-5 °C	55.1
	6-10 °C	26.5
	More than 11 °C	2.7
	Do not know	10.2
How important is the duration of transport of raw meat/tofu from the time of purchase to the home?		
	Not important	5.3
	Quite important	33.0
	Very important	58.1
	Do not know	3.7

Table taken from Jevsnik et al, 2007.

Demographics of Food Industry Employees

According to a 1997 report, the demographics of individuals working in the food industry (manufacturing plants, eating and drinking places, wholesale foods, and retail food) is quite varied (Hamrick, 1999). The average age of a food worker was 32 years old, with 20 % of workers being less than 20 years old. One-quarter of workers in eating and drinking places were under 20 years old. Due partly to the percentage of young workers, the education level in the food industry is less educated than the average United States workforce (Hamrick, 1999). Only a third of those in the food industry have a college education. However, when only looking at workers 25 years or older, two-thirds of the workers have a maximum educational level of a high school diploma (Hamrick, 1999). The number of workers in the food industry was almost equal

between males and females. Only 64 percent of workers were employed full-time and 80 % of workers were paid by the hour. Workers in food jobs have median hourly earnings of \$7.08 (Hamrick, 1999).

Importance of Food Handlers in Preventing Food borne Illness

Food handlers can greatly decrease the risk of food borne illness by practicing safe food handling practices. They are responsible for many handling steps in food preparation that could lead to a food borne illness. Due to this, it's essential that these workers have knowledge and understanding of safe food handling practices and that their practices parallel this comprehension. The tasks of food handlers range from cutting raw or cooked food to cooling food that has already been cooked and everything in between (U.S. Bureau of Labor Statistics - U.S. Department of Labor, 2008; Green et. al, 2005). Much of the safety of food prepared by a worker depends on that worker's personal hygiene, attention to time and temperatures, thoroughness of cleaning and sanitation practices, and awareness of cross-contamination.

Many food borne outbreaks can be linked directly back to the food handler. Poor personal hygiene of food workers from 1993 to 1997 was a contributing factor in 27 to 38 % of food borne illness outbreaks (Olsen et. al, 2000). Unsafe food handling practices were linked to almost 50% of reported food borne illness cases in one surveillance report (Olsen et al., 2000). Additionally, pathogens were found to be transferred from a worker's hand to food in 89 % of outbreaks caused by food contamination by food workers (Guzewich and Ross, 1999). Observation studies have also found that known food safety practices are often not being followed (Clayton and Griffith, 2004).

The following are just some examples of outbreaks which were linked to food handlers. In 2002, a Massachusetts food handler directly touched a wedding cake while serving it. Several

guests became ill after this event. This food handler was later found to have experienced norovirus-like symptoms the week prior the wedding. All of the guests stool samples showed identical sequence types of norovirus (Todd et. al, 2007). In Sweden, many attendees at a church party became ill after eating several egg-containing leftovers. The food was found to be temperature abused and six out of the seven food handlers were positive for *Streptococcus* group A (Todd et. al, 2007). On a commercial flight in Tokyo, several passengers became ill with *Staphylococcus aureus*. The on flight cook was discovered to have open cuts, sores and a finger lesion (Todd et. al, 2007). Any time a food handler does not follow safe food handling practices those consuming the food are put at risk of becoming ill.

Food Safety Training

There are many food safety training programs available for food handlers. These programs aim to educate the food handler about safe food handling practices in hopes that their practices will reflect these safety recommendations. These practices reduce the risk of contamination and encourage use of procedures that inhibit bacterial growth in foods (NRA, 2009b; FMI 2009b).

There are several food safety training programs in existence. The majority of grocery store chains and food service establishments have some type of training in place. The delivery of these trainings vary between food service establishments. These trainings have been incorporated into monthly meetings by showing a short video or held once a year at a workshop using a PowerPoint presentation, to name a few. These training sessions are sometimes taught by a store supervisor or an outside educator. Most use one of the following nationally recognized food safety programs: FMI's SuperSafe Mark TM program or National Restaurant

Association's (NRA) ServSafe™ Food Safety program or National Environmental Health Association's (NEHA) Food Safety Training (Personal Communication, 2009).

ServSafe™ Serving Safe Food Training System is a program administrated by the NRA that offers safe food handling and preparation training. This program offers both a sixteen hour manager and a six hour employee training course. The ServSafe™ Manager Certification ServSafe™'s training is taught two ways. The course is either taken in a classroom setting or the course is taken online. Those enrolled in the online course have 24/7 access to the course to study at their own pace and at their convenience. These participants take the exam online shortly after finishing the course (NRA, 2009 b). Those taking the classroom format typically receive between eight to sixteen hours of instruction depending on the instructor's format. Classroom instructors for the course are ServSafe™ certified themselves and have taken additional instruction hours to become a certified instructor (NRA, 2009 b). Exams are usually taken directly after classroom training sessions are completed or soon thereafter. Both online and classroom exams must be proctored by a ServSafe™ Food Safety instructor or proctor. The ServSafe™ examination is accredited by the American National Standards Institute (ANSI)-Conference for Food Protection (CFP) and certification through the program lasts for five years (NRA, 2009 b).

The ServSafe™ managers course covers four units entitled: The Flow of Food through the Operation; The Food Safety Challenge; Food Safety Regulations and Employee Training; and Food Safety Management Systems, Facilities, and Pest Management. These units cover information such as monitoring time and temperature contamination, food allergens, preventing food borne illness, cleaning, and sanitizing. Managers learn how to share the food safety knowledge they learn in this course with every employee (NRA, 2009 b). The ServSafe™

Employee course is called ServSafe™ Starters training and assessment program. Issues covered in this training include basic food safety, personal hygiene, cross-contamination and allergens, time and temperature, and cleaning and sanitation (NRA, 2009 b). This is an online course followed by an assessment. The interactive course takes 60-90 minutes followed by a 40 question non-proctored assessment. After passing the assessment, employees receive a certificate of completion (NRA, 2009 b).

Another program, SuperSafeMark™ : Retail Best Practices and Guide to Food Safety and Sanitation program was developed by the FMI and is specifically targeted at grocery food managers and food handlers. Like ServSafe™, this training is designed to increase food hazard knowledge and stress proper food handling practices of employees. Certified trainers teach the one to two day course (FMI, 2009 b). This program also has both manager level training and associate level training. Both trainings explain how to operate a safe and clean store by controlling food safety risk factors such as time and temperature control, personal hygiene, cross-contamination, and proper cleaning and sanitizing. SuperSafeMark™'s publication *Guide to Food Safety* is used for manager training and includes features such as industry case studies and cleaning and sanitizing charts (FMI, 2009 b). *Quick Reference* is the organization's publication for stores associates that includes features such as time and temperature charts, knowledge reviews, and an illustrated glossary of food terms. The SuperSafe Mark™ program is conducted on site at the retail grocery stores in either an eight or sixteen hour format. Upon completing this training, managers take accredited and nationally recognized food manager certification exams, such as the SuperSafeMark™ exam (FMI, 2009 b).

The National Environmental Health Association (NEHA) is an organization that works to advance environmental health professions. The NEHA produces training materials that cover all

areas of food safety using the FDA's *Food Code* to improve food worker knowledge and practice of safe food handling techniques. Courses are offered for both food handlers and food managers. There are two formats available - classroom training and online training (National Environmental Health Association, 2009). Customized training to meet any company's needs is also offered by NEHA. Training manuals used for general food safety training are *NEHA Certified Food Safety Manager*, and *NEHA Certified Food Safety Handler*. Trainings focus on issues examining the causes of food borne illness and how to prevent them such as employee hygiene, time and temperatures control (National Environmental Health Association, 2009). All NEHA trainers are certified and have food safety knowledge, training skills, and food industry experience. Completing this training program is preparation to take either the ServSafe test or any Conference for Food Protection-American National Standards Institute (CFP-ANSI) certification exam such as the National Registry of Food Safety Professionals®, Prometric™ (National Environmental Health Association, 2009; Michigan Department of Agriculture, nd.).

Impact of Current Educational Trainings on Knowledge and Practices

It is expected that individuals completing one of these trainings would have high compliance with safe food handling practices. However, this has not been found to be the case. Knowledge does not always result in food handlers practicing safe food handling techniques (Roberts et. al., 2008; Sneed and Strohbehn, 2008; Andings et. al, 2007). In a study by Roberts, et al. in 2008, the greatest food safety knowledge retention was seen with trainings that incorporated hands-on activities. Participants were observed, then completed training and were then observed again. In a hand washing exercise, Glo Germ™ was used to demonstrate how to wash your hands. Glo Germ™ is a substance you put on your hands and then wash your hands. After washing your hands, a UV light is turned on. Any places that were not washed will still

have the Glo Germ™ substance and glow (Glo Germ™,2009). This activity not only tells the trainees the importance of the activity, but also shows them why.

Because of the large percentage of food borne illnesses linked to food handlers, food safety trainings target this population. The objective of all food safety training programs is to increase food handlers' knowledge and understanding so they will follow safe food handling practices. However, several studies have shown that knowledge gained from trainings doesn't always result in practices that reflect a person's knowledge (Roberts et. al, 2008; Arendt and Sneed, 2008). Studies show varying results on the effects of food safety education and training. One study compared the effect of having food handlers educated in food safety training on inspection violations for foodservice establishments. The results showed no significant effect on food safety inspection violations in establishments due to differences in percentage of food handlers trained in food safety (Mathias et. al, 1995).

The relationship between someone knowing and understanding a concept and actually practicing a specific task is complex. People may understand the proper procedures in food handling, but not put this knowledge into practice and change a habit. Research by Green and Selman in 2005, found that food safety education and training is only one component in preparing foods safely. Other factors that play a role are restaurant procedures, time pressure, equipment and resources, management and coworker emphasis on food safety and worker characteristics (Roberts et. al, 2008; Sneed and Strohbehn, 2008). Mitchell, (2007) attributed predisposing factors, enabling factors, and reinforcing factors working together to effect food handling behaviors. Predisposing factors include : knowledge about causes and perceived risk of food borne illness and perceived control and self-efficacy over safety practices. Enabling factors include: instructions regarding food safety at initial employment, exposure to food safety

training, availability of appropriate equipment and space, development of food safety procedure manuals, work pace, and worker literacy and language skills. Management's attitude towards safe food handling practices, coworker's attitudes toward safe food handling practices, management incentives to safe food handling practices, job stress, and perceived organizational justice in the workplace are reinforcing factors (Mitchell et. al, 2007).

Training by itself does not equate to the implementation of safe food handling practices. A gap seems to exist between knowledge and food handling practices, which makes understanding the motivation behind practicing safe food handling important (Arendt and Sneed, 2008). Focus groups with food service workers found that barriers to safe food handling practices include time constraints, lack of resources, inadequate knowledge, lack of understanding the consequences, inadequate resource management, and employee motivation (Roberts et. al, 2008). Previous learning and teaching methods have not resulted in changes even when increases in knowledge have been measured. This suggests that alternative ways to teach and encourage good food safety may be needed (Sneed and Strohbehn, 2008).

Health Inspections and Food Safety

Health inspections are used as a method to evaluate whether restaurants, food service, grocery stores or any other business that prepares or sells food follows food safety guidelines. In Virginia, grocery stores with seating for more than 15 are inspected by the Virginia Department of Health (VDH) and stores with seating for less than 15 are inspected by the Virginia of Department of Agriculture and Consumer Services (VDACS, nd). However, some localities, such as in Roanoke City, allow health departments to inspect all grocery stores regardless of seat capacity (Virginia Department of Health, 2009).

If an establishment is deemed to be out of compliance on several regulations regarding food safety, it may face disciplinary action. This action could range from a monetary fine or shutting down the food operation (VDH, 2008). Virginia food regulations require a minimum of one yearly inspection of food establishments. Full service restaurants that handle a lot of food are inspected more often than a store that only serves made-to-order sandwiches. Depending on the risk of the establishment, inspections generally occur one to four times a year. An establishment could be visited by an inspector more than four times a year or more if there is a need for a follow-up inspection or complaint inspection (VDH, 2008.). There are four types of inspections – routine inspections, follow-up inspections, critical procedure evaluation inspections, and complaint inspections. Routine inspections include a complete inspection to make sure all regulations are being met. These types of inspections are unannounced to the food service establishment (VDH, 2008.). Issues that were not in compliance at the time of a routine inspection are re-examined at the follow-up inspection. Critical procedure evaluation is an inspection that only checks for compliance of critical procedures – ones that if violated could likely cause food borne illness. When the health department receives a complaint, an inspector visits that location for a complaint inspection and discusses the details of the accusation details with the person in charge (VDH, 2008).

When inspecting a store, the inspector notes violations seen during the visit. These violations are divided into noncritical and critical categories. Critical violations are ones that are most likely to directly contribute to a food borne illness (VDH, 2008.). Examples of critical violations are improper cooking, cooling, or reheating of foods. Noncritical violations do not usually directly cause food borne illness, but if left uncorrected could become a critical violation.

Examples of noncritical violations are lack of facility cleanliness or improper equipment cleaning (Virginia Department of Health, nd.).

There are joint responsibilities for making food regulations and inspecting establishments for compliance. In the state of Virginia, the Virginia Department of Agriculture and Consumer Services (VDACS), and other state agencies like the VDH work together to ensure that consumers obtain only high quality, safe food (VDACS, nd.). VDACS conducts inspections anywhere food is produced, stored, shipped, processed, or sold to examine food safety and labeling law compliance (VDACS, nd.).

The Retail Grocery Food Handlers

The majority of research related to safe food handling focuses on restaurants and food service operations (which encompass operations such as school and hospital cafeterias or catering companies). While these practices are the same in food preparation areas in grocery stores, the overall environment is somewhat different. Differences include the work atmosphere, job duties, and interaction with customers. Due to the production of more RTE and convenience foods, there are many food borne risks present in grocery stores (Sneed and Strohbehn, 2008). A full examination of the retail food industry environment and the related problems is necessary in the continued attempt to reduce food borne illness.

Retail Grocery Food Demographics

Retail food stores are divided into several categories depending on their type and format. Store types are divided into grocery store, supermarket, convenience store, independent, and chain. Store formats are subdivided into traditional and non-traditional categories (FMI, 2009 a). Examples of traditional store formats are conventional/traditional supermarket, superstore, food/drug combo, limited-assortment store, traditional convenience stores, and petroleum-based

convenience stores. Conventional/traditional stores offer a full line of groceries, meat, and produce. These stores also have a service deli and usually a have a service bakery (FMI, 2009 a). Furthermore, traditional/conventional supermarkets have at least two million dollars in sales each year and carry approximately 15,000 items including general merchandise as well as health and beauty products. Superstores are a larger version of the traditional/conventional store offering approximately 25,000 items and a larger selection of non-food items. A combination of a superstore and a drugstore is called a food/drug combo. This type of store has a pharmacy and approximately one-third of the floor space is devoted to selling health, beauty, cosmetics, and general merchandise. Limited-assortment stores are low-priced stores that offer fewer than 2,000 items, little or no service, and a very limited amount of perishable items (FMI, 2009 a). Aldi and Sav-A-Lot are examples of limited-assortment stores. Convenience stores are small and sell a very limited selection of convenience food products such as ready-to-heat and ready-to-eat products, limited staple groceries, and some non-food items (FMI, 2009 a).

Examples of non-traditional store formats are hypermarkets, supercenters, wholesale club, and the internet. Hypermarkets are large stores, approximately 180,000 square feet that allot up to 75 percent of the floor space to general merchandise such as Brigg's stores. Supercenters (Wal-Mart, Fred Meyer, and Super Target) are a large food drug combo and mass merchandiser store. Supercenters carry a wide variety of food with grocery items consisting of up to 40 percent of the approximately 170,000 square feet floor space (FMI, 2009 a). Wholesale clubs require a membership to enter a warehouse-like environment with a varied selection of both food and non-food items. Items at these stores usually must be purchased in bulk. Wholesale clubs are approximately 120,000 square foot in size with, around 30 percent of the items available being food products. The internet is one of the newest nontraditional store

formats where people are able to select and purchase their groceries online and have their order ready for pick up or delivered to their house. Internet stores usually offer around 12,000 products and an example of an internet store is Peapod (FMI, 2009 a).

This study will focus on traditional grocery stores and small grocery stores. In 2006, there were approximately 34,000 traditional supermarkets --each offering groceries, meat, and produce and taking in over 2 million dollars in sales each year. Seventy-five percent of these supermarkets were operated by a chain. Chain grocery stores are defined as stores that operate eleven or more retail stores (FMI, 2009 a; U.S. Bureau of Labor Statistics - U.S. Department of Labor, 2008). Additionally, there were approximately 13,000 small grocery stores with sales less than 2 million dollars annually. These small grocery stores usually have a smaller selection of perishable items than a supermarket and are often operated by independent owners (FMI, 2009 a). In 2006, grocery stores paid 2.5 million dollars for wage-and-salary jobs, ranking among one of the top industries. Most grocery stores are relatively small, with 80 % of stores having fewer than 50 employees. However, the 20 % of stores that have more than 50 workers, employ 75 % of all grocery store workers. Thus, the largest stores employ the majority of workers in the industry (U.S. Bureau of Labor Statistics - U.S. Department of Labor, 2008).

Grocery Store Labor

Jobs in the grocery store industry are quite varied and typically reside in one of several departments. Jobs are available in the pharmacy, meat, produce, floral, canned/dry goods, and deli departments. Possible job titles include manager, first line supervisor, customer service representative, janitor, stock clerk, butcher, cook, food preparation worker, bagger, and cashier. Of these employees, one-third are cashiers. Stock clerks and order fillers make up another 17 % of the workers, while bakery workers are only about 1.5 % of the grocery store employees (U.S.

Bureau of Labor Statistics - U.S. Department of Labor, 2008). Bakery workers produce bread, rolls, cakes, cookies and other baked goods. Employees that work in the deli cook, prepare, and/or serve food make up 9.2 % of workers. These workers prepare ready-to-heat and ready-to-eat foods such as entrees, salads, chicken, and party platters. They may also manage a salad bar or prepare ordered items such as sandwiches (U.S. Bureau of Labor Statistics - U.S. Department of Labor, 2008). The demand for those employees working in a grocery store preparing, serving, or processing food is expected to continue to increase due to the increase in demand for bakery products, ready-to-heat, and ready-to-eat products for today’s busy consumers. The bakers and deli workers are a key factor to food safety in the retail food industry. These associates prepare the ready-to-eat foods as well as have many chances for improper food handling which could increase the risk of a food borne illness (U.S. Bureau of Labor Statistics - U.S. Department of Labor, 2008).

The age of those working in the grocery industry is somewhat varied (U.S. Bureau of Labor Statistics - U.S. Department of Labor, 2008). Thirty-three percent of those employed in a grocery store are between the ages of 16-24. The remaining workers are somewhat evenly spread between the ages of 25-64 with a small percentage of workers 65 and older as seen in table 3.

Table 3: Age of Grocery Store Employees

Age Group	Percentage
16-19	17.9
20-24	14.6
25-34	17.0

35-44	18.7
45-54	17.6
55-64	10.4
65 and older	3.8

Table taken from U.S. Bureau of Labor Statistics - U.S. Department of Labor, 2008.

In 2007, the United States' total food expenditures for all food was \$1,128.0 billion dollars. A 3.3 percent increase occurred in 2008 when total food expenditures increased to \$1,165.3 billion dollars (USDA Economic Research Service, 2008). Records for 2008 show dry grocery goods, nonfood items, and alcohol consisting of about 38 percent of total grocery store sales. Another approximately 12 percent of total sales are comprised of general merchandise and pharmacy items. The remaining comprising of about 50 percent of sales included perishable items. Of these perishable items almost five percent come from the deli or food service and a little more than five percent come from the bakery and baked goods (FMI, 2008 b).

Challenges in Delivering Effective Training

Some challenges causing problems for the grocery store industry are a high employee turnover rate, long-time employees not practicing safe food handling practices, and the increased demand for convenience/ready-to-eat foods (Binkley and Ghiselli, 2005; Bryan, 2002; Sneed and Strohbehn, 2008). Grocery stores have a hard time training employees that work in the store for less than a year for this can be expensive and time-consuming for management to constantly be training new employees. Additionally employees that have worked with food for many years sometimes have false confidence in their food safety practices. When asked, these employees often have knowledge about food safety but do not always practice these habits. Often these

employees think they know best when it comes to the preparing the food but are incorrect (Binkley and Ghiselli, 2005). The increased preparation and processing of ready-to-eat and ready-to-heat convenience products requires upmost attention to food safety. This is because these products do not have a kill step. This is a step that will kill biological hazards in a product for example, heating raw chicken to 165 degrees Fahrenheit. Since these products will not have a kill step, any contamination such as improper practices of food safety practice that contaminates the food could cause a customer to become ill (Binkley and Ghiselli, 2005).

Research Objectives:

- 1) Evaluate the food safety educational needs of chain and independent frontline grocery store employees through and interview/survey
- 2) Assess the food handling behaviors of frontline grocery store associates using an observational study method

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CHAPTER 3:

Assessment of Educational Needs and Current Practices of Front-line Grocery Associate Food Handlers in the Deli and Bakery

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ABSTRACT:

Grocery store associates in the deli-bakery departments serve and prepare an increasing amount of ready-to-eat foods. This increases the need for a detailed, effective food safety training program in retail grocery establishments to prevent food borne illness. This research examines food safety knowledge, training preferences, needs, and current practices of grocery stores deli-bakery employees in Southwest and Southern Virginia. This research had two phases. Phase I: employees completed a thirty-four question needs assessment survey concerning background, food safety training needs, preferences and knowledge. Phase 2: 15 employees (from phase 1 locations) food behaviors were observed for approximately six hours each (5,343 minutes total). Observational data collection focused on glove use, cross-contamination, and hand washing. The results showed that most associates desired hands-on, interactive and one-on-one training that occurs frequently, but is short: less than two hours in length. Overall most associates had general safe food handling knowledge; however, the observational behavior data indicates associates behaviors do not reflect their knowledge. Greater than 95% understanding was found on the subjects of hand washing and glove use; however, these items were observed practiced incorrectly the most with bare hand contact with ready-to-eat foods and lack of hand washing prior to glove use. The creation of short, hands-on or interactive trainings for retail grocery food handlers that focuses on changing food handling and preparation behaviors may be more effective than current training.

INTRODUCTION

With Americans increasingly pressed for time, there is a higher demand for ready-to-eat (RTE) or convenience foods that require very little preparation in the home (Binkley and Ghiselli, 2005). As a result of this trend, grocery stores are offering prepared RTE meals such as fried chicken, rotisserie chicken, entrée salads, subs, and many side dishes such as corn, green beans or mashed potatoes with gravy. Grocery store employees working to prepare these types of foods need food safety training comparable to that of a restaurant food handler in order to prevent food borne illness (FDA, 2004; Binkley and Ghiselli, 2005).

The food supply in the United States is one of the safest in the world (Roberts, et al, 2008). There are many preventive steps in place on the farm to fork continuum to help maintain the safety of the country's food supply . Farms have recommended guidelines to follow such as Good Agricultural Practices (GAPs). Retail stores, foodservice operations, and restaurants train employees in safe food handling practices. Consumers also are informed about recalls and outbreaks from television ads, newspaper stories, and grocery store signs (FMI, 2008 b).

Despite all this, food borne illness outbreaks are taxing individuals, food companies, and the economy, keeping food safety as a major concern (Kaferstein, Motarjemi, & Bettcher, 1997). An estimated 76 million cases of food borne illness occur each year in the United States according to the Centers for Disease Control and Prevention (CDC). Although the majority of these cases are mild and only last one to two days, food borne disease still accounts for 325,000 hospitalizations and 5,000 deaths annually (CDC, 2009). To decrease the number of illnesses caused by foods annually, it is essential for people working with foods, (especially ready-to-eat (RTE)) to use safe food handling and preparation practices.

Food can easily be contaminated by a food handler; therefore, safe food handling practices must be followed. The top risk factors for food borne illness contracted from food handlers are improper holding time and temperature, poor personal hygiene, and contaminated equipment/ prevention of contamination (FDA, 2000; FDA, 2004). These three categories have shown a consistent high rate of noncompliance in institutional foodservice (hospitals, nursing homes, and schools), restaurants (fast food and full service), and retail food stores (FDA, 2004). Having workers that are knowledgeable and practice safe food handling can greatly decrease the risk of food borne illness.

Currently, there are a variety of different trainings that grocery store chains use to educate their food handlers. However, knowledge gained from trainings doesn't always result in correct food handling practices (Roberts et. al, 2008; Arendt and Sneed, 2008). Food safety education and training is only one component in training food handlers to prepare foods safely (Green and Selman, 2005). Other factors that play a role in safe food preparation include restaurant procedures, time pressure, equipment and resources, management and coworker emphasis on food safety and worker characteristics (Roberts et. al, 2008; Sneed and Strohbehn, 2008). For food safety training to be effective, it must influence knowledge gain and change food handling practices. Research has been conducted to examine what factors influence change and result in food handlers' adoption of training practices and good food safety habits in food service and restaurant operations (Mitchell et al, 2007; Roberts et al, 2008). Time pressures, management involvement, and accountability have been found to influence change. To our knowledge, no studies exist that have evaluated the food safety knowledge and behaviors of frontline grocery store food handlers. This research will gain insight into the food safety training needs of these employees as well as their preferences for training methods in hopes that this

knowledge will lead to development of more effective training for these individuals. More effective training may ultimately result in decreased incidence of food borne illnesses. The objectives of this research were to examine the current food safety needs and practices of frontline deli bakery grocery stores food handlers as well as their training preferences. The needs were assessed using a questionnaire and the current practices were noted by direct observation in the workplace. Results will determine if current food safety programs met the needs of associates and design future food safety educational training materials for grocery store deli-bakery associates. Associates working in the deli and bakery departments will be referred to as grocery food handlers throughout this research.

MATERIALS AND METHODS

This research was divided into two phases. Phase I included a survey to assess the educational needs and current knowledge of frontline grocery associate food handlers in the deli and bakery departments. Phase II was an observational study to document associates actual practices and behaviors related to food safety on the job.

Phase I

Sampling and Data Collection

A list of large grocery/supermarket stores in Southwest and Southern Virginia was compiled from Virginia Department of Agriculture and Consumer Services (VDACS), word of mouth, and online searches. To qualify for inclusion in the study, in addition to selling canned and packaged grocery products, the store needed to have a full service deli/bakery area, slice deli meats and cheese, and / or prepare ready-to-eat products like chicken tenders, chicken salad, or sandwiches.

Stores that qualified were contacted via email, phone or an in-person visit to determine if they were willing to participate in this study. If they agreed to participate, arrangements were made for the investigator to visit store locations to conduct a survey containing 34 questions (Appendix A) with grocery food handlers in the deli and bakery departments for 15-30 minutes in their work place.

When arriving at a store, the investigator notified management that she was in the store. All deli and bakery employees were invited to take the survey. Each grocery food handler voluntarily consenting to take the survey was given the option to take it on paper themselves or to have questions read aloud to them. Upon completion of the survey, the investigator recorded

any additional comments related to food safety training or procedures. There were 78 deli and/or bakery food handlers from 20 different locations that took the in-store survey.

Survey instrument

The survey contained 30 question total collection information pertaining to background/demographics (9), training and education preference (11), safe food handling and preparation knowledge questions, and open-ended opinion questions (2). Prior to initiating the study, the survey tool was piloted with college students working at a catering business and changes were made to clarify any questions as needed. This survey received approval (Appendix B) from Virginia Tech's institutional review board (IRB #09 - 584). Participants were required to sign a consent form indicating their willingness to take the survey (Appendix C).

Completion of the survey took 15 minutes or less if the grocery food handler took it individually on paper, and between 15-30 minutes if the investigator read the survey to the participants and recorded the answers. An iPod (Apple; Cupertino,CA) with a recoder (Belkin) was used to record some of the responses and ensure accuracy.

Data Analysis

Statistical analyses were completed using VT Survey analysis tools and Microsoft Excel. All survey responses were entered into the survey data base and then imported into Excel. The percentages were calculated for the background/demographics, training and educational needs, and the knowledge questions. The knowledge questions were graded using the Food Code with a grade of 80% or higher correct considered a good or high response. Open-ended questions were analyzed/reviewed by the investigator for themes.

Phase II

Sampling and Data Collection

Fifteen of the twenty stores that participated in phase I agreed to participate in observational data collection, phase II. Contacts and manager notification was completed as outlined in phase I by the investigator. For this study, the investigator collected observational data on a single grocery food handler for approximately three hours on two separate occasions within three weeks of each other for a total of approximately six hours. This gave a total of 30 observational periods. Employees were given an information sheet to read prior to being observing on the first visit (Appendix D). Upon completion of the second observational data collection period a debriefing form (Appendix E) was reviewed with each employee and he or she signed a form agreeing for data collected to be used for research, as outlined in IRB protocol (#09 – 584). The first 20 minutes the investigator observed the employee no data was collected to attempt to give the employee time to revert back to his normal behaviors in case being observed affected his practices or behavior. Thus the grocery employees were actively observed for approximately 3 hours and 20 minutes, but data was only collected for the later 3 hour period. The 20 minute time period was set due to advice from Dr. Christopher Griffith who has completed numerous observational food research projects.

Seven of the thirty observational periods was less than two hours and forty-45 minutes due to employee breaks, employees leaving early, and inclement winter weather. The observed associate at each location was either introduced to the investigator by in-store management, - or was the employee that first greeted the investigator upon entrance to the store (unless the individual would not be present in the store for three consecutive hours, or were unwilling to consent to being observed). In those situations, any employee that was nearby with three or more

hours left to work and was willing to participant was observed for the research. Only one person could be observed at each location because after the investigator debriefed the associate, he or she then knew the type of data was being recorded and may have shared this with their coworkers. This would have influenced results for other associates.

There were fifteen deli/bakery employees, each in a different store that agreed to participate in phase II of the research, the observational data collection. A total of 89.05 hours (5,343 minutes) were spent observing employees for phase II.

Data Collection Instruments

The observation data collection forms focused on glove use, cross-contamination, and hand washing (Appendix F). These forms were piloted in a retail grocery store that was not involved in the actual research study and changes were made to improve ease of use in data collection by the investigator. Approval from Virginia Tech's IRB (# 09-584) was received for the observational data collection forms. Prior to being observed participants were given an information sheet (Appendix D) that gave a broad description of the research. After the observation periods, participants were debriefed and told exactly why they were being observed. Each participant then had to initial or sign a consent form (Appendix E) if he or she was willing to allow the data to be used for the research study.

Data Analysis

Frequencies in each of the eighteen practices were calculated for the observational data. Each associate's individual data was also analyzed looking to see how many of the eighteen practices he/she performed incorrectly. This was completed using Microsoft Excel.

Limitations

This research was limited by time, resources and weather. There was only one investigator administering surveys and collecting all the observation data collection and she had approximately one year to design data collection forms and collect all data for this research. Additionally, creating a relationship and gaining the trust of both larger, corporate and smaller, independent retail grocery stores was difficult. Due to changes in management and company restructuring new relationships had to be built to continue this research in the same stores as phase I. Several large winter storms (2010) impacted data collection on several days. The investigator was not allowed access to some stores prior to snow due to the high volume of customers. Additionally, on many occasions, travel to stores was also halted. Scheduling the follow-up visit with associates also caused problem with employees being out sick or unable to get to work due to snow.

RESULTS

All participation in this research was confidential and anonymous. Table 1 details the 20 stores used in this research. Eighteen were national chains and two were independent and 91% of the respondents for the survey were from chain stores, 9% from independent stores.

PHASE I

Demographics and Characteristics

The majority of grocery food handlers were female (71 %) (Table 2). All participants were 18 or older. The majority (97%) communicated best in English and had a high school education or higher (Table 2). The majority (91%) of grocery food handlers worked at a chain grocery store. Fifty percent were a full-time associate and 72% had 2 years or greater experience working in the food industry. Three-fourth of the respondents were responsible for cooking, cold holding, monitoring temperatures, cooling and preparing/slicing of food (Table 3).

Current Training and Preferred Training

The majority (81%) of the training that the grocery food handlers received was general food safety training conducted primarily (78%) in house by training classes using computers, videos or CD presentations (Table 4). The frequency of this training is most often once a year to a few times a year (56%). Grocery food handlers would prefer to receive one on one training in the work place (78%) in English (96%). However, a large percentage, 46%, of the grocery food handlers did not feel like they needed more training (Table 5).

Associates were encouraged to discuss or write out any additional comments they had concerning safe food handling practices, food safety training many comments were made about training concerned the format, frequency, length and what topics should be included in the training. Eight associates desired materials that they could refer to after training and eight

participants said they wanted training to be conducted in a one-on-one format (Table 6) Furthermore, associates wanted additional information about cross-contamination and ways to prevent customers from becoming ill and desired training whenever there is a new procedure or item, indicating that this would most likely occur several times a year (Table 7, Table 8). Training length preference was between twenty minutes to three hours- with an expressed desire by employees for training to be short (Table 9).

Grocery Food Handlers Knowledge

Deli-bakery food handlers had a high level of knowledge in cooking temperatures. A majority (89%) knew the correct temperature to cook raw chicken or turkey (Table 10). Furthermore, 96% knew to keep hot foods at least 135 degrees or higher. There was also a high understanding of cooling and working with cold foods. Eighty-seven percent of those surveyed knew the correct temperature to keep cold food stored and 97% knew how to properly cool a hot cool (Table 11). Thirty-seven percent of grocery food handlers knew that the upper end of the temperature danger zone was 140 °F. or higher and 54% knew that the lower end of the danger zone was 41 ° F. or below.

Ninety-two percent of respondents said they should not work with a contagious disease 8% said they could work anytime if they felt okay (Table 12). One worker stated that she knew she should not work when she was sick but due to needing money and the pressure not to miss shifts because it makes other employees have to work harder she has to do it sometimes anyway.

Associates had a good understanding of wearing gloves (94% and higher) and proper hand washing techniques (99%). The majority (72 %) of respondents feel like there are not problems keeping them from understanding safe food handling practices (Table 13). The majority of participants (90%) have a supervisor monitoring their food handling practices.

Furthermore, there is no reward for practicing safe food handling practices for 53% of respondents (Table 14).

When associates were encouraged to discuss or write out any additional comments they had concerning safe food handling practices, food safety training many remarks were made concerning the confusion about food safety expectations. Five associates made comments to the open-ended questions about confusion about who or what food safety rules they should be following. Associates said that store management, health, inspectors, and corporate management all give different instructions on what the correct food safety procedures to follow are. Some associates even commented that different health inspectors even make different comments in regards to food safety practices. Associates were very frustrated by feeling as if they needed to have different practices depending on who was watching them. One associate comments that he wished there was just one set of rules to make things less frustrating for him.

PHASE II

Fifteen of the grocery stores surveyed in phase I of this research were used to collect data for phase II. One associate from each location was observed for their safe food handling and preparation behaviors on the job site. With each associate observed on two separate occasions, there were a total of 30 observational periods. The grocery associate food handlers were observed using a data collection form (Appendix F) focusing on the individuals' attention to glove use, hand washing, cross-contamination, and other food safety practices. There were eighteen specific practices observed, however other improper food safety practices noticed at the time of observations were noted by the investigator. Four associates incorrectly performed five or more practices from the eighteen practices that were being watched for on the observational

data collection form. There were four associates observed with two or less total unsafe food handling practices during an approximately three hour observational period. Safe food handling recommendations outlined in the 2009 Food Code was used to assess compliant versus non-compliant observations.

Glove Use

Bare hand contact with ready to eat foods was infrequent. Associates were never observed slicing deli meat or cheeses without wearing gloves. However, 13 times grocery food handlers (5 of 15) had bare hand contact with a ready-to-eat product. This equates to one bare hand contact event every 6.85 hours(411 minutes). Five grocery food handlers were observed having bare hand contact with food items such as ready-to-eat chicken products, cakes, cupcakes, and icing. Ready-to-eat chicken products were often handled with bare hands when associated had trouble fitting them into the package. Additionally, many employees had bare hand contact with the inside of icing baggies and chicken baggies prior to placing the ready-to-eat products into these containers. (Table 15). Another reoccurring practice was gloves being taken off to answer the phone and then the same gloves being immediately put back on after hanging up the phone. An important note is that just because gloves were being worn did not always equate to safe food handling practices as noted below in the cross-contamination and hand washing section.

Hand washing

There were a total of 44 hand washing attempts over the course of the observational periods. Of these, only 21 were fully successful in meeting all the requirements for a proper hand washing as defined by the 2009 FDA Food Code. The food code defines correct hand washing procedures as the following: using soap, washing all hand surfaces for at least ten seconds,

rinsing well, using a paper towel or air dryer, and turning off the water with a paper towel if applicable (FDA, 2009). Washing all surfaces of the hand, washing for at least ten seconds and turning off the faucet with a paper towel when needed, all were observed at a less than 80% compliance rate. All associates successfully rinsed well and used a paper towel to dry hands. When foot pedals were not present, it is recommended that associates turn off the water handles using paper towels to prevent recontamination (FDA, 2009); however this practice was only observed 40% of the time (Table 16). Out of the 30 observations periods 10 periods had no hand washing attempts. However, one of these periods was not a cause for concern as the associate was not in direct contact with food due to cleaning and stocking packaged food while being observed.

The most frequent improper hand washing practice observed were associates not washing their hand prior to putting on gloves (Table 17). This practice was seen in 29 of the 30 observation periods and occurred 111 times with all associates doing this practice. Some examples of practices associates partook in prior to putting on gloves without washing their hands were running the cash register, handling money, handling raw meats such as bacon or chicken, and cleaning their work area.

Cross-Contamination

Most of the cross-contamination incidents observed for this research did not fit into the pre-defined categories included on the observation data collection form. Five incidents of gloves or hands touching a potentially contaminated surface and then a ready-to-eat item and five incidents of contaminated utensils touching a ready-to-eat food were observed (Table 18). Some of the cross-contamination events included using a cell phone; using dirty/contaminated gloves; bare hand contact with food; picking up items from the floor; and lack of hand washing. One of

the most frequently noticed issues was the lack of hand washing by associates. Several employees used their cell phones both with and without gloves on and then went back to working with food without washing their hands or changing gloves. Preparing raw chicken also caused several cross-contamination incidents. Raw chicken was handled with the same gloves that were used to work with ready-to-eat items by three associates. Additionally, chicken juice/ blood was splattered or dripped onto clean utensils, counters and dishes on two occasions. These incidents occurred when the liquid was being poured out of the box into the sink as well as from liquid dripping from the raw chicken / box containing raw chicken. A specific example of a cross-contamination event is an associate placing a bag of raw chicken from the freezer into a pan that was being used to pour cooked chicken into after frying. As the associate kept frying chicken, the bag(s) of raw chicken was placed into the pan and then the cooked chicken was placed into the pan prior to packaging it. Another observed cross-contamination event included an associate pouring chicken juice/blood down the sink with gloved hands, rinsed the gloved hands with water and then dried gloved hands with paper towels. The associate then proceeded to rinse off dishes used for ready-to-eat food preparations, changed gloves without washing hands and sliced ready-to eat deli meat.

Five associates put their bare, unwashed hands, into icing baggies or chicken baggies that the ready-to-eat item was then placed into. Associates seemed to place their hands into these baggies to help open the baggies to make placing the food into them easier. Another cross-contamination incident involved an associate showing a new associate-in-training how to take the temperature of a chicken. The trainer touched the thermometer tip with her bare hands several times and then placed the tip into a ready-to-eat chicken. Additional incidents included tongs, a thermometer, and a deli meat label all being picked up off the floor and then placed into

contact with ready-to-eat items without being cleaned by three several associates. One associate touched the floor with gloved hands after having bent down to the floor to get something out of the bottom cabinet. She needed to push up off the floor with her hands to get up and was wearing gloves" This associated then proceeded to touch and serve customers ready-to-eat chicken products with the same gloves.

Additional Food Practices

The three other items that were noted were employee health, cleanliness of meat and cheese deli slicers and consumption of food/drink in the food processing area. Only one employee was noticeably sick with a respiratory illness. Additionally, an employee called in sick while I was at a store and was encouraged to stay home until they were feeling well again. All of the locations I visited except one had a separate slicer for the meats and cheeses. Lastly, associates were eating or drinking while working with food during three of the thirty observational periods. One associate ate some the breading from the chicken that she was being packaging to sale.

DISCUSSION

Research evaluating the preferences and needs in food safety training as well as food safety practices and behavior in retail grocery stores is limited. Many grocery store deli and bakery departments are preparing, holding, and serving food to customers similar to food handlers in restaurants or other food service operations (Binkley and Ghiselli, 2005). With the amount of food preparation that takes place in many of today's retail grocery chains, food safety training programs for these food handlers are a necessity. Attention needs to be paid to ensure a successful food safety education program is in place. This program needs to take into consideration the learning styles and preferences of employees. This study aimed to gain a better understanding of the knowledge, practices/behaviors and training needs of grocery food handlers related to safe food handling and preparation. Both large and small establishments were evaluated in this study.

Grocery food handler current and preferred training

The majority of participants communicated best in English (97%) and had a 9th grade high school education or higher (97%), therefore training programs for this audience can be conducted in English at a high school level. Additionally, since the majority (72%) of participants have worked two or more years in the food industry, food safety trainings can be built upon each year. Ensuring that trainings are not the same every year is important to help keep employees' interest. If a very similar training is conducted every year, employees are likely to not pay attention since they feel they already know all the information and become bored. However, it's important to review concepts over time for the new employees and continuing employees as well (Egan et. al, 2005). The grocery food handlers' responsibilities at work are vast and varied with most workers involved in preparing, slicing, cooking, cooling, packaging,

and serving food to customers. Due to deli bakery employees having such a wide array of responsibilities at work, it's important to educate them on general food safety as well as task specific training to meet particular needs for their job responsibilities. This is especially important because if an employee is out of work, another employee will likely fill in and complete tasks not completed on a regular basis.

An examination of current food safety training compared to the training preferences of the grocery food handlers demonstrates the desire for training changes or additional training by these employees. Some food safety topics need to be added and other topics need to be presented in a new manner to encourage knowledge retention. Some current gaps in training curriculum according to the survey are allergens and labeling, proper reheating temperatures, correct holding temperatures for hot and cold food holding, and the employee sick policy. It is well documented that training does not always result in the trainee practicing the appropriate behavior (Roberts et al, 2008;Egan, 2005). However, with no training on a subject the grocery food handlers may not understand the proper practices to ensure the safety of food. A lack of training in any of the above areas could lead to the accidental contamination of food product, illness, or even death.

Grocery food handlers also desired changes in the frequency and length of training that they receive. Some employees (24%) received training once a year and felt it lasted too long. According to the survey, the ideal food safety training would occur approximately every three months and last no longer than two hours. It would also incorporate the actual work area, be engaging and interactive – occurring as one-on-one or in small groups with a person as an instructor. The desire for hands-on training by grocery food handlers aligns with findings by Roberts, et al. in which a Glo Germ ® demonstration significantly influenced the employees' hand washing knowledge and behaviors (Roberts et al, 2008). Using Glo Germ for training is

very interactive and involves rubbing a substance on participants hands just like lotion and then having them wash their hands as they normally would. Then, an ultraviolet light is shone on the participants hands to demonstrate any areas that were not washed thoroughly (Glo Germ™, 2009). The training should not only teach the correct way to safely handle food, but also the reason behind it. Examples of common mistakes as well as real food borne outbreaks should be used to explain problems/issues that could result if food safety practices are not followed.

Grocery food handlers should receive handouts to refer back to after the training to reinforce safe behavior. Additionally, training needs to occur any time there is a new food item or procedure change.

Grocery food handler safe food handling knowledge and practices

Grocery food handlers also answered basic food safety questions to determine their knowledge of general safe food handling and preparation. Answers to these questions showed that grocery food handlers' understanding of food safety items were subject dependant. For example, employees did not seem familiar with the term "potentially hazard food" or "temperature danger zone". When told that a potentially hazardous food, (PHF), was a food that required time and temperature control for safety, most employees were able to recognize deli meats/cheese and prepared salads fell into this category, but only half stated that cut melons and strawberries were a PHF. This could mean that grocery food handlers do not realize the importance of temperatures in keeping some foods safe. Grocery food handlers also did not understand that when they are sick, they shouldn't work with food. Six employees stated that they could work with food anytime as long as they felt okay and about twenty percent felt that it was okay to work with food if they had a fever and/or if they had diarrhea in the last 24 hours. Grocery food handlers need to have a better understanding of when they are not allowed to work

with food as well as why. An employee health policy is required by law, so grocery food handlers should be familiar with what symptoms or illnesses that prohibit them from working with food. During phase II, employees were observed to see if they were working while ill or consuming food in their work area. Only one employee was noticed to be obviously ill with respiratory sickness while working. She did wash her hands after sneezing and coughing into them, but food she was working with still had potential to be contaminated.

Personal Hygiene:

Grocery food handlers seem to have a solid understanding of some food safety concepts such as hand washing. Most employees (99%) understood the need to use soap and water for proper hand washing and that gloves were required for handling baked or fried chicken as well as handling or slicing deli meats or cheeses. With such a strong understanding of hand washing and glove use, these grocery food handlers should be putting this knowledge into practice. Hand washing, glove use and cross-contamination are all closely tied to food safety. Improper hand washing or glove usage can both lead to cross-contamination issues (Mitchell et al, 2007 ;Green et al, 2007). Hand washing is a key practice to help prevent cross-contamination that was often completed improperly or skipped altogether. Only 21 of the 44 hand washing attempts were successful in meeting all the proper requirements. The minimum guidelines require hands to be washed for at least 10 seconds with soap. Grocery food handlers failed to wash for the recommended time in 29% of hand wash attempts and 15% of the time did not use soap. Hand washing is a simple process that takes about 30 seconds and hand washing instructional signs are posted at every hand wash sink. It is difficult to understand why compliance in following these guidelines is low; however these finding are similar to a study that observed food service workers that were generally knowledgeable about personal hygiene but their practices were not

in line with their knowledge (Hislop and Shaw, 2009). Over the course of 89.05 hours, there were only 44 hand washing attempts. This averages to one hand washing attempt every 2.02 hours (121 minutes). Even when employees were not busy and rushed with a lot of customers they were not washing their hands, or changing gloves as needed.

Cross-contamination:

Grocery food handlers were confused about when to wear gloves. All of them understood the need to wear gloves when slicing deli meats or cheese. This may be due to customers watching the grocery food handler slice the food. Bare hand contact with ready-to-eat products was seen 13 times most commonly on bakery items. Grocery food handlers knew to wear gloves when handling bread, but for some reason didn't view glove usage with cakes the same way. Employees decorating cakes were usually working alone and off to the side of the bakery, so no one was usually watching their food safety practices.

Employees did not follow good personal hygiene with certain activities. When chicken products (rotisseries, fried chicken pieces) did not easily fit into their packaging employees would just press the product into packaging with their hands. Additionally this could be caused by not having the proper packing which is what Mitchell (2007) would call an enabling factor. This issue could be resolved by simply wearing gloves or packaging items with tongs. The most observed problem with gloves was grocery food handlers putting on gloves without washing their hands. This occurred 111 times and led to the potential for cross-contamination, especially if the grocery food handler was working with raw meats or touched contaminated surfaces prior to picking up gloves. These findings are similar to Green et al, 2007 in that hand washing was found to be less likely to occur when gloves were worn.

Several incidences of cross-contamination occurred when employees were working with raw chicken. An employee was observed using gloves to handle a ready-to-eat product after handling raw chicken. Additionally, an employee used the same pan for raw and cooked chicken without cleaning it between uses. It is well documented that these activities lead to food borne illness (Mitchell, et al, 2007) Grocery food handlers need more training and information in how to safely work with the raw meat products and the risk for cross-contamination. Lastly, grocery food handlers were noted texting and using their cell phone while wearing gloves or while working. These employees then used the same gloves to touch a ready-to-eat product. A personal cell phone may contain many pathogens and should not be allowed in the processing area.

Time / temperature control:

Employees understanding of time temperature control was good. Greater than 85% of grocery food handlers knew the proper temperature for holding hot foods, holding cold foods, and cooking chicken and turkey. Employees are required to keep temperature logs of their cooked chicken as well as items being held for sale which may contribute to this knowledge. Additionally signage is placed on display coolers and above equipment used to cook chicken for employees to see listing correct temperatures to store hot or cold food items.

Grocery food handlers commented that confusion and discrepancies in policies was a barrier to understanding safe food handling practices. These employees felt there were discrepancies in safe food handling and preparation between management, health inspections, and corporate management. Additionally there were discrepancies between local government inspectors. Different expectations caused frustration and sent mixed messages to employees. Store policies, corporate policies, and inspection expectations need to all align. Food safety

training should be based on general good food safety practices and state food laws. Likewise, supervisors and managers should be familiar with food safety programs used for trainings as well as state laws. They should also lead by example in regards to food safety and stress the importance of food safety being quite important. Inspectors should be all enforcing the same food laws and take the time to explain the importance of food safety. They should also give suggestions for improvements or changes when need not just say a practice is wrong. With one clear message of safe food handling practices food handlers will likely be less frustrated and have a greater understanding of these practices. One employee commented that there should just be one rule to make things less frustrating. Stores need to insure that their policies are at least equal to the food safety requirements for inspections and that a clear, strong message of the correct food safety expectations are given to grocery food handlers from all sources.

CONCLUSION

These results could be used to help retail food stores develop a food safety training program that caters to the needs and desires of their employees. By listening to these grocery food handlers preferences, a more engaging, effective and interesting training curriculum and program should be developed. These results can also help managers understand some of the barriers to achieving safe food handling practices. Learning common unsafe practices is also helpful for training, which can be developed to address these issues and help employees understand why the practices are not allowed. Focus for trainings needs to be not only on increasing grocery food handlers' knowledge but on getting them to practice safe food handling and correctly apply that knowledge at all times.

Future research in food safety is needed to understand more about the work environment, practices, and needs of retail grocery store deli/bakery employees. These results can be viewed as a building block to understanding the needs and practices of food handlers in a retail food store. Similar studies need to be completed with larger sample sizes and more locations. A key discovery would be being able to understand what contributes to safe food handling practices and help increase safe food handling behaviors.

Overall, these findings affirm the results of other studies that knowledge does not always equate into practice (Roberts et al, 2008; Mitchell et al, 2007). Further studies could explore in greater details as to the strengths and weaknesses of the current food safety education programs. Additionally, a food safety education program focusing on the preferences of the store grocery food handlers with more frequent, shorter training sessions should be pilot tested. If these training sessions are more effective, then possible changes to the way trainings are held in retail and foodservice firms could help increase safe food handling practices.

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TABLES

Table 1 Identification for Retail Grocery Stores

Identification	Store Type	Store Visited in Phase I	Stores Visited in Phase II
Store A	National Chain	9	8
Store B	National Chain	9	7
Store C	Independent Grocer	1	0
Store D	Independent Grocer	1	0

Table 2 Demographics of Grocery Store Food Handler Participants

	Total N=78	Percentage
Gender:		
Male	23	29%
Female	53	70%
No answer	2	1%
Age:		
Under 18	0	0%
18-25	19	24%
26-35	13	17%
36-45	17	22%
46-55	19	24%
Over 55	10	13%
Language understood or communicate best		
Spanish	0	0%
Chinese	0	0%
Vietnamese	0	0%
Korean	1	1%
Other : Hindi (1)	1	1%
English	76	97%
Highest level of education		
Elementary (K-5)	0	0%
Middle (6-8)	2	3%
High school (9-12)	35	45%
Some college	22	28%
College degree	18	23%
Graduate degree	1	1%

Table 3 Characteristics of Grocery Store Food Handler Participants

	Total N=78	Percentage
Current position in retail food service		
Quality Control Manager	2	3%
Other : Chef Assistant (1), Chef Shop Manager (1), Chef Shop Associate (1)	3	4%
Supervisor	12	15%
Part Time Associate	22	28%
Full Time Associate	39	50%
Food preparation area(s) work *		
Sushi	0	0%
Other : Cashier (1), Chef Shop (2), Cake Decorator (2)	5	6%
Produce cutting, packaging	7	9%
Bakery	41	53%
Deli cold prepared salads, sandwiches	48	62%
Deli hot foods/prepared foods	52	67%
Deli – meats/cheeses	62	79%
Years of experience in the retail grocery, food service, or food preparation industry		
less than 1 year	11	14%
1 year to less than 2 years	11	14%
2 years to less than 5 years	16	22%
5 years or more	39	50%
Responsibilities at work*		
Other : Bag Bread & put on Shelf (1), Baking (1), Selling and Cutting Cheese (1), Scheduling & Ordering (1)	4	5%
Reheating food (microwave, stove, or oven)	24	31%
Receiving food	45	58%
Hot-holding food for sale	52	67%
Serving food directly to customer	55	71%
Sell-by-date marking	55	71%
Cooking food	60	77%
Cold holding food for sale	61	78%
Monitoring temperatures of food	61	78%
Cooling food	62	79%
Preparing/slicing food	72	92%

*Percentages do not add up to 100% as associates could choose more than one answer for some questions

Table 4 Current Food Safety Training of Grocery Stores Food Handlers

	Total N=78	Percentage
Since beginning your job, which food safety training/education topics have you completed, attended, or participated in?*		
Other : Serv-Safe Certified	1	1%
I have not received any training or short courses at our facilities	4	5%
Allergens and labeling	54	69%
The correct temperature for reheating prepared foods	55	71%
The correct holding temperature for hot and cold foods during serving	57	73%
Employee sick policy	62	79%
How to calibrate equipment i.e. thermometer, ovens, scales	66	85%
Cross-contamination issues	68	87%
Proper cooking temperatures for various food products	69	88%
How to take temperatures of hot foods	69	88%
Recognizing the temperature danger zone	69	88%
How to assign sell-by-date to products	70	90%
How to monitor and record temperatures	72	92%
How to take temperatures of cold foods	72	92%
Procedures for cleaning and sanitizing work and food preparation areas	75	96%
Proper hand washing	75	96%
If you received training/education in food safety, what type of program was it *		
I didn't receive any training	1	1%
Other : Mom trained at Family Store	1	1%
Super SafeMark training	5	6%
I did receive training, but I don't know what type of program it was	7	9%
ServSafe training	22	28%
General food safety training	63	81%
How was that training/education conducted?*		
Other		
I paid for it myself	0	0%
I have not received any training or short courses at our facilities	1	1%
Bringing in outside trainers	2	3%
Booklets/brochures/pamphlets for at-home learning	2	3%
Off-site training classes or workshops given by universities, trade associations, etc	12	15%
	14	18%
One on one /In-house on the job training	44	56%
In-house training classes using computers, videos or CD presentations	61	78%
How often do you receive food safety training?		
Never	0	0%
No Response	1	1%
While preparing and serving foods	2	3%
Every week	6	8%
Once a month	10	13%
Once, at the time of hire	15	19%

Once a year	19	24%
A few times a year	25	32%
Are there signs or written instructions available at work for ____?*		
No signs are posted, but are included in the company training manual	4	5%
Bare hand contact with prepared foods	28	36%
How to use cutting boards	38	49%
How to clean your equipment	55	71%
Proper cooking and holding temperatures for products	57	73%
When to wash hands	67	86%

*Percentages do not add up to 100% as associates could choose more than one answer for some questions

Table 5 Food Safety Training Preferences of Grocery Store Food Handlers

	Total N=78	Percentage
How do you prefer to receive training?*		
Other	0	0%
Training or short courses in my native language	11	14%
Off-site training classes or workshops	16	21%
Booklets/brochures/pamphlets for at-home learning	24	31%
Educational posters and signs at work	30	38%
Group setting in the work place	36	46%
Training classes using computers, videos or CD presentations at work	48	62%
One on one training in the work place	61	78%
What is your language preference for trainings?		
Spanish	0	0%
Chinese	0	0%
Vietnamese	0	0%
Korean	0	0%
Other: Hindi (1)	1	1%
No Response	2	3%
English	75	96%
What would you like more training with?*		
Other		
Renewal of concepts is good (1), Certified with ServSafe (1)	2	3%
Proper hand washing	5	6%
Taking temperatures of hot foods	7	9%
Taking temperatures of cold foods	7	9%
Monitoring and recording temperatures	8	10%
Cleaning and sanitation of work areas	9	12%
The temperature for reheating prepared foods	9	12%
Proper holding temperature for hot and cold foods	10	13%
Assigning sell-by-date to products	12	15%
Sick employee policy	14	18%
Cross-contamination issues	14	18%
Proper cooking temperatures for various food products	16	21%
Recognizing the temperature danger zone	16	21%
Allergens and labeling	19	24%
Calibration of equipment i.e. thermometer, ovens, scales	20	26%
None	36	46%

*Percentages do not add up to 100% as associates could choose more than one answer for some questions

Table 6 Comments About Preferred Training Format

Preference	Number of associates commenting
One-on-one Training	8
Getting Reference Material such as Pamphlets or Posters	8
Interactive/Hands-on Training	7
In-person Training with a Teacher using Demonstrations (not computer)	7
Training in Small Groups	3
Training in Actual Workplace/Work Area	3
Training to be specific to deli/bakery (no irrelevant broad training)	3
DVD/movie to watch	2
ServSafe training program.	2
All training formats	1
Training with computers	1
Training not using computers	1

Table 7 Comments About Preferred Training Topics

Comments	Number of associates commenting
Training should focus on the main ways to prevent customers from getting sick because they don't want to make anyone sick	2
Training should Focus on preventing cross-contamination	2
Training should focus on Temperatures	1
Training must be interesting and entertaining so associates don't fall asleep	1

Table 8 Comments About Training Frequency

Preferred Frequency	Number of associates commenting
Training should occur anytime there is a new item or procedure	7
Training should occur twice per year	6
Training should occur once a month	5
Training should occur three times per year	4
Training should occur more often	4
Training should occur once per year.	3
Training should occur once per week	2
Training should occur every three-six months	1
Training should occur every three months	1
Training should occur every two months	1

Table 9 Comments About Training Length

Preferred Length	Number of associates commenting
Training should last about an hour	4
Training should not be too long	3
Training should last between 20-45 minutes	3
Initial training needs to last a month or so to prevent training from being overwhelming and rushed	3
Training should last two-three hours.	2
Training should be short	1

Table 10 Food Safety Knowledge of Cooking Temperatures of Grocery Store Food Handlers

	Total N=78	Percentage
Which of the following are considered a potentially hazardous food (PHF)? (Requires time and temperature control for safety)		
None of the above	0	0%
I don't know	4	4%
Bakery products – i.e. bread	8	10%
All of the above	13	13%
Cut melons and strawberries *	44	56%
Prepared potato or chicken salad *	57	73%
Deli meats/cheeses *	61	78%
Raw chicken and turkey must be cooked to what temperature?		
No Response	0	0%
145° Fahrenheit	2	3%
155° Fahrenheit	3	4%
Other	21	27%
Don't know (4), 160 (1), 180 or higher (16)		
175 ° Fahrenheit	22	28%
165 ° Fahrenheit *	30	38%
Hot foods that are being kept warm for serving should be kept at temperatures greater than ...?		
No Response	0	0%
Other	5	6%
160 (1), Don't Know (4)		
150° Fahrenheit	6	8%
135 ° Fahrenheit*	8	10%
165° Fahrenheit	12	15%
140 ° Fahrenheit	47	60%
When reheating leftovers or previously prepared hot food, they must reach what temperature?		
41 ° Fahrenheit or below	0	0%
No Response	1	1%
70 degrees ° Fahrenheit or above	3	4%
Other	9	12%
Do not reheat (6), Don't know (2), Blank (1)		
140 ° Fahrenheit or above	27	35%
165 ° Fahrenheit or above*	38	49%

* Denotes correct answer

Percentages do not add up to 100% as associates could choose more than one answer for some questions

Table 11 Food Safety Knowledge of Cooling and Cold Foods of Grocery Stores Food Handlers

	Total N= 78	Percentage
To properly cool a hot food, it must reach 41 ° Fahrenheit or below within ...		
No longer than 8 hours	2	3%
6 hours*	15	19%
4 hours	21	27%
2 hours	40	51%
The correct temperature to hold cold prepared foods is:		
140 ° Fahrenheit or above *	1	1%
Other	1	1%
Don't know (1)		
No Response	2	3%
165 ° Fahrenheit or above	2	3%
70 ° Fahrenheit or below	4	5%
41 ° Fahrenheit or below	68	87%

* Denotes correct answer

Table12 Hygiene and Cleaning Knowledge of Grocery Store Food Handler Participants

	Total N=78	Percentage
You should NOT work with food if you have:		
I can work anytime as long as I feel okay	6	8%
None of the above	1	1%
Have a hangover	21	27%
Had diarrhea within 24 hours *	61	78%
Had a fever within 24 hours *	62	79%
Vomited within 24 hours *	66	85%
A contagious disease *	72	92%
For which activities are gloves required?		
Not required as long as I wash my hands	0	0%
Not necessary, I can use other things – tongs or deli tissues	3	4%
Handling fried/baked chicken *	73	94%
Handling deli meats *	77	99%
Slicing deli meat and cheeses *	78	100%
Proper hand washing techniques require:		
I don't need to wash my hands if I am wearing gloves	0	0%
Drying your hands on your pants	1	1%
The use of water only before preparing foods	5	6%
Always using soap and water *	77	99%
When slicing deli meats and cheeses in the same slicer, how often should you clean and sanitize the slicer?		
Only once, at the end of the day	1	1%
No Response	1	1%
Every hour	11	14%
Every 4 hours *	15	19%
In between slicing cheeses and meats *	24	31%
In between each different meat or cheese type *	26	33%
Disinfecting refers to:		
Rinsing the equipment food prep areas with water during the day	0	0%
No Response	1	1%
Other Sanitize every time done with task (1)	1	1%
Using detergent and water to remove bacteria from equipment and food prep areas	8	10%
Using a chemical sanitizer to kill bacteria on the equipment and food prep areas*	68	87%
What is the difference between cleaning with a detergent and using sanitizer on the equipment and food preparation areas?		
There is no difference between using a detergent and using a sanitizer	1	1%
I don't know	6	8%
Cleaning kills bacteria and sanitizing removes bacteria	10	13%
Cleaning removes bacteria and sanitizer kills bacteria*	61	78%

* Denotes correct answer

Percentages do not add up to 100% as associates could choose more than one answer for some questions

Table 13 Barriers to Understanding Food Safety Practices

	Total	Percentage
Are there problems which prevent you from understanding safe food handling and preparation practices?		
Training is not necessary in my job position	1	1%
Understanding the English language	1	1%
Understanding and applying the concepts (how to do my job)	3	4%
Help in addressing problems or question (who to go to ask questions)	4	5%
How to answer customer questions	7	9%
Not enough time for training during the work day	10	13%
None	56	71%
Other:	3	4%
Discrepancies on what rules to follow/confusion with management, health inspectors, and/or corporate all having different expectations		

Percentages do not add up to 100% as associates could choose more than one answer for some questions

Table 14 Management's Role in Food Safety

	Total N= 78	Percentage
Are your food handling practices observed or assessed by a supervisor?		
No Response	1	1%
No	7	9%
Yes	70	90%
What happens when you follow safe food handling practices in your work?		
Other None (1), Supervisor tells you that you did a good or bad job (1), it is part of job (1), - (1) Nothing (1), tells you what to do if doing it wrong (1), No one gets hurt (1)	7	9%
I am rewarded for learning and showing safe food handling practices	25	32%
Disciplinary action is taken when I fail to demonstrate safe food handling practices	28	36%
I am not rewarded for learning and showing safe food handling practices	41	53%

Percentages do not add up to 100% as associates could choose more than one answer for some questions

Table 15 Glove Usage of Deli-Bakery Grocery Store Food Handlers

Observation	Total Number of Occurrences	Number of Associates Viewed N=15	Number of Observation Periods Practice was Observed N =30
Bare Hand Contact with Ready-to-Eat Foods	13 times	5	6
Gloves Not Worn Preparing or Packaging Food	8 times	4	4
Gloves Not Replaced After Touching Face, Hair or Clothing	5 times	5	4
Gloves Not Worn When Packaging Bakery Products	2 times	1	1
Gloves Not Worn when Serving Ready-to-Eat Items	0 times	0	0
Gloves Not Worn When Slicing Deli Meat or Cheese	0 times	0	0

** There were a total of 15 associates observed in this study for 89.05 hours (5,343 minutes)**

Table 16 Hand Washing Attempts by Deli-Bakery Grocery Store Food Handlers

Action	Times Performed Correctly	Total Times Performed	Correct Percentage
If Applicable, Turn Off Water with Paper Towel ^a	2	5	40%
Wash for at Least 10 seconds	30	42	71%
Wash All Hand Surfaces	30	38	79%
Use Soap	35	41	85 %
Rinse Well	38	38	100%
Dry with Paper Towel OR Air Dryer	40	40	100%

** There were a total of 15 associates observed in this study for 89.05 hours (5,343 minutes)**

** Total times performed are not the same due to store layout blocking the investigator's view **

a) The low number of times this activity was performed was due to the inclusion of foot pedals at many of the establishments

Table 17 Hand Washing Practices of Deli-Bakery Grocery Store Food Handlers

Observation	Total Number of Occurrences	Number of Associates Viewed	Number of Observation Periods Practice was Observed
Not Washing Hands Prior to Putting on Gloves	111 times	15	29
Not Washing Hands After Touching Hair, Skin, or Clothing	6 times	4	5
Not Washing Hands Prior to Preparing Food	3 times	2	3
Not Washing Hands After Coughing or Sneezing	1 time	1	1

** There were a total of 15 associates observed in this study for 89.05 hours (5,343 minutes)**

Table 18 Cross-Contamination Occurrences by Deli-Bakery Grocery Store Food Handlers

Observation	Total Number of Occurrences	Number of Associates Viewed	Number of Observation Periods Practice was Observed
Glove/Hand Touched Contaminated Surface Then a Ready-to-Eat Item	5 times	5	5
Contaminated Utensil Touch Ready-to-Eat item	5 times	4	4
Associates Touched Raw Item Prior to a Ready-to-Eat Item	1 time	1	1
Ready-to-Eat Item in Contact with Contaminated Cutting Board / Counters	1 time	1	1

** There were a total of 15 associates observed in this study for 89.05 hours (5,343 minutes)**

APPENDIX A (Needs Assessment Survey)

Dear Grocery Associate,

Understanding safe food handling and preparation is important for food service workers. Those of us at Virginia Cooperative Extension (VCE) have received funding from the United States Department of Agriculture (USDA) to develop training for retail grocery store associates in food safety. To develop training that addresses your needs, we need to understand more about you. Attached you'll find a survey that asks about : 1) your background, 2) training you've received, 3) training you need, 4) the way you like to receive training, and 5) your understanding of safe food handling practices.

The survey will take approximately 15-20 minutes of your time. The information you provide will be kept confidential and anonymous. We will not connect your name with your responses and will not share this information with your supervisors or others in any way. In fact, as surveyors we will not even know who you are. We will only track responses by location/store so no answers will be tracked to you as an individual. Do NOT put your name on the survey.

If you have any questions, please contact the survey administrator (Lynn Ann Robertson). She will be present to administer the survey to help ensure confidentiality and anonymity. If you have questions about your rights as a research participant, contact the Virginia Tech Institutional Review Board at irb@vt.edu. This board reviews research studies to protect the rights and welfare of research participants.

Thank you for your time! Responses to this survey will help VCE develop support and educational programs to help meet your needs as a grocery associate.

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Section I: Background Information:

1. Store Code: _____

You will be given this number at the beginning of the survey.

2. Gender:

- Male
- Female

3. Age:

- Under 18
- 18-25
- 26-35
- 36-45
- 46-55
- Over 55

4. Which title best describes your current position in retail food service (select one):

- Part Time Associate
- Full Time Associate
- QC (Quality Control) manager
- Supervisor
- Other (please specify): _____

5. Which food preparation area(s) do you work in: (check all that apply)

- Deli – meats/cheeses
- Deli hot foods/prepared foods
- Deli cold prepared salads, sandwiches
- Bakery
- Sushi
- Produce cutting, packaging
- Other (please specify): _____

6. How long have you worked in the retail grocery, food service, or food preparation industry:

- less than 1 year
- 1 year to less than 2 years
- 2 years to less than 5 years
- 5 years or more

7. What language do you understand / communicate best?

- English
- Spanish
- Chinese

- Vietnamese
- Korean
- Other (please specify): _____

8. What is your highest level of education completed?

- Elementary (K-5)
- Middle (6-8)
- High school (9-12)
- Some college
- College degree
- Graduate degree

9. What are your responsibilities at work? (check all that apply)

- Receiving food
- Preparing/slicing food
- Cooking food
- Cooling food
- Reheating food (microwave, stove, or oven)
- Hot-holding food for sale
- Cold holding food for sale
- Monitoring temperatures of food
- Serving food directly to customer
- Sell-by-date marking
- Other (please specify): _____

Section II: Training/Education Needs:

1. Since beginning your job, which food safety training/education topics have you completed, attended, or participated in? (check all that apply)

- Proper hand washing
- Proper cooking temperatures for various food products
- How to take temperatures of hot foods
- How to take temperatures of cold foods
- How to assign sell-by-date to products
- Recognizing the temperature danger zone
- The correct temperature for reheating prepared foods
- The correct holding temperature for hot and cold foods during serving
- How to calibrate equipment i.e. thermometer, ovens, scales
- Procedures for cleaning and sanitizing work and food preparation areas
- How to monitor and record temperatures
- Employee sick policy
- Allergens and labeling
- Cross-contamination issues
- I have not received any training or short courses at our facilities
- Other (please specify) _____

2. If you received training/education in food safety, what type of program was it:

- General food safety training
- ServSafe training
- Super SafeMark training
- I did receive training, but I don't know what type of program it was
- I didn't receive any training
- Other (please specify): _____

3. How was that training/education conducted? (check all that apply)

- One on one /In-house on the job training
- In-house training classes using computers, videos or CD presentations
- Off-site training classes or workshops given by universities, trade associations, etc
- Booklets/brochures/pamphlets for at-home learning
- Bringing in outside trainers
- I paid for it myself
- I have not received any training or short courses at our facilities
- Other (please specify) _____

4. How often do you receive food safety training?

- Once, at the time of hire
- Every week
- Once a month
- A few times a year
- Once a year
- While preparing and serving foods
- Never

5. Are your food handling practices observed or assessed by a supervisor?

- Yes
- No

6. What happens when you follow safe food handling practices in your work? (check all that apply)

- I am rewarded for learning and showing safe food handling practices
- I am not rewarded for learning and showing safe food handling practices
- Disciplinary action is taken when I fail to demonstrate safe food handling practices
- Other (please specify) _____

7. Are there problems which prevent you from understanding safe food handling and preparation practices? (check all that apply)

- Not enough time for training during the work day
- Understanding the English language
- Understanding and applying the concepts (how to do my job)
- Help in addressing problems or question (who to go to ask questions)
- How to answer customer questions
- Training is not necessary in my job position
- Other (please specify) _____

8. How do you prefer to receive training? (check all that apply)

- One on one training in the work place
- Group setting in the work place
- Training classes using computers, videos or CD presentations at work
- Off-site training classes or workshops
- Booklets/brochures/pamphlets for at-home learning
- Training or short courses in my native language
- Educational posters and signs at work
- Other (please specify) _____

9. What is your language preference for trainings?

- English
- Spanish
- Chinese
- Vietnamese
- Korean
- Other (please specify): _____

10. Are there signs or written instructions available at work for ____? (check all that apply)

- Proper cooking and holding temperatures for products
- When to wash hands
- How to clean your equipment
- How to use cutting boards
- Bare hand contact with prepared foods
- No signs are posted, but are included in the company training manual

11. Which of the following would you like training with? (check all that apply)

- Proper hand washing
- Proper cooking temperatures for various food products
- Taking temperatures of hot foods
- Taking temperatures of cold foods
- Assigning sell-by-date to products
- Recognizing the temperature danger zone
- The temperature for reheating prepared foods

- Proper holding temperature for hot and cold foods
- Calibration of equipment i.e. thermometer, ovens, scales
- Cleaning and sanitation of work areas
- Monitoring and recording temperatures
- Sick employee policy
- Allergens and labeling
- Cross-contamination issues
- None
- Other (please specify) _____

12. Please include any additional comments you have on training about safe food handling practices:

Section III: Assessment of Food Safety Knowledge

1. The temperature danger zone for prepared foods is between _____ and _____ degrees Fahrenheit. (please fill in the blank)

2. Under what conditions should you NOT work with foods? (check all that apply)

- If I have vomited within 24 hours
- If I have had a fever within 24 hours
- If I have had diarrhea within 24 hours
- If I am sick with a contagious disease
- If I have a hangover
- I can work anytime as long as I feel OK
- None of the above

3. Which of the following foods are considered a potentially hazardous food (PHF)? (A PHF is one that requires time and temperature control for safety.) (check all that apply)

- Prepared potato salad or chicken salad
- Bakery products – i.e. breads
- Deli meats/cheeses
- Cut melons and strawberries
- None of the above
- All of the above
- I don't know

4. For which activities are gloves required? (check all that apply)

- Slicing deli meat and cheeses
- Handling deli meats
- Handling fried/baked chicken
- Not necessary, I can use other things – tongs or deli tissues
- Not required as long as I wash my hands

5. Raw chicken and turkey must be cooked to what temperature?

- 145 degrees Fahrenheit
- 155 degrees Fahrenheit
- 165 degrees Fahrenheit
- 175 degrees Fahrenheit
- Other (please specify) _____

6. Hot foods that are being kept warm for serving should be kept at temperatures greater than what temperature?

- 135 degrees Fahrenheit
- 140 degrees Fahrenheit
- 150 degrees Fahrenheit
- 165 degrees Fahrenheit
- Other (please specify) _____

7. To properly cool a hot food, it must reach 41 degrees F or below within:

- 2 hours
- 4 hours
- 6 hours
- No longer than 8 hours

8. Proper hand washing techniques require: (check all that apply)

- The use of water only before preparing foods
- Drying your hands on your pants
- Always using soap and water
- I don't need to wash my hands if I am wearing gloves

9. When slicing deli meats and cheeses in the same slicer, how often should you clean and sanitize the slicer?

- Every hour
- Every 4 hours
- In between slicing cheeses and meats
- In between each different meat or cheese type
- Only once, at the end of the day

10. The correct temperature to hold cold prepared foods is :

- 41 degrees Fahrenheit or below
- 70 degrees Fahrenheit or below
- 140 degrees Fahrenheit or below
- 165 degrees Fahrenheit or above

11. When reheating leftovers or previously prepared hot foods they must reach this temperature:

- 41 degrees Fahrenheit or below
- 70 degrees Fahrenheit or above
- 140 degrees Fahrenheit or above
- 165 degrees Fahrenheit or above

12. Disinfecting refers to:

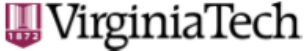
- Using detergent and water to remove bacteria from equipment and food preparation areas
- Using a chemical sanitizer to kill bacteria on the equipment and food preparation areas
- Rinsing the equipment and food preparation areas with water during the day
- Other (please specify): _____

13. What is the difference between cleaning with a detergent and using sanitizer on the equipment and food preparation areas?

- Cleaning removes bacteria and a sanitizer kills bacteria
- Cleaning kills bacteria and sanitizing removes bacteria
- There is no difference between using a detergent and using a sanitizer
- I don't know

Thank you for filling out this survey!

APPENDIX B Institutional Review Board Approval Letter



Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24061
540/231-4991 Fax 540/231-0959
e-mail moored@vt.edu
www.irb.vt.edu

FWA00000572(expires 1/20/2010)
IRB # is IRB00000667

DATE: July 15, 2009

MEMORANDUM


TO: Joseph D. Eifert
Renee Raiden Boyer
Abigail Villalba

Grant Compared 7/13/09

Approval date: 7/15/2009

Continuing Review Due Date: 6/30/2010

Expiration Date: 7/14/2010

FROM: David M. Moore 

SUBJECT: **IRB Expedited Approval:** "Assessment of Educational Needs and Current Practices of Front-line Grocery Employees", OSP #422013, IRB # 09-584

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective July 15, 2009.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.
3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtain re-approval from the IRB before the study's expiration date.
4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

Important:

If you are conducting **federally funded non-exempt research**, please send the applicable OSP/grant proposal to the IRB office, once available. OSP funds may not be released until the IRB has compared and found consistent the proposal and related IRB application.

As indicated on the IRB application, this study is receiving federal funds. The approved IRB application has been compared to the OSP proposal listed above and found to be consistent. Funds involving procedures relating to human subjects may be released. Visit our website at www.irb.vt.edu for further information

cc: File
OSP

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VIRGINIA POLYTECHNIC INSTITUTE UNIVERSITY AND STATE UNIVERSITY

An equal opportunity, affirmative action institution

APPENDIX C Needs Assessment Survey Consent Form

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Assessment of Educational Needs and Current Practices of Front-line Grocery Employees

Investigators: Dr. Joe Eifert, Dr. Renee Boyer, Ms. Abigail Villalba, Ms. Lynn Ann Robertson

I. Purpose of this Research/Project:

Continued efforts are needed to provide food safety education to the retail food and foodservice industries. The goal of this research is to develop and evaluate educational materials and training programs to enhance retail grocery store food safety. This research will focus on grocery stores or supermarkets delis as they are increasingly conducting more in-store food preparations, such as cutting and slicing, packaging, and cold-holding.

You, as a participant, will complete a survey about your food industry background and food safety. Participants of this study will consist of front-line grocery store associates like yourself.

II. Procedures

You will be as to take a paper survey or the investigator will read the survey to you verbally - whichever method is more convenient for you. The survey includes questions about job and length of time spent working in food related jobs as well as questions about food safety training and procedures.

You will only take the survey once in your work place and will spend a total of approximately 30 minutes with the investigator. While taking this survey, the investigator will use an audio-recorder to aid in data collection. This audio recording will ensure complete data is collected in case the investigator is unable to take complete notes.

III. Risks:

There are not risks associated with this research.

IV. Benefits:

Responses to this survey will help in the development of educational programs to help meet your needs as a grocery associate. Data collected will be used to see the best ways to create a successful food safety training program.

No promise or guarantees of benefits have been made to encourage you as a participant to participate.

V. Extent of Anonymity and Confidentiality:

The only information requested from you in this study for research purposes only is: Years Employed in Food industry, Current position, Native language and Sex.

This information will be confidential. You will not be identified nor will the researchers release your individual results of the study to anyone other than the research team working on the project.

There will be audio recording however this will not contain any personally identifying information. This recording will solely be used to ensure complete data from any conversations is obtained. “It is possible that the Institutional Review Board (IRB) may view this study’s collected data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research.”

VI. Compensation

By taking part in this research you will receive no direct compensation. You however will add to the knowledge of grocery store food safety and help in the development of future training for the industry.

VII. Freedom to Withdraw:

You are free to withdraw from this study at any time without penalty.
You are free to not answer any questions or respond to experimental situations that you choose without penalty.
There may be circumstances under which the investigator may determine that you should not continue as a subject.

VIII. Subject's Responsibilities:

I voluntarily agree to participate in this study. I have the following responsibilities:
To honestly answer questions in regard to food safety.

IX. Subject's Permission:

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_____ Date _____
Subject signature

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

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540-231-4330

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APPENDIX D (Phase II Informational Sheet)
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Information Sheet for Participants in Research Projects Involving Human Subjects

Investigators: Dr. Joe Eifert, Dr. Renee Boyer, Ms. Lynn Ann Robertson

I. Purpose of this Research/Project:

The purpose of this research is to gain an understanding of frontline grocery store associates' behaviors. The goal of this research is to develop materials and programs to enhance your work experience in the grocery store. Participants of this study will consist of front-line grocery store associates like you.

II. Procedures

You will be observed for about 6 hours in total. The investigator will observe you two different days for about 3 hours. The researcher will just be observing you and you should go about your job as usual.

III. Risks: There are not risks associated with this research.

IV. Benefits:

Responses to this survey will help in the development of programs to help meet your needs as a grocery associate.

No promise or guarantees of benefits have been made to encourage you as a participant to participate.

V. Extent of Anonymity and Confidentiality:

The data collected about you in this study for research purposes only. This information will be confidential. You will not be identified nor will the researchers release your individual results of the study to anyone other than the research team working on the project. "It is possible that the Institutional Review Board (IRB) may view this study's collected data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research."

VI. Compensation

By taking part in this research you will receive no direct compensation.

VII. Freedom to Withdraw:

You are free to withdraw from this study at any time without penalty.

There may be circumstances under which the investigator may determine that you should not continue as a subject.

VIII. Subject's Responsibilities:

I voluntarily agree to participate in this study. I have the following responsibilities:

To complete your job as you normally would.

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Renee R. Boyer

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Lynn Ann Robertson

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APPENDIX E (Phase II Debriefing Form)

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Debriefing Form for Participants in Research Projects Involving Human Subjects

Title of Project: Assessment of Educational Needs and Current Practices of Front-line Grocery Employees

Investigators: Dr. Joe Eifert, Dr. Renee Boyer, Ms. Lynn Ann Robertson

I would like to apologize for the use of deception. However it was necessary to not inform you exactly what I was observing for it might have influenced your behavior or actions. To collect accurate data I needed to observe you, and other store associates, with minimal influence on your actions while working. I was observing your behaviors and actions in regards to safe food handling practices. This data I collected will be used to help improve safe food handling practices.

Please feel free to ask me any questions or discuss any concerns with me at this time.

Again, I'd like to add that all the data I collected is confidential and will NOT be shared with anyone outside of the research team at Virginia Tech. This information is NOT being given to your manager or supervisor. Your name is not connected with any of the data I have collected. The data is being used to help develop food safety materials and training specific for grocery store associates.

If you would not like your data to be used in my study, I can destroy it and it will not be used. I give permission for the data collected to be used in the research study and graduate thesis. If you feel comfortable letting me use the data I collected for my research and thesis and agree with the previous statement, please sign or initial below.

Participant Signature or Initials

Date

APPENDIX F (Observational Data Collection Forms)

Store Number _____

Date & Time ____/____/____ : ____ - ____ : ____ ** Wait 20 min **

Associate works in : deli bakery sushi cake decorating produce cut/pack other _____

	Y / N	FREQUENCY		COMMENTS
--	----------	-----------	--	----------

Glove Use

Any Bare hand contact with RTE food?	Yes No			
Were gloves worn when slicing deli meat/cheese?	Yes No			
Were gloves worn when serving RTE items?	Yes No			
Were gloves worn when preparing food?	Yes No			
Were gloves worn when packaging bakery items such as bread or cookies?	Yes No			
Were gloves replaced after associate touched their face, hair, clothing, etc?	Yes No			

OBSERVATIONS

Y /
N

FREQUENCY

COMMENTS

Hand washing

Were hands washed before preparing food items?	Yes No	
Were hands washed after they touched hair, face, skin, clothing, etc?	Yes No	
Were hands washed prior to putting on gloves?	Yes No	
Were hands washed after coughing or sneezing?	Yes No	
Other hand washing issues?		

OBSERVATIONS

Y /
N

FREQUENCY

COMMENTS

Cross-Contamination

Did the associate handle a raw item and then a RTE item	Yes No	
Did gloves or hands touch a contaminated surface and then a RTE item	Yes No	
Did contaminated utensils touch RTE items	Yes No	
Did a utensil touch a raw item and then a RTE item?	Yes No	
Were contaminated cutting boards or counters in contact with RTE items	Yes No	
Were contaminated/raw foods placed in close proximity to RTE items?	Yes No	
Other cross contamination issues?		

OBSERVATIONS

Y /
N

FREQUENCY

COMMENTS

Other

Is the associate obviously sick ? (Sneezing, coughing, blowing nose)	Yes No	
Was the meat/cheese slicer cleaned between slicing meats and cheese?	Yes No	
Were there separate slicers for meat and cheese?	Yes No	
Was the associate chewing gum or eating while working with food?	Yes No	
Other issues?		

Hand Washing Practices							
Hand Wash # ____	Y	N	Comments	Hand Wash # ____	Y	N	Comments
Used Soap				Used Soap			
Washed all surfaces of hands				Washed all surfaces of hands			
Washed for at least 10 seconds				Washed for at least 10 seconds			
Rinsed well				Rinsed well			
Dried hands w/ paper towel or air dryer				Dried hands w/ paper towel or air dryer			
Turned off water w/ paper towel if applicable				Turned off water w/ paper towel if applicable			
Hand Wash # ____	Y	N	Comments	Hand Wash # ____	Y	N	Comments
Used Soap				Used Soap			
Washed all surfaces of hands				Washed all surfaces of hands			
Washed for at least 10 seconds				Washed for at least 10 seconds			
Rinsed well				Rinsed well			
Dried hands w/ paper towel or air dryer				Dried hands w/ paper towel or air dryer			
Turned off water w/ paper towel if applicable				Turned off water w/ paper towel if applicable			
Hand Wash # ____	Y	N	Comments	Hand Wash # ____	Y	N	Comments
Used Soap				Used Soap			
Washed all surfaces of hands				Washed all surfaces of hands			
Washed for at least 10 seconds				Washed for at least 10 seconds			
Rinsed well				Rinsed well			
Dried hands w/ paper towel or air dryer				Dried hands w/ paper towel or air dryer			
Turned off water w/ paper towel if applicable				Turned off water w/ paper towel if applicable			
Hand Wash # ____	Y	N	Comments	Hand Wash # ____	Y	N	Comments
Used Soap				Used Soap			
Washed all surfaces of hands				Washed all surfaces of hands			
Washed for at least 10 seconds				Washed for at least 10 seconds			
Rinsed well				Rinsed well			
Dried hands w/ paper towel or air dryer				Dried hands w/ paper towel or air dryer			
Turned off water w/ paper towel if applicable				Turned off water w/ paper towel if applicable			