

FOOD SAFETY AND SANITATION ISSUES  
IN DAY CARE CENTERS

A Dissertation

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by

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## **DEDICATION**

I would like to dedicate my dissertation to my parents, Norman and Betty Pinney, and my sons, Mike and Steve Smith.

My father, Norman Pinney, was very supportive by his encouragement and example. He also went to graduate school later in life and received his PhD from Auburn University in Education. My mother, Betty Pinney, provided encouragement and the financial means for me to realize my goal of attending graduate school.

My sons, Mike and Steve Smith, provided their love throughout my graduate school career. Mike recently received his Master's degree and Steve his Bachelor's degree.

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## **ABSTRACT**

Day care center reports from the Louisiana Board of Health Sanitarians were generated from day care centers participating in the Child and Adult Care Food Program (CACFP) in the state of Louisiana. The types of violations reported included temperature abuse, lack of handwashing supplies, spoiled food, incorrect dishwashing procedures, and physical plant problems.

A survey was developed and mailed to all 50 state CACFP Directors requesting information on the sanitary violations reported by their state sanitarians for day care centers participating in CACFP. The violations cited by the individual state CACFP Directors were similar to those reported by the Louisiana Board of Health Sanitarian Reports.

Louisiana State day care directors participating in the CACFP were surveyed twice to determine their knowledge of sanitation principles food handling, once prior to a food safety training workshop and then after the training. The two survey responses were similar with the exception of three of the questions.

A food safety manual was developed using basic sanitation and HACCP principles. It was presented as a food safety workshop for Louisiana CACFP Day Care Directors. The manual will be distributed to all CACFP participants as part of their training material for participation.

## CHAPTER 1. INTRODUCTION

The prevention of foodborne illness is a challenge at all strata of the food industry. Although progress has been made in improving the quality and safety of foods, harmful microorganisms have been shown to be present throughout the food preparation environment.

Foodborne pathogens have continued to adapt and evolve, which has increased their virulence. The U.S. Public Health Service, (PHS), and the Centers for Disease Control, (CDC), (MMR Weekly, 2001) have identified *Escherichia coli* 0157:H7, *Salmonella* sp., *Listeria monocytogenes*, and *Campylobacter jejuni* as the four foodborne pathogens of most concern in the United States because of the severity and estimated number of illnesses. *Campylobacter*, *Listeria*, and *E. coli* 0157:H7 were not considered significant sources of foodborne illness 20 years ago; however, more recently, *E. coli* 0157:H7 and *Salmonella Enteritidis* have caused illness through contamination of foods not affected previously. For example, *E. coli* 0157:H7 has been detected in salami, raw milk, lettuce, and unpasteurized apple cider, as well as undercooked ground beef. *Salmonella Enteritidis* has contaminated the interior of the egg by crossing the eggshell membrane. Also of concern to CDC is *Vibrio vulnificus*, *Yersinia enterocolitica*, *Clostridium perfringes*, and *Staphylococcus aureus* (Partnership in Food Safety Education, 1999 and MMR Weekly, 2001).

The CDC monitors foodborne illnesses in the United States. Foodborne illness sources are classified into four general categories: disease-causing bacteria, viruses, parasites, and natural toxins. In a December 2002 report, CDC stated that foodborne

illnesses were estimated to cause 76 million illnesses, 325,000 hospitalizations, and 5,200 deaths in the United States annually.

Foodborne illness is shown to have long-term consequences. *E. coli* 0157:H7 causes kidney failure in young children and stroke-like symptoms in the elderly. *Listeria* is responsible for meningitis and stillbirths. *Campylobacter* is thought to be a factor in Guillain-Barre syndrome (CDC, December 2002). Economic factors reported in the CDC December 2002 report stated that medical costs and lost wages due to foodborne salmonellosis was estimated to be more than \$ 1 billion/year.

Among those most vulnerable to complications resulting from foodborne illness are children, ages birth through five. Small children are considered at high risk for foodborne illness due to their immature immune systems (CDC, December 2002). Clean and sanitary conditions under which food is prepared and served in addition to proper cooling and cleaning at day care centers may be a way of preventing foodborne illness. Day care directors and food service workers have been trained in the steps necessary to prepare safe food for children as part of this research. The Louisiana Department of Social Services, Bureau of Licensing, has reported 4,000 day care centers serving children in 2003.

Food safety and sanitation issues in day care centers include improper refrigeration and freezer temperatures, improper storage of canned goods, and serving unwashed fruits and vegetables. Refrigerated and frozen foods may not be stored in a manner that allows free air circulation, and finally, kitchen equipment, including stoves, refrigerators, and pots and pans may not be properly cleaned (Reports of Administrative Reviews, Child and Adult Care Food Program, 2000-2003).

According to the Louisiana State Fire Marshall's Office, 2000-2003, many of the day care centers are located in renovated houses with home-style kitchen and storage areas. To meet state fire codes and food safety regulations, kitchens are equipped with three compartment sinks and hoods over stoves. Some day care centers prepare foods using home appliances, such as stovetops, microwave ovens, toaster ovens, and crock pots. Storage areas meant for general use may be used for storing canned goods. Due to a lack of space, freezers may be located in a room where children play or in the anteroom of a restroom (Reports of Administrative Reviews, Child and Adult Care Food Program, 2000-2003).

As part of a study of child care facilities conducted by the Texas Department of Human Services, 598 Texas facilities were selected for analysis of written menus. Researchers also conducted on-site meal observations, on-site observation of food safety/sanitation practices, and observation of food consumption at 102 of those sites. The refrigerator temperatures at the majority of the observed sites were at safe levels (41° F.); however twenty-eight facilities were observed to have refrigerator temperatures between 40° F. (a safe level), and 45° F., and three facilities had temperatures higher than 45° F. Recommended freezer temperatures were inadequate at 47 of the 102 sites observed, with temperatures above 0° F. at the time of the visit.

General cleanliness was lacking in some of the centers, as well as improperly stored foods. Handwashing was not a part of the regular pre-meal routine in many centers. The authors concluded that day care personnel were in need of practical and simplified education concerning food safety and sanitation issues (Kurato, Martin, Lan, Chappell, and Ahmad, 2000).

The U. S. Food and Drug Administration (FDA), developed the Model Food Service Sanitation Ordinance to implement sanitary food handling in food service establishments and health care institutions. Because the ordinance is not specific to day care centers, a simpler, more specific model or plan is needed. Such a model or plan will benefit day care center directors in training employees in proper sanitation procedures to minimize foodborne and other illnesses.

### **1.1 Purpose of the Study**

Develop a manual that may be used by day care centers to minimize the risk of foodborne illness in children. This manual will use HACCP principles and SSOP concepts and will increase the knowledge of food safety and sanitation practice in day care centers.

### **1.2 Objectives**

1. Evaluate sanitary code violations of Louisiana day care centers participating in the Child and Adult Care Food Program (CACFP)
2. Investigate sanitation practices and standards required in sixteen other selected state CACFP programs.
3. Evaluate responses based on a survey instrument on sanitation principles and food handling.
4. Develop a manual for day care centers to minimize the risk of foodborne illness in children using HACCP principles and SSOP concepts.

## **CHAPTER 2. REVIEW OF THE LITERATURE**

Food safety is of critical importance, especially in today's dynamic, complicated, and global environment. The control of foodborne pathogens is difficult because of the integrated nature of the food industry, variety of applications, and vulnerability of the human element. The two most commonly observed lapses in food safety practices found in the surveillance report by the CDC (1992-1998, MMR Weekly, 2000), were the (1) failure of consumers to wash their hands or cooking utensils properly and (2) inadequate cooling of foods. More global issues impacting the entire food chain are: emerging pathogens that require greater vigilance, greater volume of food imports in the U.S., and the increasing frequency of consumption of foods prepared away from home.

This literature review addresses:

- Sanitation issues in food service institutions,
- History of the Child and Adult Care Food Program (CACFP)
- Standard Sanitation Operating Procedures,
- Microorganisms implicated in foodborne illnesses
- Hazard Analysis Critical Control Point (HACCP),
- Methods of reducing foodborne illness,
- Model and learning theories,
- Survey development.

### **2.1 Sanitation Issues in Institutions**

#### **2.1.1 Problem Areas**

Food service, in institutional settings such as hospitals, nursing homes, and day care centers, requires special emphasis on sanitation issues. The populations served by

these institutions, (the sick, elderly, and the young) are at risk of foodborne illness due to lowered or underdeveloped immune systems. Byers, Shanklin and Hoover, (1994) stated in their text that the most frequent causes of foodborne illness reported in institutions are improper cooling of food, (a lapse of 3 or more hours between preparation and consumption,) infected food handling personnel, inadequate reheating of foods, improper hot holding of food products, contaminated prepared food and raw ingredients, and contaminated food preparation surfaces. Food from unsafe sources, improper cleaning of equipment and utensils, and cross-contamination of raw and cooked food were considered other causes of foodborne illness. The implementation of a Standard Sanitation Operating Procedure plan (SSOP) and a Hazard Analysis Critical Control (HACCP) plan is suggested to help reduce the incidence of foodborne illness (Byers, et. al).

### **2.1.2 Training Options**

Food service employees were trained in food safety principles using SSOPs and HACCP principles as a basis. Highlights of the training program included learning to purchase food and ingredients from reputable suppliers, which helped to ensure control of food contamination and provided high quality products. The training objectives for food service employees include:

- Prepare clean and properly equipped storage and work areas that meet state and local health department standards;
- Purchase and transport safe food from sources that meet the standards of regulatory agencies;
- Receive and store foods under conditions that maintain their safety;

- Minimize the risk of food contamination from microorganisms, insects, rodents, and toxic substances, (Byers, et. al., 1994, Sanitation Control Procedures for Processing Fish and Fishery Products, 2000, and U.S. Department of Agriculture's (USDA) HACCP for Child Nutrition Programs, 2002).

### **2.1.3 Control Methods**

Processing food is an intermediate step in the food distribution chain. Food safety control measures used by food processors include the Good Manufacturing Practices (GMP) (21CFR 110) and FDA's 2002 Food Code and 2003 Food Code Revisions. GMP's and the Food Code's food safety and quality measures are applicable to day care centers. The GMP and the Food Code are intended to accomplish, among other things, the following goals:

- Identify practices for personal cleanliness,
- Define good handwashing habits,
- Require the removal of hand jewelry,
- Wear gloves when in direct contact with food,
- Require the use of hair restraints, such as hairnets, headbands, caps or beard covers worn in the preparation area,
- Maintain the day care kitchen in a sanitary manner,
- Store cleaning and toxic compounds in a safe manner,
- Have adequate pest control performed by a professional provider,
- Maintain food contact surfaces in a dry and sanitary manner,
- Have an approved water supply

## **2.2 History of the Child and Adult Care Food Program (CACFP)**

### **2.2.1 Mission of the Program**

The mission of the U.S. Department of Agriculture's (USDA) Food and Consumer Service (FCS) is to alleviate hunger and safeguard the health and nutritional well being of the nation through the administration of nutrition education and domestic food assistance programs (CACFP Child Care Centers Handbook, 1995 and 2000, USDA). The CACFP has been one of the programs administered by FCS. Cash reimbursement and donated commodities or cash-in-lieu of commodities are provided to assist day care home and day care centers provide more nutritious meals.

### **2.2.2 History of the Program**

The program was authorized initially in 1968, as a three-year pilot program serving day care centers located in areas where poor economic conditions prevailed. In 1975, a new section was added to the National School Lunch Act requiring centers to meet specific licensing or approval standards. Eligibility was extended to any public or private nonprofit agency providing nonresidential day care services such as Head Start programs and day care homes. Providers are reimbursed for two meals and a snack for each day of operation. Services are provided for children 12 years of age or younger, and for children of migrant workers 15 years of age or younger. A center providing care for mentally/physically, disabled persons receives services for children up to 18 years of age.

Two new classifications were approved in Fiscal Year 1999. These are the "at-risk" after school snack program and homeless shelters. The at-risk snack program provides snacks for children up to age 18 who participate in an after school enrichment

program that provides wholesome activities. Homeless shelters with children as residents, participate in the CACFP and receive reimbursement for two meals and a snack for these children (CACFP Child Care Centers Handbook, 1995 and 2000, U.S. Department of Agriculture). This study was only on day care centers.

### **2.2.3 Requirements for Participation**

Participating centers in CACFP are required to provide nutritious meals and snacks for the children in their care. The breakfast meal requires a serving of fluid milk, a vegetable or fruit, and a whole grain or enriched bread product. Lunch requires a serving of fluid milk along with a serving of lean meat, poultry or fish, or an alternate, such as cheese, eggs, or cooked dry beans or peas. Two or more vegetables or fruits or a vegetable and fruit is required. A whole grain or enriched bread or pasta is also required.

CACFP participants have to meet sanitation standards required by the Louisiana Board of Health. Program participants assure conformance with state and local sanitation and health regulations in storing and serving of food. Adequate refrigeration and dry storage facilities are able to store food items in compliance with these regulations.

## **2.3 Standard Sanitation Operating Procedures (SSOP's)**

### **2.3.1 Problem Areas**

SSOP practices by food preparation and service personnel are essential to prevent contamination. For example, errors may begin with the purchase of food from the grocery store. In addition, there are other errors that are possible including the following:

- Long distances, requiring extensive time, may be traveled before food is properly stored at the center,
- Other errands may be completed after the grocery purchase, thus extending the time the food remains in temperatures higher than those recommended for safety,
- Once at the center, day care personnel may delay in storing refrigerated and frozen items,
- Refrigerator and freezer compartments may not be maintained at 40°F. or below, and 0°F. or below, respectively,
- The placement of foods in the freezer or refrigerator may not allow for adequate circulation of cold air around the food.

Consumer food handling practices in the following studies were found to be similar to food handling practices in day care centers (Daniels, 1998, Kurtzwell, 1996). Surveys of home food handling practices observed meal preparation, service, post-meal cleaning, and leftover storage. Problems noted were cross-contamination of raw and cooked foods, failure to wash hands, hot water at too low a temperature for adequate safety, hot food held at temperatures below 140°F., and improper labeling, and storage of chemicals. Also observed were leftover foods improperly stored, failure to cover wounds on the hands of food handlers, refrigerator temperatures higher than 45°F., service of food from damaged cans, and sick workers preparing foods for others and rodent infestation was noted. Food handlers in the home were observed smoking, drinking, eating, and chewing gum while preparing food. Frozen foods were thawed on kitchen counters at ambient temperatures (Daniels, 1998, Kurtzwell, 1996).

### 2.3.2 Methods of Promoting Safe Food Handling

Some ready-to eat foods are processed for extended shelf life (Marth, 1998, Environmental Nutrition, 1998). These foods include luncheon meats, cured meats, meat, seafood, egg and vegetable salads, fresh pasta, pasta sauces, soups, entrees, and complete meals. If these foods are heat processed, the heat treatment is less than that required for commercial sterility. Bacteria, such as *C. Botulinum*, *Listeria* Species, enteropathogenic *E. coli*, and *Vibrio* Species have been shown to grow at refrigeration temperature. Precooked meats, such ham, may also spoil and allow pathogens to grow. The high salt content promotes the growth of *S. aureus* (Marth 1998, Environmental Nutrition, 1998).

Properly washing fruits and vegetables before consumption promotes food safety. Processors are not required to wash fresh produce before packing, assuming the consumer will wash the product before use. Many foods, such as fruits and vegetables, not commonly associated with foodborne illness are implicated in disease outbreaks, (Foodborne Pathogenic Microorganisms and Natural Toxins Handbook, November 2003, The Bad Bug Book). The rind of cantaloupe is linked with outbreaks of *Salmonella*; the seasoning, basil, with an outbreak of *Cyclospora*; tomatoes with *Salmonella*; and lettuce and alfalfa sprouts with *E. coli* (The Bad Bug Book).

The importance of adequate handwashing was demonstrated in the surveillance report by the CDC, (1992-1998, MMR Weekly 2000). During this five-year period, 2,874 foodborne disease outbreaks were reported. Two of the most common contributing factors identified were improper holding temperatures of foods and poor personal hygiene of food handlers. Of the 2,874 outbreaks, 1,435 reported these

contributing factors. Poor personal hygiene was cited in 514 of the cases. Inadequate handwashing was reported to be a major factor in poor personal hygiene (Bean, Goulding, Daniels, and Angelo, 1997).

One of the purposes of handwashing is to remove harmful bacteria from the skin, (Miller, Jones-Davis, and Milanese, 1994) Bacteria on the skin are classified into two categories: resident and transient. Resident bacteria remains on the hands for a long period of time, while transient bacteria is loosely attached to the skin and may contaminate food products when food service employees do not wash their hands properly. An example of resident bacteria is toxin-producing *Staphylococcus aureus*, which is present in the skin of 50% of normal adults. Examples of transient bacteria are *Escherichia coli* and *Salmonella* Species.

The effectiveness of hand soaps and sanitizers was investigated by Miller, et. al.,1994. The purpose of the study was to compare the effectiveness of plain hand soaps, antimicrobial soaps, E2 soaps (those containing 50 parts per million of chlorine), and instant sanitizers in reducing bacteria on the skin. Twenty food service workers participated in the study. The contact plate method was used to identify bacteria on the fingertips. The transient organisms found on the hands before washing were *Bacillus* Species, *Pseudomonas* Species yeasts, filamentous bacteria and molds. A 20-second handwash method was implemented.

The average reduction of contaminants on the hands by the various categories of handwashing agents were: plain soap, 41.7%; antimicrobial hand soaps, 48.2%; and E2 hand soaps, 59.1%. The use of instant hand sanitizers resulted in a 260.8% increase in bacteria. Instant hand sanitizers have been shown to contain ethyl alcohol, a powerful

drying agent. As a result, an instant hand sanitizer may have killed bacteria on the skin, but in the process, dried the skin, and damaged the skin allowing bacteria to increase in number.

## **2.4 Pathogens that May Cause Illness in Day Care Centers**

### **2.4.1 *Salmonella* Species**

This organism is described in the Foodborne Pathogenic Microorganisms and Natural Toxins Handbook, November 2003, (The Bad Bug Book) as a rod-shaped, motile bacterium; nonmotile exceptions were indicated to be *S.gallinarum* and *S. pullorum*. The organism is also described as nonsporeforming and Gram-negative.

*S. enteritidis* is indicated as a common species of *Salmonella*, and is described as a leading cause of foodborne illness in the United States. Foods of animal origins are associated with outbreaks of salmonellosis. Historically, raw eggs are a significant source of human salmonellosis in the U.S. Outbreaks of *Salmonella* serotype *enteritidis* infection associated with eating shell eggs are described in MMWR Weekly, January 3, 2003. These outbreaks occurred between 1999 and 2001. Cases in two states, North Carolina and South Carolina, appeared to be linked to the same egg farm.

Consumption of raw milk caused *Salmonella* serotype *typhimurium* infections. MMR Weekly, July 4, 2003, described infections in Illinois, Indiana, Ohio, and Tennessee in 2002 to 2003. Visits at a working dairy farm, which included a restaurant, snack bar, and petting zoo, resulted in the hospitalization of two children infected with *Salmonella enterica* serotype *typhimurium*. Another 62 persons became ill. These persons included 40 customers, six household contacts, and 16 dairy workers. As a result the dairy discontinued the sale of all raw milk products.

### **2.4.2 *Staphylococcus aureus***

The Bad Bug Book describes *S. aureus* as a spherical bacterium. When observed by microscope, it appears in pairs, short chains, or bunched in clusters like grapes. The organism is described as Gram-positive. *S. aureus* is known to produce a heat-stable protein toxin that has caused illness in humans.

Illness is known to occur from the consumption of meat and meat products, poultry and egg products and salads, such as egg, tuna, chicken, potato and macaroni. Bakery products with cream fillings also have been implicated. Enterotoxins are usually produced in food by *S. aureus* because food has not been kept hot or greater than 140° F, cold or less than 41°F. over a two to four hour period.

An outbreak at 16 elementary schools in Texas, involving 1,364 children out of 5,824 who had eaten a chicken salad lunch, was described. The previous day before the lunch, frozen chickens were boiled for 3 hours, deboned and cooled to room temperature with a fan. The cooked chicken was ground up in small pieces, placed in 12-inch deep aluminum pans and cooled overnight at 42°- 45°F. The following day, after completion of preparation, the product was transported to the various schools where it was kept at room temperature until serving time. *S. aureus* was present in large numbers upon bacterial examination. Lack of proper cooling and handling procedures after the chicken was cooked; and lack of correct storage temperatures were the cause of the illness.

### **2.4.3 *Campylobacter jejuni***

This organism is described as a Gram-negative, slender, curved, and motile rod, and requires reduced levels of oxygen. It is considered the leading cause of bacterial diarrheal illness in the United States, cases in excess of salmonellosis (2,000,000 to

4,000,000/year). Raw chickens and raw milk are contaminated by the organism; (Bad Bug Book).

Children under five years and young adults (15-29) are found to be more susceptible to *C. jejuni* infections than other age groups. An outbreak in Vermont occurred when a non-chlorinated water source was temporarily used as a water supply. In another case, children on trips to a dairy became infected after drinking raw milk (Bad Bug Book).

An outbreak of *C. jejuni* was described in MMWR, June 28, 2002, in Wisconsin. A farm provided unpasteurized milk samples to community events and to persons who toured the farm, including children from childcare facilities. At the time of the event, unpasteurized milk could not be sold legally to consumers in Wisconsin. The dairy distributed the milk through a cow-leasing program where consumers paid an initial fee to lease part of a cow. A total of 75 persons became ill. They ranged in age from 2-63 years. Symptoms included diarrhea, abdominal cramps, fever, nausea, and grossly bloody diarrhea. No one was hospitalized.

#### **2.4.4 *Listeria monocytogenes***

The Bad Bug Book describes *L. monocytogenes* as Gram-positive and motile by means of flagella. It is found in birds, fish, and shellfish. *L. monocytogenes* is considered hardy and resistant to the effects of freezing, drying, and heat.

Listeriosis causes septicemia, meningitis, encephalitis, and uterine or cervical infections in pregnant women, which results in spontaneous abortion (second/third trimester) or stillbirth. The organism, *L. monocytogenes*, is associated with raw milk, cheeses, (soft-ripened varieties), ice cream, raw vegetables, fermented raw-meat

sausages, raw and cooked poultry, all types of raw meat, and raw and cooked fish. It can grow at low temperatures of 3° C., which permits multiplication in refrigerated foods (Bad Bug Book).

An outbreak blamed on a California processing plant in 1985 was due to Mexican-style cheese and led to numerous stillbirths. As a result of this episode, the FDA began monitoring domestic and imported cheeses (Bad Bug Book).

#### **2.4.5 *Clostridium perfringens***

This organism is described in the Bad Bug Book as an anaerobic, Gram-positive, sporeforming rod. The illness caused by this organism is called perfringens poisoning. Intense abdominal cramps and diarrhea are described as symptoms of the disease.

Temperature abuse of prepared foods is the cause of perfringens poisoning. Small numbers of the organisms have been shown to be present after cooking and multiply during the cool down period and storage of prepared foods.

Institutional feeding, such as that found in school cafeteria where large quantities of food are prepared several hours before serving, is the time when perfringens poisoning has occurred. Outbreaks investigated by the FDA demonstrated that inadequate refrigeration and insufficient reheating of roast beef and ham caused the perfringens poisoning.

#### **2.4.6 *Bacillus cereus***

The Bad Bug Book describes *Bacillus cereus* as a Gram-positive, aerobic sporeformer with large cell rods.

The symptoms of the food poisoning caused by the organism are similar to the food poisoning caused by *C. perfringens*. Watery diarrhea, abdominal cramps, and pain,

occur within 6-15 hours after the food is consumed. A vomiting-type of outbreak occurs. Either type of food poisoning occurs depending on which type of toxin is involved.

Meats, milk, vegetables, and fish are associated with the diarrheal type of food poisoning, while rice products are associated with the vomiting type outbreaks. Starchy foods, such as potatoes, pasta, and cheese products, cause illness (Bad Bug Book). Day care center children were described as becoming ill after eating a catered lunch of chicken fried rice. Of 80 persons, 67 ate the lunch and 48 persons became ill.

#### **2.4.7 *Shigella* Species**

*Shigella* are described in the Bad Bug Book as Gram-negative, nonmotile, nonsporforming rod-shaped bacteria. The organism is found in water polluted by human feces.

During 2002, according to the preliminary FoodNet Data published in the MMWR, April 18, 2003, (Bad Bug Book), there have been a total of 3,875 laboratory-diagnosed cases of *Shigella*. These were also described as one of the bacterial pathogens with the highest incidence at that time.

Salads, such as potato, tuna, shrimp, macaroni, and chicken, are found to be associated with the organism. Raw vegetables, milk and dairy products, and poultry are also implicated with the organism. Contamination is through the fecal-oral route. Contaminated water by feces and unsanitary food handling by food handlers are found to be the most common causes of contamination (Bad Bug Book). In a day care setting, infants are described as the most vulnerable to attack by the organism.

#### 2.4.8 *Escherichia coli* 0157:H7

The Bad Bug Book describes *E.coli* 0157:H7 as one of four classes of *E.coli*. that causes gastroenteritis in humans. It is shown to cause severe damage to the lining of the intestine. Hemorrhagic colitis is designated as the name of the disease cause by the organism.

This organism has the ability to be passed from person to person in a day care setting. Undercooked or raw ground beef is implicated in many outbreaks. Raw milk caused the disease in an outbreak at a school in Canada. Raw vegetables, fruit, and water have been involved in outbreaks due to fecal runoff from nearby pastures. Very young children, under the age of five years, have developed hemolytic uremic syndrome (HUS) characterized by renal failure and hemolytic anemia. The organism produces verotoxins that are similar to the type of toxin produced by *Shigella* Species (Bad Bug Book).

The problems caused by this organism were described years ago when a multi-state outbreak of *Escherichia coli* 0157:H7 infection from hamburgers was reported in the western U.S. from November 1992 through February 1993. More than 500 laboratory-confirmed infections and four associated deaths were reported in Washington, Idaho, California, and Nevada. The outbreak resulted from the consumption of hamburgers from one restaurant chain. Three deaths occurred and 30 of 144 hospitalized patients developed HUS. The median age of the hospitalized patients was 7.5 years (MMWR, 1993 and JAMA, 1993).

A survey reported by Swerdlow and Griffin, 1997, (Bad Bug Book), described the length of time, in days, that *E. coli* appeared in the stool of very young children. The

median duration in a day care setting was 29 days. Control measures suggested by the researchers included routine handwashing by the children before meals, diaper changes and toileting, and upon arrival at the center.

#### **2.4.9 Hepatitis A Virus**

Hepatitis A Virus (HAV) is described in the Bad Bug Book. HAV is shown to have a single molecule of RNA surrounded by a small (27nm diameter) protein and a buoyant density in CsCl of 1.33 g/ml. It is classified with the enterovirus group of the Picornaviridae family.

The illness caused by HAV is described as mild with fever, malaise, nausea, anorexia, and abdominal cramps followed by jaundice. Persons infected with HAV have been known to excrete the virus in their feces. The disease develops in individuals who have consumed HAV contaminated water or food.

HAV is commonly transmitted by foods, such as cold cuts and sandwiches, fruit and fruit juices, milk and milk products, vegetables, salads, shellfish, and iced drinks. Infected workers in food processing plants and restaurants have been known to contaminate food.

The MMR Weekly, June 20, 2003, (Bad Bug Book), reported a HAV outbreak at several restaurants in Massachusetts. A total of 46 persons were affected, ranging in age of 5-76 years. It was determined that the probable source of the outbreak was a food service worker who worked while infectious and contaminated food that was not cooked.

The report also said that between 1992 and 2001, approximately 230,000 cases of hepatitis A were reported in the United States. The CDC, (unpublished data, 2003), found that approximately 8% of adults reported with hepatitis A are food service workers.

## **2.5 Hazard Analysis Critical Control Point (HACCP)**

### **2.5.1 History**

HACCP is a relatively recent prevention food safety concept that has been utilized in institutional food service systems (Byers, et. Al., 1994, USDA's HACCP for Child Nutrition Programs, 2002, and National Seafood HACCP Alliance for Training and Education, 1997). HACCP was developed by the Pillsbury Company; in 1971 for the National Aeronautics Space Agency, (NASA) to ensure safe food for the space program. The company decided that quality control techniques already in place did not provide adequate assurance against contamination during food production, (traditional processing techniques used for food safety required extensive end-product testing, were not a desirable situation). A preventative system was determined to be the most practical method to ensure manufacturing consistently safe food. Pillsbury later used the program for commercial food processing.

### **2.5.2 Definition**

Institutional HACCP is described as a food safety and self-inspection process that focuses on the flow of food from the time it enters the food preparation area until it is served or stored as leftovers and reused. The goal is to identify and eliminate hazards or unacceptable contamination through an ongoing program that insures safety of food. A HACCP system consists of the following seven steps that involve the preparation of a meal.

1. Identify and assess hazards at each step in the flow of food and develop procedures to minimize the risk as preventive methods. Recipes are examined to

- determine what ingredients are at risk for foodborne illness. Assess food preparation steps to determine risky procedures.
2. Determine critical control points (CCP). After examination of the recipe and procedures, identify risky steps in the procedure.
  3. Establishes critical limits to be met. Specific cooking, cooling, and holding temperatures for foods are determined.
  4. Determine who will monitor. Assign employees responsibilities in specific areas of food preparation.
  5. Take corrective actions as needed. Any problems that were noted in step four are corrected. An example of a corrective action is discarding food that was held too long at an improper temperature.
  6. Develop a recordkeeping system to document HACCP activities. An example is the daily temperature log.
  7. Verify that the HACCP system works. All HACCP steps in the foodservice operation are reviewed periodically to determine reliability and effectiveness (Byers, et. al. 1994, USDA's HACCP for Child Nutrition Programs, 2002, and National Seafood HACCP Alliance for Training and Education, 1997).

### **2.5.3 Place in Food Processing Industry and Food Production**

Jones, 1995, cites HACCP as a crucial tool in the food processing industry. In addition, high standards of sanitation are considered essential in all phases of food processing, such as production, distribution, and preparation. Several studies conducted in foodservice operations indicated that the level of microbial activity depended on the type of food, the quality of the raw ingredients, the size of the batch, the cooking

equipment used, food handling procedures, and the placement of the food item in the equipment. The temperature of a deck oven varied in the different areas of the oven, i.e., back, center or front. The back was hotter than the front or center because it did not lose as much heat when the oven door was opened. Therefore, when a pan was placed in the back, center, or front of a deck oven, heating was not consistent in the food.

A study conducted in a hospital using a cook-chill system showed that correct temperatures of the foods were not consistently maintained. Of 93 food items, only a few met this standard of correct temperatures of foods (Martin and Conklin, 1999).

A survey of 600 dietitians employed by health care facilities revealed significant concern about food safety at their institutions. The respondents showed support for a HACCP program and less support for the use of irradiation for food, such as ground beef, and chemical rinses for food, such as poultry (Giamalva, Redfern, and Baily, 1998).

Recipes formulated following the HACCP format are available from various restaurant and institution sources. For example, a recipe for tuna salad recommended chilling canned tuna before opening to minimize bacterial growth during the preparation period. Recommended specific holding temperatures, maintains the product at the correct and safe temperature during service (USDA's HACCP for Child Nutrition Programs, 2002).

Cooking ground beef to a safe temperature of 160°F was the subject of a study conducted by Food Safety Inspection Service (FSIS), and the Agriculture Research Service, August 1998 as described in the technical paper "Color of Cooked Ground Beef as It Relates to Doneness". Two hundred and forty pairs of ground beef packages were examined to evaluate doneness (160°F) and control color. The researchers concluded

that cooking to 160° F. does not ensure that a ground beef patty will turn grey, a color that may lead consumers to believe that the product is safely cooked. Nearly half of all beef patties retained some pink color when cooked to 160°F, and nearly 150 still retained some pink color at 175° F (FSIS and Agricultural Research Service, August, 1998).

A 1995 study at Kansas State University found that an appreciable amount of ground beef patties turned grey before they reached 160°F. This study demonstrated that color was an unreliable indicator of doneness. Ground beef retained a pink color even at temperatures above 160°F. This was associated with the pH, the level of pigment in the meat, as well as the fat content. Normal muscle meat was shown to have a pH ranging from 5.5 to 5.7. Meat with a pH of 6.0 or higher remained pink at 159.8° F. The higher the pH, the longer the cooking time and/or higher the final internal temperature was required for pigment change. A high pH reduced the amount of myoglobin pigment denatured by cooking, causing a pink color rather than the grey cooked color caused by denatured hemichrome.

A high concentration of pigment contributed to a red color in cooked meats. Bull meat normally had both a higher pH and a higher concentration of pigment. Researchers suggested that patties formulated from a mixture of bull meat, chuck, and beef trim with similar amounts of total pigment showed significant difference in cooked internal color, which indicated that the pH was responsible.

The amount of fat in beef patties affected cooked ground beef color. Low-fat beef patties, which included those that contain water, oat bran, carrogeenan, and/or isolated soy protein, required longer cooking times and higher cooking temperature to

reach a specific internal temperature. Patties remained pink even though their internal temperature was higher than 160°F (FSIS and Agricultural Research Service, 1998).

Safe food temperatures were the subject of an article on transporting food that appeared in *Food Service Director*, September 15, 1999. Two problems identified with food transport: (1) time and (2) temperature (abuse). Critical control points in the procedure were identified as:

- Cooking food to the proper temperatures prior to transport,
- Monitoring temperatures of food products before transportation begins, and
- Monitoring temperatures when the food products reached their destination after transport (*Food Service Director*, 1999).

The National Restaurant Association's *ServSafe@* Course Book states foods kept in the danger zone (41-140° F) for longer than four hours, “ must be discarded.” The timing period began at delivery, and continued after cooking. For example, a frozen food product sitting on the storeroom floor waiting for frozen storage is likely to be in the danger zone for a longer period of time than necessary (*Food Service Director*, September 15, 1999; *ServSafe@* Course Book, National Restaurant Association, 1999).

#### **2.5.4 Government Protection Procedures**

The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 directed the Secretary of Health and Human Services to provide protection to the public in the event of a threatened or actual terrorist attack on the US food supply. An interim final regulation; *Protecting the Food Supply; Registration of Food Facilities*, was published by the Food and Drug Administration, (FDA) on October 10, 2003. This requires all domestic and foreign facilities that manufacture/process, pack, or hold food

for human or animal consumption in the United States to register with the FDA. Facilities are given the option to register on line or submit a CD-Rom with the information. The purpose of this registration is to help the FDA to determine the location and source of an event in the case of a potential or actual bioterrorism incidence or outbreak of foodborne illness (Protecting the Food Supply, October 2003).

### **2.5.5 HACCP Forms, Methods, and Studies**

The National Seafood HACCP Alliance for Training and Education, 1997, and USDA's HACCP for Child Nutrition Programs, 2002, developed forms for developing HACCP plans. The forms assist the individual HACCP planner in organizing significant hazards and CCPs throughout the food service operation. For example, it provides and identifies significant hazards of each CCP, the critical limits and monitoring. Hazard guides available include: *HACCP: Hazard Analysis and Critical Control Point Training Curriculum*, from the National Seafood HACCP Alliance for Training and Education and *USDA's HACCP for Child Nutrition Programs: Building on the Basics*, from the National Food Service Management Institute.

A food flow chart may help the HACCP planner to identify each step in the food preparation process such as receiving, storing or food handling. A hazard classification form helps to identify hazards in food production steps as being biological, chemical or physical.

Biological hazards are identified as pathogenic microorganisms, such as bacteria, viruses, and parasites. Chemical hazards include natural toxins, chemicals, pesticides, drug residues, and unapproved food and color additives. Physical hazards include metal or glass fragments.

After the HACCP planner determines if a hazard exists at any of the steps in the food preparation process, the planner may then identify critical control points. Control measures may then be determined. Employees may be assigned responsibilities to carry out these measures. A recordkeeping system may be developed by the HACCP planner to document these activities.

A case study was conducted to assist in developing a HACCP program for the United School District in Manhattan, Kansas (Blakeslee and Penner, 1999). The system utilized a new central kitchen with 14 satellite sites to service 6,274 students in 15 schools. Four ground beef recipes, (spaghetti sauce, taco meat, chili, and sloppy joe meat), were the focus of the investigation. Three samples of each recipe were prepared. Recipes were prepared using the cook-chill method. Observation of the process revealed that the final temperatures of two of the 12 samples prepared were above 45° F. Two of the samples prepared required five and seven hours respectively to be chilled to 45° F, and an additional three and three-and-a-half hours to be chilled to 40° F.

In addition, the packaged, cooked products were placed in two-inch pans, one bag per tray, and positioned on rolling racks. The effect of this practice placed an additional barrier between the product and the chilled air, which decreased the effectiveness of blast chilling.

Transportation of food from the central kitchen to the satellite kitchens posed a problem. The finished products were transported in insulated, unrefrigerated food carts. Although the carts were kept in refrigerated storage until it was time to load the trucks for delivery, deliveries frequently occurred during lunch service when foodservice personnel were not available to place the product into refrigerated storage promptly.

A food safety checklist for food service operations, (which included standard sanitation operating procedures), was developed by the researchers and administered four times during the study. During one observation, an employee omitted handwashing after sneezing and using her hands to cover her mouth and nose, and then handling the food products. Another employee who was ill was encouraged to go home, refused to do so, and was allowed to remain on the job handling food and food preparation equipment (Blakeslee and Penner, 1999).

The adenosine triphosphate (ATP) bioluminescence technique was used to monitor kitchen equipment sanitation at the food preparation site in this study (Blakeslee and Penner, 1999). The assay measured total residue, including microbes and food that contains ATP. Of the 16 pieces of equipment monitored, only two, the tilting fry pan and cutting board, scored below the level that indicated bacterial contamination, 300 Relative Light Units (RUL). The ATP assay indicated that the other 14 pieces of equipment tested demonstrated evidence of contamination. Some of these pieces were: the 100-gallon kettle and all its parts, the can opener, the hand stirring paddle, a serving pan and lid, a serving spoon, the serving counter, and the drain under the counter. The authors' listed 21 recommendations for improvement and encompassed all areas of the food service operation.

#### **2.5.6 Recalls**

Child Nutrition Programs (CNP) are notified by the FDA of food recalls. Each State Agency office then notifies CNP participants of these recalls. A policy overseen by the FDA is the food recall as described in FDA Recall Policies, June, 2002. A food recall is a voluntary action of removing a product from retail or distribution. A recall

removes meat or poultry suspected of contamination from public consumption areas when it is thought that the product is detrimental to health or not fit for human consumption. The manufacturer or distributor initiates the recall of the product.

Test results of samples may indicate a need for a recall. A company may find that one of its products is defective and recalls it in its own. Consumer complaints of unsafe foods may trigger a food recall.

Recalls are categorized into one of the following three classes: I, II, and III. A class I recall involves a hazardous situation in which there was a reasonable probability that consuming the food causes health problems or death. Ready-to-eat meat products contaminated with *Listeria monocytogenes*, such as hot dogs or contaminated with *Escherichia coli 0157:H*, such as raw ground beef are subject to a class I recall. The presence of a Class I allergens, such as peanuts or eggs, in a food product that has not been identified on the label may trigger a Class I recall.

Class II recalls reflects temporary illness, which is reversible. The presence of dry milk, a Class II allergen, when used as an ingredient in sausage without indicating milk on the label, prompts a class II recall.

Class III recalls may be initiated because of misbranding or economic fraud.

The public maybe notified of recalls through press releases and/or a Recall Notification Report. From January to December 2000, there were 23 recalls of ground beef for *E. coli 0157:H7* contamination. There were 24 recalls of ready-to-eat meat products for *Listeria monocytogenes* contamination. In the following year, there were 25 recalls of ground beef for *E. coli 0157:H7*, 23 recalls of ready-to-eat meat products for *L. monocytogenes*, and one recall of a meat product for *Salmonella* Species. In 2002 there

were 33 recalls of ground beef for *E. coli 0157:H7*, 39 recalls of ready-to-eat meat products for *L. monocytogenes*, and two recalls of meat products for *Salmonella* Species. In the following year, there have been six recalls of ground beef for *E. coli 0157:H7* and eight recalls of ready-to-eat meat products for *L. monocytogenes* (FDA Food Recalls, 2002). In October of 2002, a Class I recall of turkey ham distributed by the Commodity Program to all Child Nutrition Programs, including CACFP, was issued. A letter to parents was generated by the Chief of the Schools and Institutions Branch of the Food Distribution Division. The purpose of the letter was to answer questions and concerns if a student had eaten some of the recalled product (USDA, Recalled Products and the School Lunch Program 2002).

## **2.6 Methods of Reducing Risk of Foodborne Illness**

### **2.6.1 Food Irradiation**

CNP programs now have the opportunity to receive commodity donated irradiated ground beef. This product is approved for use in the National School Lunch Program and the CACFP.

Food irradiation has been in use since 1995. Irradiation exposes food to radiant energy. Radiation energy absorbed is measured in units of grays, also called kilograys (Kgy). The energy passes through the food, similar to the way microwaves pass through food, and leaves no residue.

The Army Medical Department assessed the safety of foods commonly irradiated. Results indicated that the irradiation of food killed disease-causing bacteria and delayed food spoilage. Irradiated wheat and wheat powder were approved for public consumption by the FDA; as long ago as 1963. The National Aeronautic and Space

Agency (NASA) used the process in the early 1970s to sterilize meats for astronauts to consume in space. More irradiated foods, such as spices, seasonings, pork, fresh fruits, and dry or dehydrated substances continued to be approved in the 1980s. Irradiated poultry was approved for public consumption in 1990. On May 29, 2003, the U.S. Department of Agriculture (USDA) released specifications for the purchase of irradiated ground beef for donation through the National School Lunch Program. The product was available for distribution in January 2004. The CACFP has the opportunity to receive irradiated ground beef. School districts have the option of ordering non-irradiated beef if they choose. Microbial testing is performed including standard plate count, total coliforms, *E. coli*, coagulase positive *staphylococci*, *E. coli* 0157:H7 and *Salmonella*. Irradiated ground beef items are irradiated after they had been produced, packaged, and frozen to 0° F.

Radiolytic products formed when food is irradiated are usually the same as those formed when the food is cooked. No unique radiolytic products of toxicological significance have been found in irradiated foods. Food labels are required display the international radura symbol and the statement “treated by radiation” or “treated by irradiation”. Additional statements about the purpose and type of radiation, are permitted by the Federal Food, Drug, and Cosmetic Act, (Institute of Food Technologists, January 1998, 21 CFR 179).

Food irradiation is considered to be a food additive. Great attention has been directed at the irradiation of ground beef. Some studies have indicated that irradiated raw meat develops an off-odor compared to the non-irradiated control product. Products of irradiation or the irradiation itself causes oxidation of myoglobin and fat, which results

in discoloration and rancidity or other off-odors or flavors. Ozone, an off-odor, is produced from oxygen during food irradiation. This factor contributes to the lack of consumer acceptability of irradiated meat. Low doses of irradiation have been found to kill at least 99% of *Salmonella* in poultry and an even higher percentage of *E.coli* in ground beef (Questions and Answers on Irradiated Ground Beef, USDA, 2003).

The Food and Drug Administration, (FDA), has approved a 7-kilogray (Kgy) dose in the irradiation of frozen ground meat products which could effectively eliminate *E. coli 0157:H7*. *Vibrio* in frozen oysters has been reduced by irradiation. It destroys *S. aureus* and *C. jejuni* (21 CFR 179).

### **2.6.2 Chemical Treatments**

Chemical treatment used to eliminate or slow growth of bacteria is in widespread use in processing plants. Direct chemical treatment is used on poultry carcasses. The safety, quality, and acceptability of cuts of meat treated by immersion or spraying with a chemical solution have been studied and the USDA has approved at least one product to be treated in this manner.

Rhone-Poulenc, Lyon, France, a chemical company, produced a solution of trisodium phosphate labeled AvGard for use on poultry. Studies have indicated that use of a 10% solution of trisodium phosphate reduced levels of *Salmonella* bacteria on chicken carcasses after they had been inoculated with the bacteria. The process did not adversely affect acceptability of the raw or cooked chicken (Gialmalva, et.al, 1998).

Food has been preserved with the addition of chemicals (Jay, 1996). Propionic acid and benzoic acid are added to products such as bread, cakes, cheeses, margarine, pickle relish, apple cider, soft drinks, tomato catsup, and salad dressings to eliminate

bacteria. Spices such as cinnamon, cloves, onion, thyme, and oregano are shown to have antimicrobial qualities.

### **2.6.3 Drying and Freezing of Food**

Drying and freezing food products inhibits bacterial growth by breaking down bacterial cell walls (Jay, 1996). The bacterial cell experiences a loss of lipid components and cell wall fluidity and also promotes inactivation of enzymes. Enzymes within the bacterial cell wall are inactivated. Drying or dehydration is known as the operation in which the water activity of a food is lowered by removal through vaporization or sublimation of water normally present. Lowering the amount of available water in a food product inhibits bacterial growth.

The process of freezing slows the growth of bacteria. Most control methods to promote food safety have increased the shelf life of food as well (Jay, 1996).

### **2.6.4 Food Product Dating and Warning Labels**

Food product dating or “open dating” is a date stamped on a product’s package to help the vendor determine how long to offer the product for sale. It is not a safety date. The date is not meant to indicate the length of time the product is safe to eat, but rather the time period in which the product is at its best quality. The “sell-by” date advises the vendor how long the product is to be displayed for sale. A “use-by” date is the last date recommended for use of the product while at peak quality. Retailers are allowed to sell fresh or processed meat and poultry products beyond the expiration date on the package, as long as the product is wholesome. The retailer is also allowed to change a date on wholesome fresh meat that has been cut and wrapped in the meat department of the supermarket. However, modifying the label on a product packaged under federal

inspection is illegal. If the product has an expired date and the food remained wholesome, it remains on sale; however, the expiration date is not altered (FDA/CFSAN-Food Safety A-Z Reference Guide, September, 2001).

Manufacturers voluntarily use label statements such as “keep refrigerated”, or “after opening, refrigerate at 40° F., or below”, to inform consumers of the need to maintain the product at safe refrigeration temperatures (Marth, 1998). Guidance for consumers on labeling of foods that need refrigeration, was published in 1997 by the FDA, CFR 62, 8248-8252 (Marth, 1998). It was determined that the label of potentially hazardous food that needs refrigeration should be more specific about the hazards present and the necessary storage conditions. Consequently, there is labeling guidance for manufacturers. The agency divided foods that need refrigeration into three groups (A, B, and C), depending on their refrigeration and storage needs. Group A foods are potentially hazardous and, if subjected to temperature abuse, would support the growth of infections or toxigenic microorganisms present in the food. These products require refrigerated storage (Marth, 1998).

Group B foods are shelf-stable as a result of processing, but once opened, the unused portion supports microbial growth unless refrigerated. Group C foods do not pose a hazard even after opening the product package. However, the product may experience rapid deterioration in quality, over time, if not refrigerated.

Model label statements refer to the importance of refrigeration for Groups A and B foods to maintain safety and the use of refrigeration for Group C foods to maintain quality (Marth, 1998).

### 2.6.5 Food Packaging

A modern food package has been shown to have many functions. The main purpose is to physically protect the product during transport. The package also acts as a barrier against potential spoilage agents. The package protects the product from filth, microorganisms, moisture, and objectionable odors. Four basic packaging materials used are metal, paper and wood products, glass and plastic. A combination of materials also works well. One example is lining a paper milk carton with polyethylene to protect the product in case the carton becomes wet (Institute of Food Technologists Web Site, July, 1999).

Modified atmosphere packaging (MAP) extends product shelf life by reducing O<sub>2</sub> and/or increasing gases, such as CO<sub>2</sub> into the food product's environment (Marth, 1998). The MAP process alters the normal atmospheric concentrations of certain gases in a packaged food product to levels that are not congruent with microbial growth. CO<sub>2</sub> levels are increased and O<sub>2</sub> levels are decreased. MAP may inhibit microorganisms such as *Pseudomonas* Species, but allow *Lactobacillus* Species, *Leuconostoc*, and *Pediococcus* to grow. Some of the organisms such *Lactobacillus* Species reduce the pH of the food product sufficiently enough to inhibit the growth of certain bacteria. The use of the MAP (low or no O<sub>2</sub>) process allows pathogens such as *C. botulinum*, *E.* or *Y. enterocolitica* to grow before the *Lactobacillus* Species has the opportunity to reduce the pH of the product to inhibitory levels.

Vacuum packaging is achieved by placing food products or ingredients in plastic bags or pouches. The process removes the air and seals the bag or pouch with a heat sealer. (Marth, 1998).

### **2.6.6 Pasteurization**

Milk is a required food item to be served to children who participate in the CNP. The Grade “A” Pasteurized Milk Ordinance (PMO), 2001 Revision, defines pasteurization as heating every particle of milk or milk product to a prescribed temperature in a specified amount of time. For example, milk or a milk product would be heated to 63° C, (145° F) for 30 minutes. Another example would be heating milk or a milk product to 72° C (161° F) for 15 seconds.

Eggs are another food product that may be served to CNP participants. The Bad Bug Book indicates that *Salmonella enteritidis* infection is associated with the consumption of raw eggs. The Louisiana Public Health Sanitary Code requires the pasteurization of liquid, frozen, and dry egg products. CNP participants may benefit from this requirement.

## **2.7 Model/Plan and Learning Theories, Surveys**

### **2.7.1 Systems Models/Plans**

In this study, an analogue model/plan was developed. Receiving, storing, and preparing foods in day care centers were outlined. HACCP principles (the National Seafood Alliance’s Sanitation Manual) were simplified and incorporated into the model/plan.

A food service systems model may describe observations of procedures conducted in a food service operation. Examples may include operational flow charts, organization

charts, or graphs that show customer participation. This type of model/plan is called an analogue model (Byers, et.al.,1994, Mann, 1991, Spears, 1991). The use of an analogue model/plan allows a clear presentation of important aspects of a food service operation. It may be translated into actual working situations; therefore, a foodservice systems model/plan describes the operation of the foodservice department. The components of a model/plan include a basic transformation of inputs into outputs. There are subsystems, and controls, both internal and external. Inputs of the foodservice system are labor and skill, food and supplies, space and equipment, money, time, utilities, and information. Transformation changes inputs into outputs. In a foodservice systems model/plan, functional subsystems of the food service operation are included. The subsystems include procurement, production, distribution, service, sanitation and maintenance. Outputs are products and services that result from primary output of a foodservice system. Control includes the goals and objectives, standards, policies, procedures, and programs of the foodservice organization. It provides guidance for the system, both internal and external. Internal controls include objectives and plans for the organization. External controls are local, state, and federal laws and regulations.

The laws and regulations governing sanitary practices in a foodservice operation are examples of external controls. The revised and updated standards on sanitation and safety by the Food and Drug Administration's Model Food Service Sanitation Ordinance are examples of these laws and regulations. Emphasis is placed on purchasing, storage, preparation, handling, and holding food (Byers, et al., 1994, Mann, 1991, Spears, 1991).

### 2.7.2 Learning Theories

Foodservice employees benefited from learning food safety and sanitation principles in a training session. The learning process was enhanced by the application of learning theories. Training was provided to promote compliance with food safety and sanitation principles. The employees gained new insight into ways of applying those principles. Methods of communicating the information were based on the employee's ability to assimilate information.

Helm and Klawetter, 1995, offer the following principles of adult learning:

- Adults want to choose what they learned.
- Adults do not enjoy a learning experience if they feel it is a waste of their time.
- Adults are motivated to learn if they perceive a need or purpose for learning.
- Adults learn from the experiences of others.
- Practical solutions to problems are desired by adults.
- The physical environment in which learning takes place is important.
- Adults enjoy problem solving.
- Learning experiences that encourage active participation are liked by adults.
- Adults expect to be treated as adults, not children.
- Adult learning is ongoing and continuous.
- Adult learning takes place at different rates and in different ways, and know that they are making progress is important to adult learners.

Printed and non-printed materials for the adult learner meet certain specifications.

The content of printed material is written at an appropriate level for the learner, is clear

and concise, organized in a logical sequence, and has important information highlighted. The visuals are attractive and contribute to the understanding of the concept. The print is easy to read and the type is large enough for easy reading. The content is accurate and the material allows participation by the learner.

Non-print material, such as slides, videos, or overhead projections, is appropriate for the topic, accurate and appealing, of good color and sound, with important points easily identifiable (Helm and Klawetter, 1995).

Holli and Calabrese, 1998, describe insights on the principles and theories of learning. The following two main types of learning theories that have been developed by psychologists are: behavioral or stimulus-response theories and cognitive theories.

Observable changes in behavior, which emphasized the effect of an external event or an individual, are an example of a behavioral learning response. Cognitive learning theories explain learning that is internal and not observable. Thinking, perceiving, remembering, creating, concept formation and problem solving are examples of cognitive learning.

One important principle of behavioral learning theory is that behavior changes according to the consequences of that behavior. Some consequences are pleasurable and are called positive reinforcers. Examples of these are praise for a job well done or a salary increase. Response to reinforcers differ and are not effective at all times. If an employee does not have a good relationship with the supervisor, the supervisor's praise has no effect on the employee's behavior. For praise to be accepted the person giving the praise is believable and the praise pertains to a specific behavior, such as getting an extra project completed on time.

The opposite is true in dealing with unpleasant situations. These are called negative reinforcers because the behaviors are used to escape from an unpleasant situation. For example, an employee avoids conflict with a supervisor by behaving correctly.

Another view of behavioral learning theories is modeling or social learning. People learn through the observation and imitation of others' behavior. Group learning situations are examples of model learning. A trainer demonstrates the operation of a meat slicer and the employee learns from watching the trainer and performing the same task. Negative behavior is learned from watching another employee complete a procedure improperly; or by other employees reporting to work late; without suffering the consequences.

Cognitive learning is seen as an active mental learning process of acquiring, remembering, and using knowledge. Goals are pursued, information was sought, and problems are solved. An individual brought what he already knew to the learning situation, which may have influenced what was learned.

Remembering and forgetting are part of cognitive theory. Information does not enter short-term memory until the individual pays attention to the learning. A trainer gains attention by using media or bright colors. Raising or lowering one's voice, gestures, discussions, repetition, and saying that a certain area is important are all methods of gaining the attention of learners. Repetition helps to keep information in short-term memory.

Visual and verbal images are demonstrated to be retained in long-term memory. The presenter summarizes in the middle and at the end of a presentation. Stories,

metaphors, and examples are better remembered than isolated facts. New knowledge connected to known information promotes long-term memory. In preparation for a training session, the presenter ascertains what the target audience already knows; what terminology with which they are familiar, as well as their work experiences. Well-organized material is easier to learn than that which is poorly organized. The concept of transfer of learning is indicated when the individual uses new knowledge and skills to solve problems (Holli and Calabrese, 1998).

### **2.7.3 Surveys**

Surveys were conducted as part of this study. The Total Design Method (TDM) by Dillman, 1978, describes a method of surveying and was used as a tool in the developing and conducting of the surveys used in this study.. TDM has two parts; the first identifies each step of the survey project that influences the number and kinds of responses. Each step is honed to determine the best possible responses. Each step or aspect of the survey is planned for maximum effectiveness. The second element organizes the entire survey process to ensure that the design is carried out according to the researchers' wishes. An administrative plan guides the implementation of the survey according to the plan.

Maximizing survey responses is facilitated by the following three factors: minimizes the cost for responding, maximizes the reward for doing so, and establishes trust to deliver the rewards. Using authentic signatures rather than a stamp, individual salutations, and individually typed letters demonstrates positive regard. Verbal appreciation, which appears in the communication to the potential participant, also shows positive regard. A consultative type approach by asking for the participant's opinion

provides an intrinsic reward. Token gifts such as coins, notepads, or gift certificates are examples of tangible rewards.

The costs for administering a survey not only include monetary costs, such as stamped envelopes, but also reflect the work of an individual's time in completing the survey. Establishing trust between the researcher and the respondent is exemplified by the use of a prestigious or recognized letterhead. The respondent identifies with an organization, such a university or health care institution.

The administration of the survey requires prior planning; for example, having enough surveys printed. The budget is planned to provide sufficient funds for all phases of the survey, which includes any follow-up mailings. The researcher obtains adequate assistance to process each step of the survey properly. The administration plan outlines the procedures by identifying all work that is to be done, determines what help is needed to complete each step, establishes a schedule and sequence for the tasks to be performed, and determines how each task is to be completed.

A successful survey operation is the result of attention to detail and careful planning. These steps enable the researcher to determine the depth of interest from the target population.

Issues concerning food safety and sanitation were addressed in this literature review. The prevention of foodborne illness in the very young, especially for those who spend the majority of their waking time in day care centers, is of primary importance.

## **CHAPTER 3. METHODOLOGY**

### **3.1 Examination of Louisiana Board of Health Sanitarian Reports of Day Care Centers**

The Louisiana Board of Health Sanitarian reports from the day care centers participating in the Child and Adult Care Food Program (CACFP) in the state of Louisiana were examined to identify violations of the Louisiana Sanitary Code. A code number identifies each day care center. CACFP regulations require a code number, known as a contract agreement number, be placed on each agreement as the applicant is approved for participation in the CACFP. The code number reflects the year and numerical order in which the day care center entered the program. The Sanitarian reports are stored with the day care center contract agreement at the State Department of Education and at the day care center. Violations of the Code were reviewed and recorded. Violations and occurrences were analyzed.

### **3.2 Investigation of Sanitation Practices and Standards Required in other State's CACFP Programs**

A survey, (found in Appendix A), was developed by the researcher and mailed to all 50 state and territories CACFP Directors throughout the United States, requesting information on the sanitary violations reported by their state sanitarians for day care centers participating in CACFP. Samples of sanitation training materials, as well as copies of each state's sanitarian forms and regulations, were requested. A directory of the 50 state Child and Adult Care Food Program Directors was compiled by the National CACFP Association, in conjunction with the USDA, and participants were identified from this listing.

Prior to sending out, the survey was reviewed and shared with the USDA Southeast Region CACFP Directors for comments and recommendations. This region included New Mexico, Oklahoma, Texas, Arkansas, and Louisiana. The Director's evaluation was conducted at the same time as the sanitation and food handling survey administered to the Louisiana day care directors who participated in the CACFP. Six months was allowed to distribute, collect, and analyze the surveys. Information requested from the participants included a copy of their state Sanitary Code, a copy of their state's Sanitarian reporting form, and training and resource materials used for CACFP participants.

The survey also requested the frequency of the Sanitarian's inspection, and the sanitary code violations. The training and resource materials on sanitation, used for CACFP participants were examined. Ideas from these materials were included in the Food Safety Manual found in Appendix E. Comparisons were conducted between each state's Sanitary Code and the Louisiana Sanitary Code to identify similarities and differences are included in Appendix C.

### **3.3 Evaluation of Louisiana State Day Care Directors for Knowledge Concerning Food Safety**

State day care directors participating in the CACFP were surveyed to assess their knowledge of sanitation principles and correct methods of food handling. This survey, found in Appendix B, *Can your kitchen pass the food safety test?* by Kurtzwell, was published by the *FDA Consumer Magazine* in January 1996. It was distributed to day care directors at the 2000 and 2004 CACFP Spring Training Conferences. Topics in the survey included refrigerating food; handling of foods; cleaning and sanitizing food

contact surfaces and sinks; dishwashing; and cooking foods. Completed surveys were collected prior to participants' departure from the Conference to increase response rate.

The data was coded according to the participant's contract agreement number.

Relationships between survey responses and the violations cited on the sanitarian's report for each day care center were investigated. Surveys were mailed to those who did not attend.

### **3.4 Develop a Food Safety Manual Following the Seven Principles of HACCP and SSOP Concepts**

Both a sanitation procedure (SSOP) for day care centers and a Hazard Analysis Critical Control Point (HACCP) plan were developed. The SSOP procedure and HACCP plan were based on the FDA GMPs, (21 CFR 110), and USDA's HACCP for Child Nutrition Programs, (2002). Modifications were made to address day care center needs.

The resulting plans were presented as a food safety and sanitation training manual for day care directors. The manual included a SSOP procedure, a HACCP-based plan for day care centers, handouts, and chapters two and three of the 2001 FDA Food Code.

Participants were given pre and post tests, which were used as teaching tools.

The information survey described in objective 3.2 was distributed again at another CACFP Training Conference. The results of those who took the food safety and sanitation training were compared to those who did not take the training.

The HACCP-based plan for day care centers focused on four specific areas:

1. food purchasing and transporting ;
2. food preparation;
3. food service,
4. food storage.

Useful forms, (such as temperature logs for each menu item), a meal time food safety checklist, and SSOP checklist, were provided to assist the day care director in safe food and preparation areas in day care centers. The example manual of a HACCP-based plan for day care centers is useful for day care centers to develop their own plans. It should help them identify potential hazards and control measures, and critical control points. Monitoring procedures, (such as temperature logs or visual checks), corrective actions, record keeping system and verification procedures were developed. A sample schedule for record reviews was suggested to assure standards are met consistently.

The SSOP procedure includes guidance on a safe water supply; cleaning and sanitizing food contact surfaces; prevention of cross-contamination; handwashing; toxic compounds; personal hygiene; employee health; pest control; receiving (or purchasing), storing and transporting food.

### **3.5 Statistical Analysis**

Both surveys were analyzed by using frequencies and percentages. Answers to each question of the surveys were indicated by the frequency and percentage of each answer. Chi square was conducted at a preset  $\alpha=0.05$ . A table of statistical association of some survey questions was presented.

## CHAPTER 4. RESULTS

### 4.1 Review of Board of Health Sanitarian Reports for Day Care Centers Participating in the Child and Adult Care Food Program (CACFP)

As part of the application for participation in the CACFP, licensed Louisiana day care centers are required to have a yearly inspection by the Louisiana Board of Health sanitarians. This study examined 369 sanitarian reports from day care centers. Out of the 369 reports the percentages of violations were:

Percentage	Violation
22.14	No refrigerator thermometer
14.26	3 compartment sinks were not set up properly, re: wash, rinse, sanitize
14.26	Refrigerators, shelves, and kitchen stove hoods were not clean
14.26	Litter on the floor
11.07	Roaches were present
11.07	Sinks, walls, and chairs in the dining room needed to be cleaned
11.07	Dirty sink drains
11.07	Kitchen hood filter not clean
11.07	Cooked food temperature less than 140°F.
11.07	Floor and ceiling tiles cracked
7.38	Kitchen floors not clean
7.38	Dirty kitchen counters
7.38	Lack of paper towels at the handwashing sink
7.38	Using rugs on kitchen floor instead of rubber mats
3.69	Lights had no shielding
3.69	Reusing plastic forks and spoons
3.69	Plumbing leaks at sinks
3.69	Mop sink was dirty
3.69	Spoiled milk
3.69	Dirty refrigerator
3.69	Dishes and cooking utensils stored under the sink
3.69	Counter wiping cloths dirty
3.69	No labels on bulk containers
3.69	Repair holes in kitchen walls

## 4.2 National CACFP Director's Survey

This survey, (Appendix A), was distributed at a National CACFP State Agency meeting to 50 States and US Territories. Directors were requested to send copies of:

- State's Sanitary Code
- State's Sanitarian Reporting Form
- Sanitation Training Materials for Day Care Centers
- Resource Materials on Sanitation Given to Day Care Workers

Two questions were asked:

- a. How often does the sanitarian inspect each day care center participating in CACFP?
- b. What violations are most commonly reported as a result of the inspections?

A total of sixteen States (i.e. Connecticut, Florida, Georgia, Idaho, Iowa, Louisiana, Mississippi, Montana, Nebraska, New Mexico, New York, North Dakota, South Carolina, South Dakota, Texas, and Washington State), responded to the survey. The states sending their Sanitary Code, Sanitarian Reporting Form, Sanitation Training Materials for Day Care Centers, and Resource Materials on Sanitation Given to Day Care Workers are indicated in Table 1. Sanitation Material Received.

**Table 1. Sanitation Material Received**

<b>State</b>	<b>States Sent Sanitary Code</b>	<b>States Sent Sanitarian's Reporting Form</b>	<b>Sanitation Training Materials for Day Care Centers</b>	<b>Sanitation Resource Materials Given to Day Care Centers</b>
<b>A</b>	<b>x</b>	<b>x</b>	<b>x</b>	<b>x</b>
<b>B</b>	<b>x</b>	<b>x</b>	<b>x</b>	<b>x</b>
<b>C</b>	<b>0</b>	<b>0</b>	<b>x</b>	<b>0</b>
<b>D</b>	<b>x</b>	<b>x</b>	<b>x</b>	<b>x</b>
<b>E</b>	<b>0</b>	<b>0</b>	<b>x</b>	<b>x</b>
<b>F</b>	<b>x</b>	<b>x</b>	<b>x</b>	<b>x</b>
<b>G</b>	<b>0</b>	<b>x</b>	<b>x</b>	<b>x</b>
<b>H</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>I</b>	<b>x</b>	<b>x</b>	<b>0</b>	<b>0</b>
<b>J</b>	<b>x</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>K</b>	<b>x</b>	<b>x</b>	<b>0</b>	<b>x</b>
<b>L</b>	<b>x</b>	<b>x</b>	<b>0</b>	<b>0</b>
<b>M</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>N</b>	<b>x</b>	<b>x</b>	<b>0</b>	<b>0</b>
<b>O</b>	<b>0</b>	<b>x</b>	<b>x</b>	<b>0</b>
<b>P</b>	<b>x</b>	<b>x</b>	<b>0</b>	<b>x</b>

**X = Information Received, 0 = Information Not Received**

The responses to the above questions were:

- a. Fourteen of the sixteen States said that the Sanitarian inspected each day care facility on an annual basis. Two States did not know how often the Sanitarians in their States inspected each day care facility and suggested that the State Sanitarian Office be contacted for further information.
- b. Nine out of 16 States did not know what sanitary violations were most commonly reported; but indicated that this information was available in other records. The other seven states reported these sanitary violations:
  - No thermometers, or improper use of thermometers
  - Lack of knowledge or not using proper cooking temperatures
  - Soiled food contact surfaces before serving of food
  - Children not washing their hands
  - Not sanitizing washed dishes
  - Not using serving gloves and hair restraints
  - Improper labeling of items removed from original container
  - Not monitoring of sanitizing solutions
  - Not cleaning equipment: refrigerators, food containers, pots, pans
  - No pest control
  - Cross contamination of food products

The sanitary code violations found by examining the Louisiana Sanitarian Reports of the Day Care Centers were very similar to the ones cited by the individual CACFP State Directors.

### 4.3 Louisiana State Day Care Director's Survey

At a Day Care Training Conference conducted by CACFP State Agency Staff, a food safety quiz was distributed to 299 Day Care Directors participating in the CACFP. There were 145 responses. The survey consisted of 10 general knowledge sanitation questions taken from *Food Consumer Magazine* and was multiple choice. The questions and answers were:

---

Q1.The temperature of the refrigerator in my day care is:	Freq	Percent
50°F. (10°C.)	11	8.0
41°F. (5°C.)	124	90.5
I don't know, I've never measured it	2	1.5

---

There was one blank answer, one participant wrote in 30-29°F., another answered a and b, while two wrote in 40°F. or below.

---

Q2.The last time we had leftover cooked stew or other food with meat, chicken or fish, the food was:

	Freq	Percent
cooled to room temperature, then put in the refrigerator	73	54
put in the refrigerator immediately after the food was served	62	46
left at room temperature overnight or longer	0	0

---

Two participants answered NA.

---

Q3. The last time the kitchen sink, drain, disposal, and connecting pipe in my day

care were sanitized was:	Freq	Percent
yesterday	124	86.7
several weeks ago	15	10.30
can't remember	4	3.0

---

Two participants left the question blank, and one answered two weeks ago.

---

Q4. If a cutting board is used in my day care to cut raw meat, poultry or fish, and it is

going to be used to chop another food, the board is:	Freq	Percent
reused as is	0	0
wiped with a damp cloth	1	.70
washed with soap and water and sanitized with a mild chlorine bleach solution	143	99.30

---

One participant left the question blank.

---

Q5. The last time we had hamburgers in my day care, they were

served:	Freq	Percent
rare	0	0
medium	0	0
well done	143	100.0

---

One participant answered NA, and another left the question blank.

---

Q6. The last time there was cookie dough in my day care, the

dough was:	Freq	Percent
made with raw eggs, and the children sampled some of it	0	0
store bought and the children sampled some of it	2	1.5
not sampled until baked	132	98.5

---

There were eight participants who answered NA, three left the question blank and one answered none of the above.

---

Q7. We clean the kitchen counters and other surfaces that come in contact with food

with:	Freq	Percent
water	0	0
hot water and soap	5	3.52
hot water and soap, then bleach solution	121	85.21
hot water and soap, then commercial sanitizing agent	16	11.26

---

Four participants answered both the third and fourth answer.

---

Q8. When dishes are washed in my day care, they are:	Freq	Percent
cleaned by an automatic dishwasher and then air dried	49	33.33
left to soak in the sink for several hours, and then washed with soap in the same water	0	0
washed right away with hot water and soap in the sink,	95	64.62

rinsed, sanitized, and then air dried		
washed right away with hot water and soap in the sink and immediately towel dried	3	2.05

---

Three participants answered with the first and third answer, one answer was blank, and one answered washed off with hot soap and water, then cleaned with an automatic dishwasher and then air dried. Perhaps this participant meant pre-washing.

---

Q9. The last time raw meat, poultry or fish was handled in my day care, the person cleaned their hands afterward by:

	Freq	Percent
wiping them on a towel	0	0
rinsing them under hot, cold, or warm tap water	0	0
washing with soap and warm water	145	100.0

---

Q10. Meat, poultry, and fish products are defrosted by:

	Freq	Percent
setting them on the counter	1	.69
placing them in the refrigerator	144	99.31
microwaving	0	0

---

A statistical analysis of the survey was conducted using the Chi square analysis.

Ho = there is no association between the two questions  
 Ha = there is an association between the two questions

**Table 2. Statistical Association of Some Survey Questions for Day Care Directors**

Questions	Chi square value	Prob > chi square
Q1*Q2	1.86	0.39
Q1*Q10	0.20	0.99
Q2*Q10	1.83	0.40
Q2*Q10, having Q1 response "a" 50°F. fixed	No report due to row or column sum to zero	
Q2*Q10, having Q1 response "b" 41°F. fixed	1.90	0.38
Q2*Q10, having Q1 response "c" I don't know fixed	No report due to row or column sum to zero	
Q7*Q9	No report due to row or column sum to zero	

None of these associations is significant, which means there is no relationship or association between the two questions asked. Questions 1 and 2 dealt with refrigeration temperatures. Questions 1 and 10 also dealt with refrigeration as did 2 and 10. Questions 7 and 9 referred to cleaning and sanitizing.

The Day Care Director's Survey was conducted again at another training conference. Four hundred surveys were given out and 39 surveys were returned. One additional question was added to the survey. It asked if the respondent had attended the food safety workshop given for day care directors. The questions and answers were:

---

Q1. The temperature of the refrigerator in my day care is:	Freq	Percent
50°F. (10°C.)	3	7.69
41°F. (5°C.)	35	89.74
I don't know; I've never measured it	1	2.56

---

---

Q2. The last time we had leftover cooked stew or other food with meat, chicken or

fish, the food was:	Freq	Percent
cooled to room temperature , then put in the refrigerator	25	67.57
put in the refrigerator immediately after the food	12	32.43
was served		
left at room temperature overnight or longer	0	0

---

Two participants left the question blank.

---

Q3. The last time the kitchen sink, drain, disposal, and connecting pipe in my day

care were sanitized were:	Freq	Percent
yesterday	33	84.62
several weeks ago	3	7.69
can't remember	3	7.69

---

Q4. If a cutting board is used in my day care to cut raw meat, poultry or fish, and it is

going to be used to chop another food, the board is:	Freq	Percent
reused as is	0	0
wiped with a damp cloth	1	2.56
washed with soap and hot water and sanitized with	38	97.44
a mild bleach solution		

---

---

Q5. The last time we had hamburgers in my day care, they

were served:	Freq	Percent
rare	0	0
medium	0	0
well-done	39	100.0

---

---

Q6. The last time there was cookie dough in my day care,

the dough was:	Freq	Percent
made with raw eggs, and the children sampled some of it	0	0
store-bought, and the children sampled some of it	3	7.69
not sampled until baked	36	92.31

---

---

Q7. We clean the kitchen counters and other surfaces that come in contact with food

with:	Freq	Percent
water	0	0
hot water and soap	1	2.56
hot water and soap, then bleach solution	30	76.92
hot water and soap, the commercial sanitizing agent	8	20.51

---

---

Q8. When dishes are washed in my day care, they are	Freq	
Percent		
cleaned by an automatic dish washer and then air dried	9	23.08
left to soak in the sink for several hours and then washed with soap in the same water	0	0
washed right away with hot water and soap in the sink, rinsed, sanitized, and then air dried	30	76.92
washed right away with hot water and soap in the sink, and immediately towel dried	0	0

---



---

Q9. The last time raw meat, poultry or fish was handled in my day care, the person cleaned their hands afterward by:	Freq	Percent
wiping them on a towel	0	0
rinsing them under hot, cold or warm tap water	0	0
washing with soap and warm water	39	100.0

---



---

Q10. Meat, poultry and fish products are defrosted in my day care by:	Freq	Percent
setting them on the counter	1	2.63
placing them in the refrigerator	37	97.37

microwaving	0	0
-------------	---	---

---

One participant did not answer the question.

---

Q11. Did you attend the Food Safety Workshop given on		
March 31, 2004?	Freq	Percent
yes	7	17.95
no	32	82.05

---

The second survey was analyzed by frequencies and percentages instead of Chi square because of the small number of responses. Some participants did not answer every question of the second survey. The two survey responses were similar except for three of the questions. The question involving storage of food after serving had a lower correct response rate by those who attended the food safety workshop. A higher percentage of those who attended the workshop preferred using a commercial sanitizing solution for kitchen counters and food contact surfaces instead of chlorine bleach. A higher percentage of workshop participants gave the correct answer of allowing dishes to air dry than non-participants.

#### **4.4 Day Care Director's Sanitation and Food Safety Manual**

A basic sanitation and food safety manual was developed for day care centers and is found in Appendix E. It included a basic sanitation plan, sanitation checklists, food flow plan, and basic guidance for food safety as well as handout material. A workshop featuring this material was presented to day care directors.

An example food flow plan was developed by observation and study of the daily activities of food preparation in a day care center. Example critical limits and critical control points were established. The hazard analysis worksheet and the HACCP Plan (Steps to Produce Safe Food for Day Care Children) used to identify the critical control points are found in Appendix D. The example critical control points that were established were transporting food from the grocery store to the day care center, cooking, hot holding and serving, cold holding and serving, and cooling.

**Table 3. Critical Control Points**

<b>CCP</b>	<b>Critical Limit</b>	<b>Source 2001 Food Code 2003 Food Code Revisions</b>
Transporting food from the grocery store to the day care center	Bent cans and torn bags of food will not be purchased. Food will not be purchased that has passed its expiration date.	Chapter 3 302.11
Cooking	Use of recommended temperatures and cooking time	Chapter 3 401.11 401.12
Hot Holding/Serving	Use of recommended reheating temperatures and holding times, use of serving gloves and serving utensils	Chapter 3 301.11 304.15 401.13 403.11 501.16
Cold Holding/Serving	Use of recommended temperatures and holding times, use of serving gloves and serving utensils	Chapter 3 301.11 304.15 501.16 (A) (2)
Cooling	Foods shall be cooled rapidly before storage, stored in small portions, in shallow containers.	Chapter 3 501.15

## CHAPTER 5. SUMMARY AND CONCLUSIONS

The Louisiana Board of Health Sanitarian Reports from the day care centers participating in the Child and Adult Care Food Program (CACFP) were examined to identify violations of the Sanitary Code Violations most reported were: no refrigerator thermometer, 3 compartment sinks were not set up properly, i.e. wash, rinse, sanitize, refrigerator shelves and kitchen stove hoods were not clean, litter on the floor, roaches were present, dirty sink drains, dirty walls and furniture in the dining room, kitchen hood filter not clean, and cooked food temperatures less than 140°F. These violations were very similar to the ones cited by the individual CACFP State Directors' Survey. They include: no thermometers or improper use of thermometers, lack of knowledge or not using proper cooking temperatures, soiled food contact surfaces before serving of food, children not washing their hands, not using sanitizing steps on washed dishes, not using serving gloves and hair restraints, improper labeling of items removed from original container, not monitoring sanitizing solutions, not cleaning equipment: refrigerators, food containers, pots, pans, no pest control, and cross-contamination of food products.

The Louisiana State Day Care Director's Survey was distributed two times. The second time of distribution was after a food safety workshop was conducted. The two survey responses were similar with the exception of three of the questions. The first question involved the storage of food after service. The correct answer was to place food in the refrigerator after serving. There was a lower correct response in the second survey than in the first survey. More responders in the second survey thought the correct answer was to let the food cool first before refrigerating it; in some cases, this is true. The second question was what to use when cleaning kitchen counters and food contact

surfaces. The second survey indicated a greater preference in the use of a commercial sanitizing agent instead of chlorine bleach, with hot water and soap. The third question concerned the correct method of washing dishes. There was an increase in the correct answer of allowing dishes to air dry in the second survey.

A food safety manual for day care centers was developed. A Sanitation Standard Operating Procedures (SSOPs) checklist identifies areas of sanitation monitoring. A Day Care Director's Checklist helps to identify Critical Control Points (CCPs). A Daily Temperature Log records the temperatures of hot and cold foods.

Based on Sanitary Code violations in Louisiana and other states mentioned in this study, children are susceptible to foodborne illness. We know that day care center directors have knowledge; but they do not know how to implement their knowledge. The manual that was developed gives them the potential to implement their knowledge.

For future study, the manual should be evaluated in real-life situations in a day care center. It should also be evaluated to see if there is a decline in future violations both in Louisiana and other states who participated in this study.

The U.S. Food and Drug Administration (FDA), March 2002, has instituted a risk analysis program that could be used for future study of food hazards in day care centers. The program identifies risks attributed to a food hazard, provides information about the risks, and analyzes risk control measures. It makes control decisions about the risks, and implements those controls. Monitoring measures supervise and review all aspects of the program.

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## APPENDIX A: NATIONAL STATE CACFP DIRECTOR'S SURVEY

Dear CACFP Director,

I am a Program Specialist with the Child and Adult Care Food Program at the Louisiana Department of Education. As part of my dissertation project for my Ph.D in Food Science at Louisiana State University, I am conducting a survey on information regarding food safety, sanitation training, and reference materials used in your program. These materials will be compared to materials from other CACFP programs, including Louisiana. My overall objective is to develop a sanitation model and HACCP plan for CACFP participants in Louisiana.

Would you please send samples of the following:

- A copy of your state's Sanitary Code,
- A copy of your state's Sanitarian reporting form,
- A copy of your sanitation training material for day care centers,
- Copies of resource materials on sanitation given to day care personnel.

Please answer the following questions on the attached response form:

- How often does the Sanitarian inspect each day center participating in the CACFP, and
- What violations are most commonly reported as a result of the inspection?

Enclosed is a separate response sheet listing spaces for your name and address, a check list for the requested samples, the two questions, and spaces for answers and a return, self-addressed stamped envelope. Thank you for your assistance. A copy of the sanitation and HACCP plan for day care centers will be sent to you in appreciation of your time and effort in helping me with my project.

Sincerely,

Betsy Smith, MS, RD, LDN  
37485 East Parkwood Avenue  
Prairieville, Louisiana 70769

Enclosures:

Response form  
Return self-addressed stamped envelope

Response Form

Food Safety Information Survey

Date \_\_\_\_\_

CACFP Director \_\_\_\_\_

Agency Name and Address \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Phone (    ) \_\_\_\_\_

Please check to indicate that you are sending sample copies of your:

- state's Sanitary Code,
- state's Sanitarian reporting form,
- sanitation training material for day care centers,
- resource materials on sanitation given to day care personnel.

Please answer the following questions:

- How often does the Sanitarian inspect each day care center participating in CACFP?

\_\_\_\_\_

- What violations are most commonly reported as a result of the inspection?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Please mail this response form and the requested samples of material to me in the enclosed self-addressed stamped envelope. Thank you for your help with my project.

## APPENDIX B: LOUISIANA STATE DAY CARE DIRECTOR'S SURVEY

### Food Safety Quiz for Day Care Directors

(Can your kitchen pass the food safety test? Kurtzwell, *FDA Consumer Magazine*, January, 1996)

Choose the answer that best describes the practice in your day care, whether or not you are the primary food handler.

- 1. The temperature of the refrigerator in my day care is:**
  - a. 50 degrees Fahrenheit ( 10 degrees Celsius )
  - b. 41 degrees Fahrenheit ( 5 degrees Celsius )
  - c. I don't know; I've never measured it.
  
- 2. The last time we had leftover cooked stew or other food with meat, chicken or fish, the food was:**
  - a. cooled to room temperature, then put in the refrigerator
  - b. put in the refrigerator immediately after the food was served
  - c. left at room temperature overnight or longer
  
- 3. The last time the kitchen sink, drain, disposal and connecting pipe in my day care were sanitized was:**
  - a. yesterday
  - b. several weeks ago
  - c. can't remember
  
- 4. If a cutting board is used in my day care to cut raw meat, poultry or fish and it is going to be used to chop another food, the board is:**
  - a. reused as is
  - b. wiped with a damp cloth
  - c. washed with soap and hot water and sanitized with a mild chlorine bleach solution
  
- 5. The last time we had hamburgers in my day care, they were served:**
  - a. rare
  - b. medium
  - c. well-done
  
- 6. The last time there was cookie dough in my day care, the dough was:**
  - a. made with raw eggs, and the children sampled some of it
  - b. store-bought and the children sampled some of it
  - c. not sampled until baked
  
- 7. We clean the kitchen counters and other surfaces that come in contact with food with:**
  - a. water
  - b. hot water and soap
  - c. hot water and soap, then bleach solution
  - d. hot water and soap, then commercial sanitizing agent

page 2

- 8. When dishes are washed in my day care, they are:**
  - a. cleaned by an automatic dishwasher and then air-dried
  - b. left to soak in the sink for several hours and then washed with soap in the same water
  - c. washed right away with hot water and soap in the sink, rinsed, sanitized, and then air-dried
  - d. washed right away with hot water and soap in the sink and immediately towel-dried
  
- 9. The last time raw meat, poultry or fish was handled in my day care, the person cleaned their hands afterwards by :**
  - a. wiping them on a towel
  - b. rinsing them under hot, cold or warm tap water
  - c. washing with soap and warm water
  
- 10. Meat, poultry and fish products are defrosted in my day care by:**
  - a. setting them on the counter
  - b. placing them in the refrigerator
  - c. microwaving
  
- 11. Did you attend the Food Safety Workshop given on March 31, 2004?**
  - a. yes
  - b. no

## APPENDIX C: COMPARISONS OF LOUISIANA SANITARY CODE

### Comparison of Louisiana Sanitary Code to Other State's Sanitary Codes

States	FDA Food Code	Permit Required	Cold Temp 41°F	Cooling Temp Req	Hot Hold Temp 141°F. Req	Cold Hold Temp 41°F. Req	Pest Cont	Safe Water	Hand Wash
<b>A</b>	x	0	0	0	x	x	x	0	x
<b>B</b>	0	x	x	0	0	0	x	x	0
<b>C</b>	0	x	x	0	0	0	x	0	0
<b>D</b>	x	0	x	x	0	0	x	0	x
<b>E</b>	0	0	x	x	0	0	x	0	x
<b>F</b>	0	x	0	0	0	0	0	0	0
<b>G</b>	0	x	x	x	0	0	x	x	0
<b>H</b>	0	0	x	x	0	0	x	0	x
<b>I</b>	0	0	x	0	0	0	x	x	x
<b>J</b>	0	0	x	0	0	0	x	x	0

**x= cited as required; all items required in Louisiana Sanitary Code**

**0 = not required or not cited in the material sent by the State**

## APPENDIX D: HAZARD ANALYSIS WORKSHEET AND HACCP PLAN

(1) Ingredient/ Processing step	(2) Identify potential hazards introduced, controlled or enhanced at this step.	(3) Are any potential food safety hazards significant? (Yes/No)	(4) Justify your decision for column 3	(5) What preventative measure(s) can be applied to prevent the significant hazards?	(6) Is this step a critical control point? (Yes/No)
Purchasing	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Avoid bent and dented cans, torn bags, foods that have passed expired in date or frozen foods that have thawed	Do not purchase food in bent or dented cans, born bags, those that have passed expiration date. Buy only frozen foods that are frozen.	No
Transport	<u>BIOLOGICAL</u> Bacterial growth of pathogens CHEMICAL  PHYSICAL	Yes	Thawing of frozen foods Refrigerated foods could rise above 40°F	Use of ice chest, paper bags for insulation, using stores that are located within 30 minutes of the day care center	Yes
Shelf Stable Storage (Dry Storage)	<u>BIOLOGICAL</u> Bacterial growth of pathogens CHEMICAL  PHYSICAL	Yes	Unventilated store room temperature above 80°F Lack of thermometer, failure to use FIFO system	Ventilate storage area with fans or AC. Keep a thermometer to assure temperature control, use of FIFO system	No
Refrigerated Storage	<u>BIOLOGICAL</u> Bacterial growth of pathogens CHEMICAL  PHYSICAL	Yes	Faulty temperatures above 40°F	Keep internal thermometer in refrigerator; put items away immediately upon arrival at the day care from the grocery store.	No
Frozen Storage	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Faulty temperature above 0°F	Keep internal thermometer in refrigerator; put items away immediately upon arrival at the day care from the grocery store.	No
Thawing	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Items thawed on countertops	Thaw items in refrigerator	No

## Hazard Analysis Worksheet

(1) Ingredient/ Processing step	(2) Identify potential hazards introduced, controlled or enhanced at this step.	(3) Are any potential food safety hazards significant? (Yes/No)	(4) Justify your decision for column 3	(5) What preventative measure(s) can be applied to prevent the significant hazards?	(6) Is this step a critical control point? (Yes/No)
Cutting/ Preparation	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Observation of using same cutting boards for vegetables and meats, carved meats for salads left at room temperature during preparation, leaving food uncovered, lack of preparation gloves.	Separate cutting boards for vegetables and meats. Prechill meats for cold salads, keep food covered, wear preparation gloves.	No
Cooking	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Lack of minimal cooking temperature and time	Use of thermometer and timers to ensure adequate cooking of food products	Yes
Hot Holding/ Serving	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Food held for more than two hours, lack of serving gloves, serving utensils.	Reheat to proper temperature, hold for two more hours, desired use of serving gloves and serving utensils.	Yes
Cold Holding/ Serving	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Food temperatures above 40°F, lack of serving gloves, serving utensils.	Use of thermometer, maintain use of temperature logs, use of serving gloves, serving utensils.	Yes
Cooling	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Foods left on counter too cool, stored in large containers, and stored at temperatures that are too high.	Foods shall be cooked rapidly before storage, stored in shallow containers and in small portions. Use ice water baths to aid in lowering temperature before storage.	Yes

## Hazard Analysis Worksheet

(1) Ingredient/ Processing step	(2) Identify potential hazards introduced, controlled or enhanced at this step.	(3) Are any potential food safety hazards significant? (Yes/No)	(4) Justify your decision for column 3	(5) What preventative measure(s) can be applied to prevent the significant hazards?	(6) Is this step a critical control point? (Yes/No)
Packing of leftovers	<u>BIOLOGICAL</u> Bacterial growth of pathogens  CHEMICAL  PHYSICAL	Yes	Containers not adequate for storage, or covered with adequate lids or tops.	Use containers specifically designed for storage of food and specific lids or tops designated for those storage containers.	No
Storage of leftovers	<u>BIOLOGICAL</u> Bacterial growth of pathogens CHEMICAL  PHYSICAL	Yes	Leftovers not packaged properly or storage not at proper temperature.	Store leftovers in adequate containers at the proper temperature.	No

## Steps to Produce Safe Food for Day Care Children

Steps	Problems	Things to do to prevent problems	Monitoring				How to correct the problem	Records	How to be sure problem is corrected (done by supervisors)
			What	How	Frequency	Who			
Transporting food from the Grocery Store to the Day Care Center	Bacterial growth due to improper food handling	Ice chests and paper bags will be used to transport food from the Grocery Store to the Day Care within 30 minutes	Time of transporting food	Watch or clock	As needed	Supervisor	Checklist	Review of the records once a week by the supervisor	
Cooking	Biological pathogens due to incorrect cooking temperatures	Food is cooked to proper temperature/ time	Temperature and time	Taking temperatures of prepared food, observation of kitchen clock, using thermometer log	Daily	Cook	Time and temperature logs, testing records, equipment maintenance records	Review of the records weekly, microbiological testing quarterly, <sup>new</sup> calibration of thermometers bi-annually.	

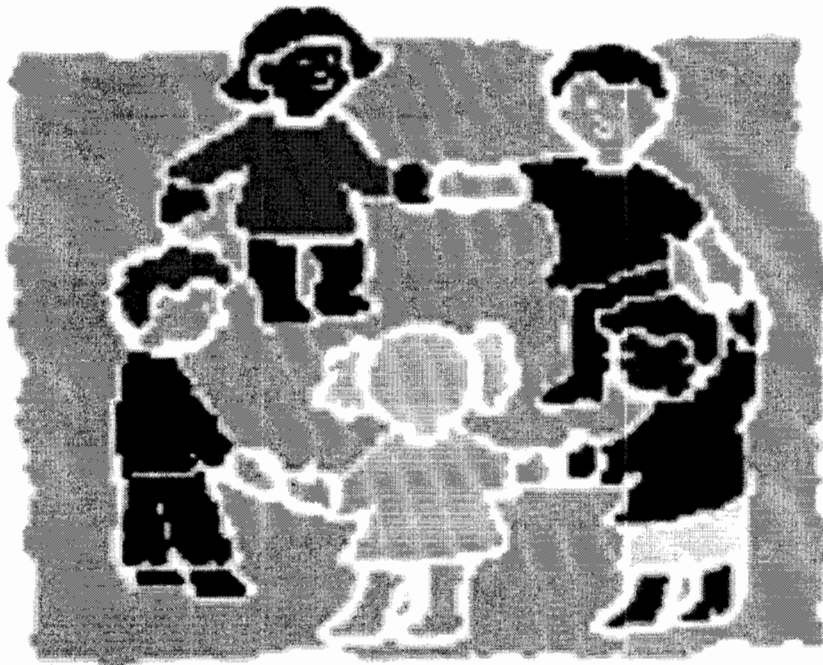
## Steps to Produce Safe Food for Day Care Children

Steps	Problems	Things to do to prevent problems	Monitoring				How to correct the problem	Records	How to be sure problem is corrected (done by supervisors)
			What	How	Frequency	Who			
Hot Holding/ Serving	Growth of biological pathogens due to incorrect holding temperatures	Food is held at 140°F/time limit. Use of serving gloves and serving utensils	Temperature and time, serving technique	Taking product temperature every half-hour during hot holding time using thermometer and temperature log, use of serving checklist.	At every meal	Cook	Time and temperature logs, testing records, equipment maintenance records, serving checklist.	Review of the records, weekly microbiological testing quarterly, calibration of holding cabinet thermometers bi-annually	
Cold Holding/ Serving	As above	Food is held at 41°F; use of serving gloves and serving utensils.	As above	Visual observation of refrigerator every half hour during cold holding time using thermometer and temperature log, use of serving checklist also taking product temperature at least twice during serving time.	At every meal	Cook	Time and temperature logs, testing records, equipment maintenance records, serving checklist.	Review of the records weekly, calibration of refrigerator thermometers bi-annually.	

## Steps to Produce Safe Food for Day Care Children

Steps	Problems	Things to do to prevent problems	Monitoring				How to correct the problem	Records	How to be sure problem is corrected (done by supervisors)
			What	How	Frequency	Who			
Cooling	Bacterial growth due to improper food handling.	Foods shall be cooked rapidly before storage. Foods shall be stored in shallow containers and in small portions.	Cooling food rapidly in preparation for storage.	Taking product temperature every half hour during thawing, cooling time, use of checklist	Daily	Cook	Temperature logs, checklist.	Review of the records once a week by the supervisor.	

APPENDIX E: FOOD SAFETY AND SANITATION MANUAL FOR DAY CARE  
CENTERS



# Day Care Center Food Safety

Draft

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## Introduction

This manual provides food safety information and strategies for day care center kitchens, food handling, and food sanitation. It is a useful guide for both managers and staff. In addition, it is an information source for periodic day care staff training. A Sanitation Standard Operating Procedures (SSOPs) Daily Checklist identifies areas of sanitation monitoring.

Hazard Analysis and Critical Control Point (HACCP) principles are the basis of this manual. HACCP has proven to be an effective tool in the prevention of foodborne illness (HACCP: Hazard Analysis and Critical Control Point Training Curriculum, 1997). There are three categories of hazards are biological, chemical, or physical. Critical Control Points (CCPs) are points where hazards are controlled. The Day Care Director's Checklist helps to identify CCPs.

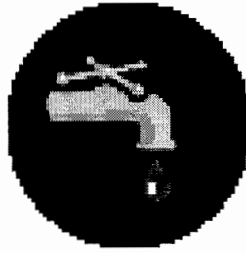
## Standard Sanitation Operating Procedures (SSOP's)



The U.S. Food and Drug Administration recommends that the following basic sanitation categories be controlled in order to facilitate implementation of HACCP principles. These eight sanitation basics are from the FDA Good Manufacturing Practices (21 CFR 110).

- safe water
- cleaning and sanitizing
- prevention of cross-contamination
- handwashing
- separating cleaning and sanitizing agents from food
- personal hygiene and employee health
- pest control
- sanitary methods for receiving (or purchasing), storing, and transporting food (HACCP for Child Nutrition Programs, and National Seafood HACCP for training and education)

## Safe Water



Water is an essential component in the preparation of food and sanitation. It is used in boiling foods such as vegetables or pasta. In addition, it is used in washing, rinsing, and sanitizing dishes and pots and pans and other food contact surfaces. The source of water for a day care kitchen must be from a safe source such as city water or a regularly tested well. All day care centers must have an adequate source of hot water (120°F).

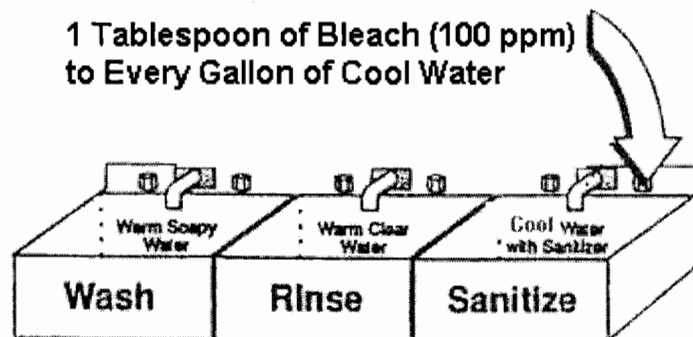
## Cleaning and Sanitizing



### *Cleaning and Sanitizing Equipment and Food Contact Surfaces*

All equipment and food contact surfaces, such as utensils, pots, pans, cutting boards, counter tops, etc., must be properly washed, rinsed, and sanitized after each use. In continuous use, these equipment items should be cleaned at least every four hours.

Day care centers in Louisiana require a triple sink for cleaning and sanitizing. Compartment one is for washing (soapy water), compartment two is for rinsing, and compartment three is for sanitizing pots and pans that have been washed and rinsed. To make a sanitizing solution, mix one tablespoon of chlorine bleach to one gallon of cool water (55°F). This sanitizing agent should be changed after each use to maintain its strength (Louisiana Sanitary Code, Chapter 25, Sanitization).



*Cleaning and sanitizing counter top surfaces.*

There are four steps for properly cleaning and sanitizing counter tops:

1. Remove all visible food particles. Use a damp paper towel or other disposable material.
2. Apply a cleaning solution with a clean cloth.
3. Using a clean cloth, rinse with clear water.
4. Sanitize with a sanitizing solution and allow to air dry.



*Using chlorine to properly sanitize:*

- Are readily available and cost-effective;
- Most effective when diluted as recommended;
- Test strips determine the presence of adequate chlorine levels. The recommended chlorine level for food contact surface sanitizing is 100 ppm.
- Hot water should not be used because chlorine loses its effectiveness in hot water;
- Dirt should be removed from surfaces before they are sanitized;
- Change solution often; and
- Other chemicals such as ammonia should never be mixed with chlorine because a harmful cloud of chlorine may form (Louisiana Sanitary Code, Title 51, Sanitization).



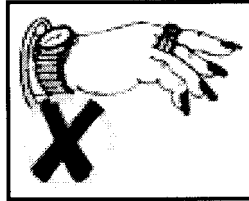
**Prevention of Cross-Contamination**

Cross-contamination is the transfer of bacteria or poisonous substances from contaminated or a contaminated source of foods.

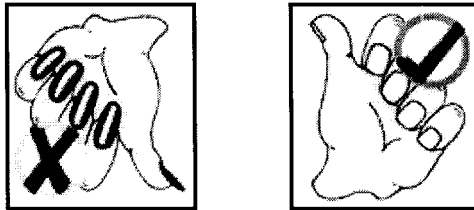
Ways to prevent cross-contamination are:

- Don't use the same utensils to prepare raw foods and ready-to-eat foods,
- Separate raw food from cooked food,
- Store raw food separate from ready-to-eat food in the refrigerator, For example, don't store raw food above cooked food.
- Keep the kitchen area clean and sanitized,
- Insist on good personal hygiene and handwashing practices,
- Do not allow anyone but food service employees into the kitchen area,
- Food service employees should not have responsibilities such as changing diapers or caring for children while preparing food (HAACP for Child Nutrition Programs).

## Handwashing

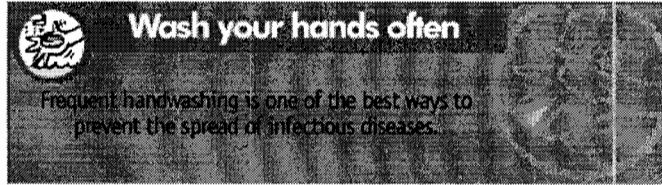


Food service workers should wear only plain wedding bands without gemstones and should not wear bracelets or watches. The kitchen area should have a clock to make the wearing of a watch unnecessary.



Fingernails should be clipped to fingertip length with no polish or artificial nails. Dipping the hands in a sanitizing solution instead of washing is not an acceptable practice. A sanitizing solution does not remove soil, which protects bacteria from sanitizing solutions.

Employees should wash not only their hands, but also any exposed portions of their arms. Hands and arms should be wet with warm water, scrubbing the area well with soap, including the backs of the hands, fingertips, underneath the fingernails, and between the fingers. A 20-second wash is recommended. A method of assuring a 20-second wash is to sing "Happy Birthday" two times. (Child Care Connection Training Program, 1997)



Food service employees should always wash their hands:

- after going to the toilet (most important),
- before work begins,
- before putting on gloves,
- periodically during work hours,
- when switching from working with one food to another,
- before going from a dirty work area to a clean work area,
- after handling children or changing diapers,
- after washing dirty dishes and utensils, or touching objects that may be a source of contamination.

Examples of objects that may contaminate:

- telephones (cell or table),
- raw foods,
- tobacco products,
- food,
- Drinks, chewing gum.
- hands after sneezing, coughing, or going to the bathroom,
- trash or garbage,
- soiled diapers,
- Head, hair or face.



Good handwashing technique is essential to prevent the spread of bacteria from the hands of food service employees to the food. There are six general steps in handwashing:

1. Remove jewelry,
2. Wet hands with warm water (110 degrees F.),
3. Lather and rub hands together using warm water,
4. Rinse hands,
5. Dry hands with disposable paper towels; and
6. Avoid touching contaminated areas.

### What about sanitizing soaps?

Regular soaps are just as effective as sanitizing soaps. Overuse of sanitizing soaps may cause skin irritations.

## Separating cleaning and sanitizing agents from food



All chemicals, including such common ones as cleaners, sanitizers, or chemical containing paper goods must be stored in a locked separate area. These items must be labeled to indicate that they are poisonous and dangerous. Empty chemical containers must never be used for the storage of food. Because the chemical compound may still remain in the container,

Sanitizers used in the wiping of tables or counters must not be stored near food and never on a serving line while food is being served. Most sanitizers are applied with a spray bottle, and droplets of the sanitizer may remain on the bottle after use that could fall into the food.

Never mix sanitizing or cleaning compounds. Material safety data sheets (MSDS) are available from the supplier. You should be familiar with their handling and use as specified in the MSDS. Keep a copy on file. Labels may also provide safety information about the product.

## Personal Hygiene and Employee Health



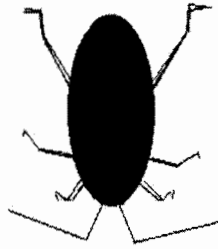
Food service employees must practice good personal hygiene by:

- washing hair and bathing daily,
- wearing clean clothing daily,
- using hair restraints,
- and avoiding touching the hair, hair restraints, clothing or skin.

### Employee Health

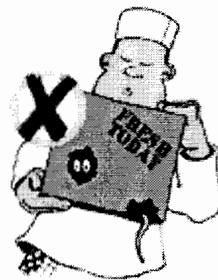
- Never report to work sick.
- Cover a cut on the hand, wrist, or arm with an impermeable cover and a single use glove (Louisiana Sanitary Code, Title 51, Employee Health).

## **Pest Control**



To help ensure that there should be no pests or rodents in the food service area:

- a commercial, licensed and bonded professional service is recommended.
- Daily inspections for the presence of pests and rodents should be done inside using a flashlight to locate hiding places for pests.
- Employees should use good housekeeping practices, such as keeping their work area clean and sweeping the floors often.
- Trash and garbage should be removed often.



## **Receiving, Storing, and Transporting**

To prevent spoilage and loss of quality, all food products must be:

- transported and stored from the grocery store under sanitary conditions, and
- Transported, stored at the recommended temperature (less than 40°F for refrigerated products) to prevent microbial growth (HAACP Child Nutrition Programs and National Seafood HAACP for training and education, A Quick Consumer Guide to Safe Food Handling).

## Day Care Director's Checklist

The following pages provide a general guidance for sanitation standard operating procedures (SSOPs).

The Food Preparation Flow Chart for Day Care Centers shows the path food takes from the time it is brought into the center until leftover storage. A SSOP daily checklist will help to ensure and document that basic principles of sanitation are in place. A Day Care Director's Food Safety Checklist provides daily guidance on safe handling of food in the day care. This checklist identifies Critical Control Points (CCPs) in the daily food preparation operation. CCPs are points where hazards are controlled. The Daily Temperature Log that is provided helps to record the temperature of food throughout each meal service. Suggested temperatures for cooking and reheating food are found in the Appendix.

## Guidance Material for SSOP's

### 1. Purchasing

Grocery shopping should be the last task when securing supplies and groceries for the day care. Transport food directly back to the day care and never leave food in a hot car. Don't buy food in poor condition. Refrigerated foods should be cold to the touch and frozen food should be hard as a rock. Make sure cold and frozen foods are kept cold during transportation. Use an ice chest if necessary. Canned goods should be free of dents, cracks, and bulging lids. Never purchase food that is past the "sell-by" date. Refer to the American Dietetic Associations' (ADA), fact sheet titled "Refrigerate Promptly Below 40 degrees F." found as a separate handout.

### 2. Storage: Dry, Refrigerated, and Frozen

Be sure to have thermometers in your refrigerator and freezer. A thermometer should also be placed in your dry storage area. Refrigerators should run at 41 degrees F. or less, and freezers at 0 degrees F or less. Dry storage should be between 50-70 degrees F. The dry storage area should be well ventilated. Fresh meat, poultry, and fish should be frozen if not used in a few days. Frozen and refrigerated foods must be placed in cold storage immediately after arrival at the day care. Refer to the ADA fact sheet "Refrigerate Promptly Below 40 degrees F." found as a separate handout.

### 3. Thawing

Frozen foods must never be thawed at room temperature. The safest ways to thaw frozen foods are in the refrigerator or in the microwave. Plan ahead to allow enough time to thaw foods safely. Refer to the ADA fact sheet "Refrigerate Promptly Below 40 degrees F." found as a separate handout.

#### 4. Handwashing

There are two excellent fact sheets found as separate handouts on handwashing. One is ADA's "Wash Hands Often" and the Child Care Connection's "Keeping It Safe: Wash Hands the Best Way". Each fact sheet describes proper handwashing procedures and gives step-by-step instructions.

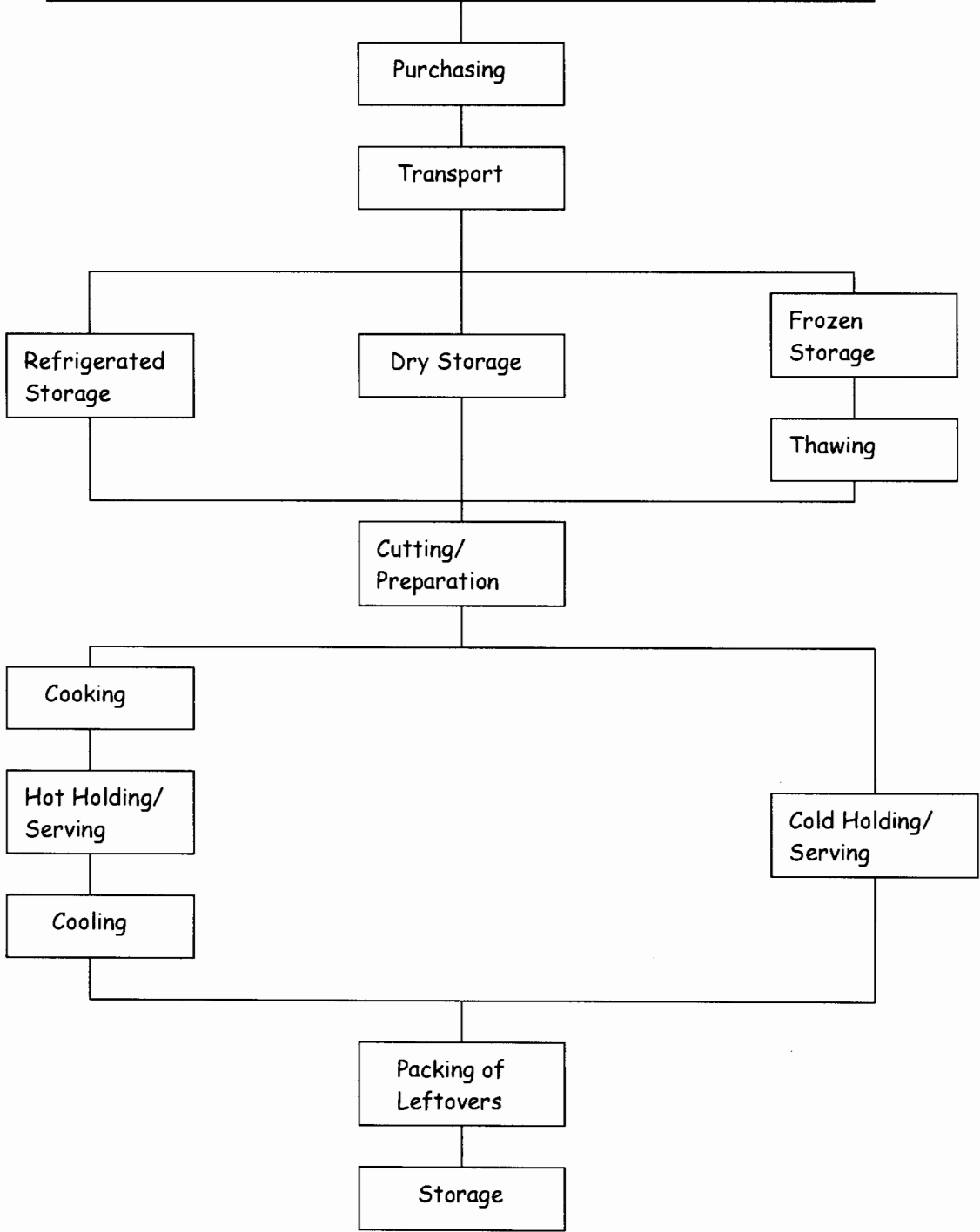
#### 5. Preparation of Food

There are several fact sheets found as separate handouts on food preparation. One is ADA's "Cook to Proper Temperatures", another is ADA's "Keep Raw Meats and Ready-to-Eat Foods Separate, and "Infant Formula Preparation Checklist for Ready-to Feed Formula" from the US Department of Agriculture's, *Infant Feeding Guidance*.

#### 6. Packing and Storage of Leftover Foods

Leftover foods must be stored in shallow, covered pans and in small portions. Use clean containers with tight-fitting lids. Allow plenty of space between stored food for air circulation. Never push storage containers against the walls of the refrigerator or freezer. This interferes with air circulation. Always label and date stored products. Use the "first-in, first-out" method of using leftover foods. Foods frozen for long periods of time may affect the quality of the food.

# Food Preparation Chart for Day Care Centers



## Sanitation Standard Operating Procedures Daily Checklist

Day and Date: \_\_\_\_\_ Signature \_\_\_\_\_

Question	Yes	No
1. Is the water used in food preparation and for drinking safe?		
2. Have all the food contact surfaces been cleaned and sanitized after every use?		
3. Have steps been taken to prevent cross-contamination in the day care kitchen area?		
4. Have all food service employees washed hands as required?		
5. Are all employees' personal items properly stored in places other than the kitchen area?		
6. Are hazardous cleaning chemicals kept secured from children, and separated from the preparation and serving areas?		
7. Are all employees clean and neat according to personal hygiene standards?		
8. Have ill employees been allowed to work today?		
9. Is the food preparation area inspected daily for the presence of pests or rodents?		
10. Have foods purchased or delivered to the day care kitchen area been stored in a sanitary manner?		
11. Have food temperatures been taken and recorded during preparation and serving time?		
12. Are refrigerator temperatures kept at 41 degrees F or lower and freezers at 0 degrees F or lower?		

## Day Care Director's Food Safety Checklist

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Transporting Food	Yes	No	Corrective Action
1. Ice chests or other insulated containers and paper or plastic bags were used to transport food from the grocery store to the day care within 30 minutes.			
2. Canned foods with swollen tops or bottoms, missing or torn labels, dents or rust were not purchased.			
3. No products in torn packages or held together with tape were purchased.			
4. All foods were put in storage immediately upon arrival at the day care.			
Cooking/Preparation	Yes	No	Corrective Action
1. Breakfast, lunch and snack foods were prepared and cooked according to the recommended temperature and time provided in standardized recipes.			
2. Cooking, holding, and cooling temperatures of prepared foods were checked in the product's center or thickest part.			
3. Temperatures were checked at least twice during the preparation time.			
4. Warmers or serving lines were not used to cook the food.			
5. The minimum safe cooking temperatures, found in the Food Safety Code 2003, were used for each food item and were recorded on the daily temperature log for cooking.			
Hot Holding/Serving	Yes	No	Corrective Action
1. Breakfast, lunch, and snack foods were held at the proper time/temperature.			
2. Serving gloves and serving utensils were used to serve the food.			

3. Holding equipment was preheated before serving time.				
4. Hot food was held at 140° F during serving time.				
5. Temperatures during serving were checked every hour and recorded on the daily temperature log for hot holding.				
<b>Cold Holding/Serving</b>	Yes	No	Corrective Action	
1. Breakfast, lunch, and snack foods were held at the proper temperature in the time limit.				
2. Serving gloves and serving utensils were used to serve the food.				
3. Holding equipment was prechilled before serving time.				
4. Cold food was held at 41° F or below during serving time.				
5. Temperatures during serving were checked every hour and recorded on the daily temperature log for cold holding.				
<b>Cooling</b>	Yes	No	Corrective Action	
1. All leftover hot foods that were served at breakfast, lunch, and snack were cooled to the proper temperature before being stored.				
2. All leftover foods were stored in covered shallow containers with labels intended for food.				
3. The temperatures of the foods being cooled were taken and recorded after every meal on the daily temperature log.				

# Daily Temperature Log

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Menu Item	Hot Temperatures		Cold Temperatures		Initials
	Cooking Temps & Time	Hot Holding Temps & Time	Cold Holding Temps & Time	Cooling Temps & Time	
Breakfast					
Lunch					
Snack					

\_\_\_\_\_  
Signature

# Appendix

## COOKING Food Temperatures and Holding Times

Food	Minimum Internal Temperature	Minimum Holding Time at internal temperature
Fish, Pork, and Meat (Not whole roasts or ground) 3-401.11(b)	(145°F) 63°C	15 seconds
Ground or Flaked Fish, Meat, or Hamburger	(155°F) 68°C	15 seconds
Eggs (raw)	(145°F) 63°C	
Poultry Stuffed Meat Stuffed Fish Stuffed Pasta Stuffed Poultry Stuffing Containing Fish, Meat or Poultry	(165°F) 74°C	15 seconds
Raw Animal Foods Cooked in a Microwave Oven	(165°F) 74°C	Hold for two minutes after removing from microwave oven
Fruits and Vegetables cooked for hot holding 3-401.13	(140°F) 60°C	

Adapted from the 2001 FDA Food Code and 2003 FDA Food Code Revisions

**Question:** How do you measure the internal temperature?

**Answer:** The thermometer is placed in the middle of the thickest part of the meat, not touching the bone.

## REHEATING Food Temperatures and Holding Times

Food	Minimum Internal Temperature	Minimum Holding Time at the Specified Temperature	Maximum Time to Reach Minimum Temperature
Food that is cooked, cooled, and reheated 3-403.11 (A)	(165°F) 74°C	15 seconds	2 hours 3-403.11 (D)
Food that is reheated in a microwave oven 3-403.11 (B)	(165°F) 74°C	And hold for 2 minutes after removing from microwave oven	Until product reaches minimum temperature 3-403.11 (D)
Food that is taken from a commercially processed, hermetically sealed container or intact package (Eg. canned vegetables, beans, or meats) 3-403.11 (C)	(140°F) 60°C	No time specified	2 hours  3-403.11 (D)

Adapted from the 2001 FDA Food Code and 2003 Food Code Revisions

## Glossary of Terms

Cross contamination - an unsanitary practice that may cause disease-producing bacteria to be transferred from one area to another.

Detergent - a substance that is used with water to aid in cleaning soiled food service equipment.

Internal Temperature - the temperature of the middle of a food product that is measured by a thermometer.

Proper Dry Storage - food products must be stored in adequate ventilated areas to prevent spoilage and the growth of bacteria.

Sanitizer - a product used to sanitize destroy living bacteria on a food contact and/or equipment. Chlorine bleach is typically used in a day care center.

Sell-By-Date - a product should not be purchased after this date.

## Frequently Asked Questions and Answers

1. Q. Is it ok to leave food to thaw overnight on the kitchen counter?  
  
A. No, food would be exposed to temperatures over 41 degrees F. This would cause the growth of disease-producing bacteria. Food should always be thawed in the refrigerator at the above temperature.
  
2. Q. How often should you wash your hands when preparing food?  
  
A. Hands should be washed when going from one food to another, especially raw to cooked; after using the toilet, touching your face or hair, and from one task to another; such as preparing food after washing pots and pans.
  
3. Q. At what temperatures should my refrigerator and freezer be kept?  
  
A. The refrigerator should be kept at 40 degrees F., and the freezer at 0 degrees F.
  
4. Q. At what temperature should hot food be kept?  
  
A. Hot food should be kept at 140 degrees F. or above.
  
5. Q. What is a good sanitizer for day care use?  
  
A. A good sanitizer for day care use is chlorine bleach.
  
6. Q. Where should the meat thermometer be placed when measuring the temperature of cooked meat?  
  
A. The meat thermometer should be placed in the thickest part of the cooked meat without touching the bone.
  
7. Q. Where should cleaning compounds be stored?  
A. Cleaning compounds should be stored completely away from food.

## References and Resources

1. *A Quick Consumer Guide to Safe Food Handling*. Home and Garden Bulletin, No. 248, U.S. Department of Agriculture, Food Safety and Inspection Service, September, 1990.
2. American Dietetic Association, *Home Food Safety, It's in Your Hands*, 2003.
3. Child Care Connection Training Program, National Food Service Management Institute, 1997.
4. Code of Federal Regulations 21 (21 CFR); Part 100 to 169, April 1, 2002. Office of the Federal Register, National Archives and Records Administration. U.S. Government Printing Office, Washington, DC.
5. *Feeding Infants, A Guide for Use in the Child Care Food Program*, U.S. Department of Agriculture, 1995.
6. Food and Drug Administration, 2001 Food Code. U.S. Government Printing Office, Washington, DC.
7. *HACCP: Hazard Analysis and Critical Control Point Training Curriculum*. National Seafood HACCP Alliance for Training and Education, 1997. Publication UNC-SG-96-02, North Carolina Sea Grant, N.C. State University, Raleigh, NC.
8. Louisiana Public Sanitary Code, Title 51. Chapter 7, Employee Health, paragraph 701, p. 244; Chapter 25, Sanitization, paragraph 2513, p. 256, June 2002.
9. *Sanitation Control Procedures for processing Fish and Fishery Products*, National Seafood HACCP for Training and Education, 2000. Florida Sea Grant, Gainesville, FL.
10. U.S. Department of Agriculture Food and Nutrition Service, with the National Food Service Management Institute, (2002). *HACCP for Child*

*Nutrition Programs: Building on the Basics.* University, MS: National Food Service Management Institutes.

#### Web Sites

1. American Dietetic Association: <http://www.homefoodsafety.org>
2. Centers for Disease Control: <http://www.cdc.gov>
3. FDA Food Code: <http://www.cfsan.fda.gov/~dms/foodcode.html>
4. Food Safety and Inspection Service: <http://www.fsis.usda.gov>
5. Gateway/GovernmentFoodSafetyInformation:  
<http://www.FoodSafety.gov>
6. U.S. Food and Drug Administration: <http://www.fda.gov>

## VITA

Elizabeth K. Smith was born on February 3, 1942, in Philadelphia, Pennsylvania. Her parents are Betty Pinney and the late Norman Pinney. She earned a Bachelor of Science degree in dietetics in 1964 from the University of Alabama. Her Master of Science degree in institutional food service systems was earned from Texas Woman's University in 1995.

After graduating from the University of Alabama in 1964, Elizabeth served in the US Air Force as a hospital dietitian until 1968. She continued this type of work as a civilian until 1972 when she went to work in school food service on the local school board level until 1995.

After graduating from Texas Woman's University in 1995, Elizabeth moved to the state level in school food service. She is presently employed at the Louisiana Department of Education, Division of Nutrition Assistance. The Division monitors Child Nutrition Programs in Louisiana for the United States Department of Agriculture.

In 1998, Elizabeth began her pursuit of a Doctor of Philosophy degree in the Department of Food Science at Louisiana State University, which she expects to receive in May, 2005.