Handling and Preparing Baby Food, Breast Milk, and Infant Formula

Public Health Reasons

Baby food, breast milk, and infant formula are foods unique to the child-care environment. Each must be handled safely to prevent foodborne disease. Breast milk is the best source of nutrients, antimicrobials, and other protective substances for infants (under 12 months old). However, because breast milk is not sterile, it must be handled safely to prevent natural bacteria from growing to levels that could cause illness. Several studies have shown that breast milk refrigerated for up to 48 hours is bacteriologically safe. After this time period, it should be thrown out. If breast milk is frozen immediately after expression it can be stored up to six months.

Infant formula also has inherent risks. Like breast milk, formula is not a sterile product. During the drying process, pathogens can be sublethally injured, meaning that the damage to the cell is minimal, so the cell can recover. Furthermore, milk-based infant formula contains lactose, protein, and milk fat that may protect bacteria during the drying process. These sublethally injured microorganisms have been reported to survive for up to two years. Barron and Forsythe showed that survival of strains of *Enterobacteriaceae* in powdered infant formula could be divided into three groups based on survival rates. *Citrobacter koseri, C. freundii,* and *Enterobacter cloacae* were not recoverable after six months. *Salmonella* Enteritidis, *Escherichia coli,* and *Klebsiella pneumonia* survived for up to 15 months, and *E. sakazakii, E. vulneris, K. oxytoca,* and *Pantoea* spp. were still recoverable after two years. These bacteria can multiply when the powdered infant formula is reconstituted. Other studies have shown that many bacterial pathogens, such as *S.* Newport, *S.* Typhi, *Shigella dysenteriae, Pseudomonas fluorescens*, *Streptococcus lactis*, *Francisella tularensis*, and *Neisseria* spp., survive even longer in a nitrogen atmosphere, which is commonly used during the processing of dehydrated infant formula, rather than the oxygen environment of ambient air. Therefore, it is important that infant formula be stored properly and used before the expiration or use by date on the package.

Another risk associated with infant formula is ineffective cleaning and sterilization of the bottle and nipples before use. A study in 2006 reported that significantly more cases of gastrointestinal illness were reported in formula-fed infants, particularly those under six months of age, whose caregiver did *not* sterilize bottles and nipples with steam or chemicals. Rowan and Anderson described the method of sterilizing baby bottles that would most efficiently reduce *Bacillus cereus,* a bacterial pathogen sometimes associated with dried infant formula. They reported that cleaning with soap and water would not decrease the levels of *B. cereus* to a safe level. One chemical and two thermal methods were tested to determine which would give the greatest reduction of bacteria. In order for any of the methods to reduce *B. cereus* to a safe level, the bottles had to be thoroughly cleaned first. Both thermal methods of sterilization (1) bottles automatically steamed at

212°F (100°C) for 15 minutes and (2) bottles placed in a sterilizing unit and steamed at 212°F (100°C) in a microwave oven for 9 minutes, were equally or more effective than the tested chemical method.

Baby food also poses a risk if it is not properly handled. Using the same spoon to feed multiple children could introduce pathogenic oral bacteria into a container of baby food and allow for the spread of microorganisms to other children if they are fed from the same container or spoon. Trevino et al. showed that a significantly higher population of bacteria was present in foods dipped with bitten crackers compared to foods dipped with crackers that had not been bitten. Bacterial cells in the mouth attach to each other and mouth surfaces to form dynamic bacterial communities that are not naturally found anywhere else in the body. Oral bacteria can include pathogenic strains such as *Staphylococcus aureus*. To prevent contamination from a child's saliva, use a clean spoon to put a portion of baby food into a clean dish before feeding, and do not put any leftover food back into the original container.

In addition to conscientious preparation, formula, breast milk, and opened containers of baby food must be stored properly. They must be stored below 41°F (5°C) to prevent the growth of pathogens. A study of 37 child-care facilities in North and South Carolina found that in 53.1% of the centers and 62.5% of homes the air temperature inside the refrigerator was not adequate to keep foods at 41°F (5°C). In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set to 39°F (3.8°C).

Practices

Cleaning and Sterilizing Bottles

Bottles for breast milk and infant formula must be washed and sterilized before use.

Washing Bottles

- Clean the sink before using.
- Use a sink stopper to hold hot water in the sink.
- Add dish detergent to hot water until water becomes soapy.
- Put bottles, nipples, caps, rings and preparation utensils into the hot soapy water.
- Fill bottles partially with hot soapy water.
- Put the bottle brush into the bottle.
- Rotate the brush inside the bottle until the bottle is clean.
- Wash away the soapy water under running water.
- Before cleaning nipples, place them in the soapy water for five to ten minutes.
- Fill the nipples with hot soapy water.
- Use a nipple brush to wash nipples, including nipple holes.
- Squeeze the hot, soapy water through the nipple hole to flush out any trapped milk.
- Rinse caps, rings, and preparation utensils in the hot, soapy water.
- Remove the sink stopper to flush out all soapy water.
- Rinse all utensils under running water to wash away all traces of soapy water.
- Use sanitized tongs to remove bottles, nipples and other utensils.
- Place components in a dish drainer to dry.

Sterilization

A commercial sterilizer, such as an electric steam sterilizer or microwave sterilizer, can be used following manufacturer's instructions. Otherwise, the following stove-top method can be used:

- Fill a large pot with water.
- Place the cleaned feeding and preparation equipment into the water.

- Make sure that the equipment is completely covered with water and that no air bubbles are trapped.
- Cover the pot with a lid and bring to a rolling boil. Boil for 5 minutes.
- Keep the pot covered until the feeding equipment is needed.

Breast Milk

Storage

- Ask mothers to store pumped breast milk in clean glass or hard, BPA-free plastic bottles with tight-fitting lids. Bisphenol A (BPA) is a key component used to make polycarbonate plastic that is used to make consumer goods, such as water bottles. Exposure to BPA may lead to negative health effects especially when children are in the initial stages of development.
- Mothers can also use milk storage bags that are made for freezing human milk and are available from many companies that specialize in products for breastfeeding mothers and infants.

Never use disposable bottle liners or other plastic bags to store breast milk.

- Have mothers label the bottle or bag with the date that the milk was expressed and her child's name.
    - Store breast milk immediately after collection following government recommendations (Table 1).
    - Have mothers bring bottles of fresh or frozen breast milk to the facility in a cooler with an ice pack to keep the milk at 41°F (5°C) or colder.
- Store thawed breast milk for no more than 24 hours. Never re-freeze thawed breast milk (Table 2).

In order to keep breast milk below 41°F (5°C), it is recommended to keep the refrigerator set to 39°F (3.8°C).

Table 1. Guide To Storing Fresh Breast Milk

Place	Temperature	How long
Countertop, table	Room temperature [60°F (15.6°C)–85°F (29.4°C)]	No more than 3-4 hours
Small cooler with ice pack	50°F (10°C)	24 hours
Refrigerator	39°F (3.8°C) or colder	No more than 48 hours
Freezer	24°F (-4.4°C) or colder	No more than 6 months

Table 2. Guide To Storing Thawed Breast Milk

Room temperature	Refrigerator	Freezer
[60°F (15.6°C)–85°F (29.4°C)]	[39°F (3.8°C) or colder]	[24°F (-4.4°C) or colder]
No more than 1-2 hours is best Up to 3-4 hours is okay	24 hours	Do not re-freeze

Preparation

- Wash hands before handling bottles of breast milk (See "Practicing Good Hand Hygiene for Care Providers" fact sheet).
- Thaw a bottle of frozen breast milk in the refrigerator or hold it under cold running water.

Do not thaw frozen breast milk at room temperature, by heating on a stove, or in a microwave.

- If not using prefilled bottles, fill cleaned and sterilized bottles with the amount of breast milk the infant usually drinks at one feeding.
- Throw out breast milk that has a bad odor after thawing. It might be spoiled.
- Breast milk does not have to be warmed, but an infant may prefer warm milk.
- To warm, hold the bottle under warm, running tap water or place the bottle in a warm bowl of water (no more than 15 minutes).
- Swirl the milk and test the temperature by dribbling some on your wrist. It must be comfortably warm (close to body temperature).

Disposal

- After a feeding, throw out any unused breast milk left in the bottle used for the feeding.
- Bottles with a significant amount of milk remaining (greater than 1 ounce) may be returned to the mother at the end of the day as long as the child was not fed directly from the bottle.

Infant Formula

Storage

- Powdered infant formula must be tightly covered and stored in a cool, dry place and used within one month of opening. Never store powdered infant formula in the refrigerator as it can be exposed to water and temperature extremes that affect the quality of the formula.
- Opened cans of concentrated or ready-to-feed infant formula must be covered, refrigerated, and used within 48 hours. Do not freeze concentrated or ready-to-feed infant formula.

Preparation

- Wash hands, arms, and under nails very well with soap and water for 10-15 seconds. Rinse thoroughly (See "Practicing Good Hand Hygiene for Care Providers" fact sheet).
- Clean and sanitize the workspace (See "Cleaning and Sanitizing Food Contact Surfaces" fact sheet).
- Clean and sterilize bottles according to previously discussed procedures.
- Thoroughly rinse the formula container lid and can opener with warm water before opening a can of formula to minimize contamination.
- If using ready-to-feed formula, shake the can well before opening, and pour the amount of formula needed for one feeding into a sterilized bottle. Never add new formula to a half-filled bottle of formula.
- If using powdered formula, prepare the formula according to the manufacturer's directions.
- Attach nipple and ring to the bottle and *shake well*. Feed the child the prepared formula immediately.
- If more than one bottle is prepared, put a clean nipple right side up on each bottle and cover with a nipple cap. Label each bottle with the baby's name and the date and time that it was prepared.
- Do not leave formula at room temperature. Put the formula in the refrigerator.
- Never use formula that is past the expiration date on the package.

Disposal

- Throw out leftover formula in the bottle after the feeding.
- Infant formula that is removed from refrigeration must be used within two hours or be discarded.

Heating Infant Formula and Breast Milk

- For infants who prefer a warmed bottle, warm the bottle immediately before serving.
- Hold the bottle under warm, running tap water or place the bottle in a bowl of warm water (no more than 15 minutes).
- Shake the bottle before testing the temperature. Dribble some formula on the inside of your wrist to make sure it is comfortably warm (body temperature) but not too hot.

Never use a microwave oven to warm infant formula or breast milk. It can heat unevenly and possibly cause burns.

Baby Food

Preparation

- Wash hands, arms, and under nails very well with soap and water for 10-15 seconds. Rinse thoroughly (See "Practicing Good Hand Hygiene for Care Providers" fact sheet).
- Clean and sanitize the workspace (See "Cleaning and Sanitizing Food Contact Surfaces" fact sheet).
- Thoroughly rinse the lid of the baby food container with warm water before opening to minimize contamination.

Heating

- Baby food does not need to be heated, but if the child prefers warm baby food, it can be heated in a microwave oven.
- Place the baby food for one feeding in a microwavable container.
- Heat the baby food in the microwave.
- Stir the food thoroughly to ensure that it is heated evenly.
- Always test the temperature of the food to prevent it from burning the child.

Storage

- To prevent contamination from the child's saliva, use a clean spoon to put a portion of baby food into a clean dish.

Do not serve the child directly from the baby food jar or container.

- Refrigerate the un-served portions in the original container or jar at 41°F (5°C) or below. If the jar or container is not re-sealable, store in a clean sealable container.

In order to keep baby food below 41°F (5°C), it is recommended to keep the refrigerator set at 39°F (3.8°C).

- Before refrigerating leftover baby food, label the jar with the child's name and time opened.
- Observe the use-by date for shelf storage of unopened jars of baby food to ensure they are microbiologically safe.
- Keep a permanent marker and masking tape by the refrigerator to make labeling easy.

Disposal

- Throw out any unused baby food one day after opening.
- Throw out any uneaten baby food that the child has eaten from right after feeding.

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Handling Deli Foods

In August 2008, Maple Leaf Foods, Inc., of Canada deli meats contaminated with Listeria caused 57 illnesses and 22 deaths. Deli meats linked to this outbreak were stored in excess of seven days by institutions, stores, and consumers, allowing Listeria growth to reach dangerous levels.

In July 2002, sliced turkey meat from Pilgrim's Pride Foods caused an outbreak of L. monocytogenes leading to 8 deaths and 3 stillbirths. One unopened package and 25 environmental samples from the Pilgrim's Pride Foods poultry processing plant yielded Listeria spp.

Public Health Reasons

Refrigeration prevents the growth of most bacteria in foods. However, two categories of bacteria, psychrophiles and psychotrophs, can grow at refrigeration temperatures. While psychrophilic microorganisms grow optimally at 59°F (15°C) and psychotrophs at approximately 77°F (25°C), both can still multiply slowly at 41°F (5°C) or colder during refrigeration. *Listeria monocytogenes* is a psychotrophic bacterium that is a public health concern in chilled ready-to-eat foods, especially deli foods. Deli foods include bulk sliced deli meats, prepackaged sliced deli meat, as well as cold salads, like potato salad, ham salad, and egg salad. All deli foods are classified as ready-to-eat foods.

The U.S. Food and Drug Administration and the U.S. Department of Agriculture assessed the risk of *L. monocytogenes* in 23 categories of ready-to-eat foods. They found that deli meats had the highest predicted relative risk of causing listeriosis in the United States. Several studies have shown that *L. monocytogenes* will grow on deli meats at refrigeration temperatures of 40°F to 50°F (4.4°C to 10°C) for up to six weeks. Cross-contamination of deli meats by contact with refrigerator surfaces and hands had little effect on the prevalence of *L. monocytogenes*. Growth was related to time in refrigerated storage. Initial contamination levels of deli meats are believed to be due to contamination during processing and growth during storage.

L. monocytogenes behaves much differently in deli salads. Overall, populations of *L. monocytogenes* decrease in most types of deli salads instead of growing. Deli salads tend to be made with acidic ingredients, such as lemon juice, mayonnaise, and vinegar. These products will lower the overall pH of the salad, thus inhibiting the growth of *L. monocytogenes*. Deli salads have a low predictive risk for causing listeriosis in the United States because of the decrease in *L. monocytogenes* populations and the normally short storage times for deli salads.

Based on the predictive growth curve-modeling program for *L. monocytogenes*, ready-to-eat, potentially hazardous food, such as deli meats, can be kept at 41°F (5°C) for up to seven days. Potentially hazardous food that is prepared in a foodservice establishment, such as a child-care kitchen, and then held or frozen and thawed should be date marked. Deli foods held for more than 24 hours must be clearly labeled with the date by which they must be eaten or discarded. However, if deli meats and deli salads were commercially processed and packaged, they can be held for up to seven days at 41°F (5°C) or colder *after* the package was opened, or used before the expiration date stamped on the package. If deli meats were bought "fresh-sliced," they can be held for up to seven days at 41°F (5°C) after purchase. All deli salads prepared fresh in a foodservice establishment, including child-care kitchens, must be date-marked. However, deli salads prepared and packaged by a food processing plant contain sufficient acidity, along with the addition of preservatives (e.g., sorbate, benzoates), to prevent the growth of *L. monocytogenes,* so date marking is not necessary.

Practices

Handling Deli Foods

- Never handle deli foods with bare hands. Single-use gloves must be worn or tongs must be used.
- Wash hands before putting on single-use gloves (See "Practicing Good Hand Hygiene for Food Workers" fact sheet). Gloves must never be worn in place of hand washing.
- Change gloves whenever they become damaged or when they come in contact with a heavily contaminated surface, such as raw meat or poultry or garbage.
- Prevent cross-contamination, such as placing deli meat on the same surface that was used to hold raw meat.

Storing Deli Foods

- Keep deli foods for up to seven days at 41°F (5°C) or colder, and discard after seven days.
- In order to keep deli foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set to 39°F (3.8°C).

Developing a Date Marking System

- Date marking is recommended by the Food and Drug Administration's Food Code as a method of documenting the amount of time a food is held. Date marking requirements apply to containers of processed food that have been opened and to foods prepared on premises. Date marking is used if food is held for more than 24 hours, and for the duration the food is held under control of the food establishment.
- A date marking system identifies the date or day by which the food must be consumed or discarded.
    - It is important for a date marking system to be established and maintained.
    - Deli foods held for more than 24 hours must be clearly labeled with the date that foods must be eaten or discarded by. This can be up to seven days after the food was opened (for commercially processed and packaged deli meats and salads), purchased (for fresh-sliced deli meats or fresh-made deli salads), or made, as long as the food is kept at 41°F (5°C) and the time limit does not exceed the manufacturer's use-by date.
    - Calendar dates, days of the week, color-coded marks, or other effective means may be used, but the system must be disclosed to the Regulatory Authority upon request.
    - The label may also indicate what the food is, the time it was prepared, and who prepared it.
- Food workers need to be instructed on how to implement the date marking system properly.

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Handling Fresh Produce Safely

In June 2001, contaminated melons caused a Salmonella enterica outbreak in California leading to 23 illnesses.

Public Health Reasons

Between 1999 and 2007, fresh produce was associated with 12.3% of reported foodborne disease outbreaks in the U.S. One way to reduce risk for foodborne disease attributed to fresh produce is to buy from a supplier who follows Good Agricultural Practices (GAPs). GAPs is a voluntary certification program offered by a third party auditor. A GAPs audit precedes certification. In the audit, an auditor assesses the producer's efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts, and other commodities by microbial pathogens. GAPs guidelines are based on the U.S. Food and Drug Administration's (FDA) *"Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables."* The guidelines center around eight principles:

1. preventing microbial contamination
2. using GAPs
3. dealing with human and animal feces
4. using water
5. dealing with animal manure
6. worker hygiene sanitation
7. following all applicable laws
8. using a traceback system or other record of documentation

Most suppliers of major markets, such as the National School Lunch Program and retail grocery stores, are required to be GAPs certified.

Being GAPs certified does not eliminate risk for foodborne disease, but it does reduce risk. Therefore, it is very important to handle and store produce in a safe manner after it is received. For detailed information about produce storage, go to: http://postharvest.ucdavis.edu/files/109107.pdf

Uncooked fruits and vegetables, except for cut melons, sliced tomatoes, and bean sprouts, are NOT potentially hazardous, so do not need to be at 41°F (5°C) or colder. However, it is *recommended* that they be held at 41°F (5°C) or colder for optimal quality. While whole produce does not need to be refrigerated, some fresh-cut produce does. Fresh-cut melons, tomatoes, and leafy greens are classified as potentially hazardous, so they must be kept at 41°F (5°C) or colder after cutting. In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator

set at 39°F (3.8°C). While other fresh-cut produce, such as celery sticks, orange wedges, and cucumber slices are not classified as potentially hazardous, it is still recommended that they too be refrigerated after preparation. After cutting, the fluids and nutrients inside are released, providing an ideal medium for pathogenic microorganisms on the surface to grow.

Fresh fruits and vegetables that will not be peeled or cut must also be washed before use. Simple washing can only remove 10-10^2cfu/g of pathogenic microorganisms even if a sanitizing treatment is used, so washing cannot be used to make a grossly mishandled food safe to eat. In addition, some pathogenic microorganisms can become internalized through openings on the fresh produce, such as bruises or cuts, so they cannot be removed by the cleaning process. Furthermore, internalization of pathogens increases if fresh produce is immersed or washed with water that is colder than the temperature of the produce, thus fresh produce must be washed with warm water. No soap or sanitizing solution can be used as both might leave a residue that is not safe to consume. Because fresh fruits and vegetables are ready-to-eat, one must wear gloves when washing or cutting them. It is always best to make sure that fruits and vegetables that are washed are completely dry before consumption. However, if there is some water still on the product, this does not pose a food safety hazard.

The FDA also regulates the consumption of juice by highly-susceptible populations including children under the age of nine. There have been documented cases of foodborne illness throughout the United States that were associated with the consumption of juice products that contained microorganisms such as *Cryptosporidium*, Shiga-toxin producing *Escherichia coli*, *Salmonella* spp., and *Vibrio cholera*. The FDA Food Code states that prepackaged juice served to highly susceptible populations must be pasteurized or otherwise treated to attain a 5 log reduction of the most resistant microorganism likely to occur in the juice.

Practices

Receiving Fresh Produce

- Visually inspect fresh produce for damage, filth, and infestation
- Discard all damaged, moldy, or decomposed fresh produce

Storing Fresh Produce

- It is best to not wash fresh produce before storage as it may promote the growth of bacteria that cause spoilage
- Store whole fresh produce properly. For more information about produce storage, visit: http://postharvest.ucdavis.edu/files/109107.pdf
- Keep fresh-cut fruits and vegetables at 41°F (5°C) or colder
- If a sealed crisper drawer is available in the refrigerator, place fresh produce in the drawer to maintain proper humidity conditions
- Place raw meat, fish, and poultry below fresh produce to prevent meat juice from possibly leaking onto and contaminating fresh produce

In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set at 39°F (3.8°C).

Handling Fresh Produce

- Before and after cutting fresh fruits and vegetables, clean and sanitize tables and countertops used for food preparation and foodservice (See "Cleaning and Sanitizing Food-Contact Surfaces" fact sheet).
- Before and after handling any fresh produce, wash hands properly (See "Practicing Good Hand Hygiene for Food Workers" fact sheet).
- Wash whole fruits and vegetables immediately before eating or preparing for cooking.
- Never wash packaged fruits and vegetables that are labeled as previously washed or ready-to-eat.
- Wash fresh produce thoroughly under warm running water to remove soil by using chemicals that are recognized as safe for food. Never use detergent or bleach solutions to wash fresh produce.
- Produce washes can be used, as long as they are labeled as safe for food.

- Immerse leafy green vegetables in a clean bowl or basin with warm running tap water to remove any dirt or debris. Place the washed leafy green vegetables in a salad spinner or blot dry with paper towels.
- Scrub fresh produce that has firm skin, such as melons, with a clean produce brush.
- Remove any damaged or bruised part of the fresh produce.
- Never cut fruits and vegetables on surfaces or with knives that have been previously used to prepare raw meat, fish, or poultry.

The FDA Food Code does not require gloves to be worn while washing fruits and vegetables. However, it might be best to wear gloves because once the produce has been washed it becomes a ready-to-eat food, and the Food Code requires that gloves be worn when handling ready-to-eat foods (See "Handling Ready-to-eat Food" fact sheet).

Serving Juice

- Never serve fresh squeezed juice as part of the foodservice menu in a child-care facility; only serve pasteurized juice.
- Check the label on the juice package before purchasing. Make sure the prepackaged juice is pasteurized. If the prepackaged juice has not been pasteurized, there will be a warning statement on the package to inform the consumer that the product has not been pasteurized. Pasteurized prepackaged juice will not have a warning label.
- For educational activities where children make their own fresh squeezed juice, such as placing a few orange sections in a zippered plastic bag and allowing the children to squeeze the oranges to produce juice:
    - wash undamaged fruit thoroughly with warm water and a produce wash
    - make sure the hands of the child-care providers handling the fruit as well as the children's hands are washed thoroughly (See "Practicing Good Hand Hygiene for Care Providers" fact sheet)
    - do not store fresh squeezed juice—consume the juice as soon as it has been made and discard any leftovers

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Handling Raw Animal Foods

In April 2010, an E.coli O157:H7 was traced to a Sidney, Nebraska day care center. The Associated Press reported that at least four children between the ages of nine and 18 month became ill with E.coli infections and three were hospitalized.

Public Health Reasons

Raw animal food comes from the muscle tissue of animals and includes beef, pork, and poultry. The muscle tissue of healthy live animals has extremely low, undetectable, or no bacterial populations. However, as the barriers that protect muscle tissue (skins and hides) and the natural antimicrobial defense mechanisms of live animals (lysozymes and antimicrobial peptides) are destroyed during slaughter, the meat becomes exposed to pathogenic microorganisms. The sources of these pathogens include external surfaces of the animal (hide, hair, hooves, and feathers) and the animal's gastrointestinal tract. Some important pathogens in raw animal meats include *Clostridium perfingens*, *Escherichia coli* O157:H7, *Listeria monocytogenes*, *Salmonella* spp., *Yersinia enterocolitica*, and *Campylobacter jejunum*.

Eggs are another raw animal food of concern. Eggs are frequently eaten raw, undercooked, or lightly cooked. The most important pathogen in raw eggs is *Salmonella enterica* serotype Enteritidis. Infections of *Salmonella* Enteritidis began in the late 1970s and spread during the 1980s. The shell egg has been recognized as the most important vehicle for transmitting the pathogen in the United States. Among outbreaks of *Salmonella* Enteritidis with a confirmed food vehicle from 1985-2003, 75% of attributed food sources were either primarily egg-based or contained egg ingredients. There are three ways in which *Salmonella* Enteritidis can contaminate eggs: (1) *Salmonella* Enteritidis can be transmitted directly to the internal contents of the egg prior to laying, (2) external contamination of the shell may occur when the egg passes through the cloaca of the hen during laying, and (3) internal contamination of the egg can occur by penetration of the eggshell via microscopic cracks after the egg has been laid.

If raw animal foods are not stored and handled properly, they can contaminate food-contact surfaces, hands, or other foods. Chen et al. quantified the transfer rate of *Enterobacter aerogenes* from artificially contaminated raw chicken to hands, from hands to a metal water faucet, from a metal water faucet to hands, between hands and lettuce, and between plastic cutting boards and lettuce. They found that the most common transfer rates were 3% and 10% between chicken and hands, 1% from hands to the water faucet, 1% from the water faucet to hands, 0.3% between hands and lettuce, and 10% from cutting boards to lettuce. In a study done by Kusumaningrum et al. in 2004 the mean transfer rates of *Salmonella* spp. were 1.6% from chicken to a stainless steel surface and

34.8% from a stainless steel surface to cucumber slices. The mean transfer rates for *Campylobacter* spp. were 2.4% from chicken to a stainless steel surface and 42.5% from a stainless steel surface to cucumber slices. For raw eggs, Humphrey et al. found that the breaking of contaminated eggs led to contamination of fingers with *Salmonella* Enteritidis, and the mixing of eggs with other ingredients in a bowl created contaminated droplets that could contaminate surfaces around the mixing bowl.

The U.S. Food and Drug Administration (FDA) defines highly susceptible populations as "persons who are more likely than other people in the general population to experience foodborne disease" including preschool age children. The FDA requires that raw animal foods or partially cooked animal foods not be served to highly susceptible populations. Also, pasteurized eggs or egg products must be substituted for the use of raw eggs unless the raw eggs are combined as an ingredient in baked goods, such as cakes, muffins, or bread. Pasteurization is a heat process that will kill or inactivate bacteria and other harmful microorganisms likely to be in these potentially hazardous foods.

Thorough cooking of raw animal products is necessary for eliminating pathogens. Different species of microorganisms have different susceptibilities to heat. Also, microorganisms that are in the growing stage of their development, such as the vegetative cells of bacteria, are more susceptible to heat than the protective stage of development, such as the spore form of bacteria. The thermal killing of a microorganism is determined by its ability to survive at a certain temperature for a certain length of time, and there are different time/temperature combinations that will be equally effective. To kill all the pathogens in raw animal foods, all parts of the food must reach the required temperature for the correct length of time.

Practices

Separation

- Keep raw meat, poultry, seafood and their juices away from ready-to-eat food.
- Separate raw meat, poultry, seafood, and eggs from other foods in your shopping cart, grocery bags, and in your refrigerator.
- Store raw meats on the lowest shelf of the refrigerator possible to avoid having juices drip on other foods and contaminate them.
- Use separate plates, utensils, and cutting boards when preparing food to prevent cross-contamination: one set for raw meat, poultry, and seafood and another for other foods.

Storage

- Refrigerate or freeze raw meat, poultry, and eggs promptly. Do not leave these foods at room temperature.
- Keep raw meat, poultry, and eggs below 41°F (5°C).

In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set at 39°F (3.8°C).

- Keep fresh raw meats and poultry in the refrigerator for one to two days.
- Raw shell eggs can be kept for three to five weeks.
- Keep liquid egg substitutes in the refrigerator for ten days if unopened and three days if opened.
- Keep raw meats and poultry in the freezer for three to four months.
- Egg substitutes can be kept frozen for twelve months if unopened.

Preparation

- Wash hands with warm water and soap for 10-15 seconds before and after handling raw animal foods (See "Practicing Good Hand Hygiene for Food Workers" fact sheet).
- Do not cross-contaminate cooked or ready-to-eat foods with raw animal foods or their juices.
- Wash and sanitize cutting boards, dishes, utensils, and counter tops after preparing raw animal foods before you go on to the next food (See "Cleaning and Sanitizing Food-Contact Surfaces" fact sheet).
- Use paper towels to clean up kitchen surfaces. If using cloth towels, wash them each day in the hot cycle of your washing machine.

Cooking

- Foods must be cooked without interruption until the minimum required internal temperature is reached.
- Cook all whole raw meat and eggs to at least 145°F (63°C) as measured with a food thermometer for 15 seconds before removing meat from the heat source. For safety and quality, allow meat to rest for at least three minutes before carving or consuming. For reasons of personal preference, consumers may choose to cook meat to higher temperatures or longer time periods.
- Cook all poultry to an internal temperature of 165°F (74°C) as measured with a food thermometer for 15 seconds. Greater numbers and varieties of pathogens are generally found on poultry than on other raw animal foods. Therefore, a higher internal temperature is needed to cook these products.
- Cook all hamburgers and raw ground meat to an internal temperature of 155°F (71°C) as measured with a food thermometer. In whole muscle meat, the interior meat is sterile, but the grinding process exposes the interior meat in ground beef to bacteria and other microorganisms. Therefore, a higher internal temperature is needed to cook these products.

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Handling Ready-to-Eat Food

Public Health Reasons

Ready-to-eat (RTE) foods are foods that do not need further preparation before eating. Ready-to-eat foods include:

- raw animal food that is cooked according to U.S. Food and Drug Administration (FDA) guidelines (See "Handling Raw Animal Foods" fact sheet)
- raw fruits and vegetables that are washed (See "Handling Fresh Produce" fact sheet)
- fruits and vegetables that are cooked for hot-holding
- plant food that does not require further washing, cooking, or processing to be safe and from which rinds, peels, husks, or shells are removed, such as nuts
- substances derived from plants such as spices, seasonings, and sugar
- bakery items for which further cooking is not required such as bread, cakes, pies, or icing
- dry fermented sausages (dry salami or pepperoni), salt-cured meat and poultry products (prosciutto ham, country cured ham, and Parma ham), and dried meat and poultry products (jerky and beef sticks) that are produced in accordance with United States Department of Agriculture guidelines and have received lethality treatment for pathogens
- thermally processed low-acid foods packaged in hermetically sealed containers

Viral agents cause more foodborne outbreaks than bacterial agents. Norovirus, which has been reported to cause 58% of foodborne disease in the United States, can cause an infection after ingestion of as little as 18 viral particles. It only takes 10 viral particles for rotavirus to cause an infection. The infectious dose of hepatitis A virus is unknown, but presumed to be between 10-100 viral particles. Guzewich and Ross reviewed foodborne outbreaks from 1975 to 1998 and found that noroviruses and hepatitis A virus accounted for 60% of all outbreaks reviewed. Greig and colleagues reviewed 816 foodborne outbreaks between 1927 and 2006 where food workers were implicated in the spread of the pathogens. They found that viruses caused 60.2% of outbreaks and noroviruses or probable noroviruses accounted for 41.4% of the total outbreaks. Viruses are more likely to cause outbreaks attributed to ready-to-eat foods because of their small infectious doses.

For these reasons, the FDA Food Code does not allow foodservice staff to handle cooked ready-to-eat foods with their bare hands, especially when working with highly susceptible populations, such as young children. Instead, utensils such as spatulas, tongs, or single-use gloves must be used during preparation and serving. Contaminant microorganisms on hands, such as pathogens, are less bound to skin than the resident microflora and are readily transferred from hands

to food or food-contact surfaces by direct contact. Gloves can prevent hands from becoming contaminated with microorganisms in the food environment. However, contamination on the gloves is just the same as on the hands, and failure to change gloves when soiled or when switching tasks can also lead to contamination of foods and surfaces.

Practices

- Use disposable, single-use gloves when preparing ready-to-eat foods.

Never handle ready-to-eat foods with bare hands.

- The following types of gloves can be used:
    - fitted, disposable, latex gloves (may cause allergic reactions in the user and consumer)
    - fitted, disposable, non-latex gloves (made from polyethylene)
    - non-form-fitted, disposable gloves (made from polyethylene or vinyl)
- To avoid cross-contamination, wash hands properly and thoroughly before putting on gloves and when changing to a new pair (See "Practicing Good Hand Hygiene for Food Workers" fact sheet).

Never use gloves in place of hand washing.

- Discard gloves when:
    - they are damaged or soiled
    - changing from handling raw meat, seafood, or eggs to handling ready-to-eat foods
    - when touching refrigerator handles or trash containers
    - after coughing or sneezing

Never wash or reuse gloves.

- Use utensils that are clean and sanitized when working with ready-to-eat food. Examples include the following:
- Change utensils when they become contaminated. For example, when the part of the utensil that is in contact with food touches bare hands or unclean surfaces.
- Use separate equipment for ready-to-eat foods and raw animal foods to prevent cross-contamination.

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Holding and Serving Food

In the spring of 2006, there were three large outbreaks in Lansing, Michigan in which food workers were known or suspected to have been the cause of approximately 800 norovirus infections.

Public Health Reasons

The methods used for holding foods before service are typically much different in a child-care facility than they are in a restaurant setting. Most child-care facilities do not use steam tables or cold-holding units to keep foods hot or cold. In a child-care facility, cold foods are often prepared and then refrigerated. They are then removed from the refrigerator and served immediately to the children. Hot foods are often pre-plated directly from containers of hot food that are on a stovetop or in the oven. Many prepared foods must be kept hot or cold after preparation to minimize the growth of pathogenic bacteria. Those that must be kept hot or cold are classified as potentially hazardous. If the food is classified as potentially hazardous, it must be held at the proper temperature: 41°F (5°C) or colder OR 135°F (57°C) or hotter.

The interaction between two intrinsic factors of food is frequently used to determine if a food is potentially hazardous. These two factors are water activity (A_w) and pH. Water activity is the degree to which water is available for biochemical reactions. The optimum water activity for the growth of microorganisms is between 0.97 and 0.99. The pH is a measure of the acidity or basicity of an aqueous solution. The interaction between water activity and pH determines if a food is potentially hazardous. For more information about determining if a food is potentially hazardous or not, refer to the 2009 FDA Food Code, Chapter 1. Foods that are not potentially hazardous do not need to be kept at 41°F (5°C) or colder OR at 135°F (57°C) or hotter.

Fruits, except for figs and melons, are not potentially hazardous because of their low pH. Figs and melons only become potentially hazardous after they are cut or in the case of figs, when they are heated. Potentially hazardous fruits must be kept at 41°F (5°C) or colder for safety. If figs are cooked and not served immediately, they must be held at 135°F (57°C) or hotter. Vegetables are typically not viewed as potentially hazardous until they are heated and then hot-held. Two exceptions to this are coleslaw and cut tomatoes. Both have been implicated in many cases of foodborne illness, so they must be kept at 41°F (5°C) or colder. Vegetables that are cooked and hot-held must be held at 135°F (57°C) or above. Baked potatoes, sweet potatoes, cooked rice, cooked pinto beans, other cooked beans, and texturized soy protein are also classified as potentially hazardous. These foods must be cooked to and held at 135°F (57°C) or hotter. If using raw bean sprouts, keep them at 41°F (5°C) or colder.

Examples of Potentially Hazardous Foods

These items must be kept at 41°F (5°C) or colder OR at 135°F (57°C) or hotter:

- macaroni and cheese
- cooked vegetables, such as corn and broccoli
- oven fried chicken
- hot dogs
- coleslaw
- melon slices

Examples of Non-Potentially Hazardous Foods

No temperature control is required for these items:

- waffles
- rolls
- Jell-O®
- apple and orange slices
- bread

Potentially hazardous foods that are to be kept cold must be stored in a refrigerator that keeps food at a temperature of 41°F (5°C) or colder. This temperature is based on the growth curve for *Listeria monocytogenes*, a type of psychotropic (cold-tolerant) bacteria that is able to grow at some refrigeration temperatures (See "Handling Deli Foods" fact sheet). In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set at 39°F (3.8°C). If the refrigerator is not below 39°F (3.8°C), the food may be in the "temperature danger zone" allowing the growth of psychotropic and psychrophilic bacteria. A study of 37 child-care facilities in North Carolina and South Carolina found that in 53.1% of the centers and 62.5% of homes, the air temperature inside the refrigerator was not adequate to keep foods at 41°F (5°C).

Although it is uncommon, if a child-care facility does use steam tables, hot and potentially hazardous foods must be kept above 135°F (57°C). This is based on the upper limit at which *Clostridium perfringens* and *Bacillus cereus* can survive. The spores of these two bacteria are highly resistant to heat. Food cooked according to the provisions outlined in the 2009 FDA Food Code should be free of vegetative bacterial cells, so the food is safe to eat. However, the required endpoint cooking temperatures are not sufficient to kill spores of *C. perfringens* or *B. cereus*. In fact, they may actually serve as a heat shock that activates the spores. When spores are activated, vegetative cells can form and grow. To prevent this from occurring, potentially hazardous foods must be held at 135°F (57°C) or hotter after cooking. The FDA Food Code states that foods must be reheated to an internal temperature of 165°F (74°C) if the food is to be hot-held. If food is reheated and immediately served, it does not have to be reheated to 165°F (74°C).

Holding potentially hazardous foods without temperature control allows the product to warm or cool as it equilibrates with the environment and may allow foods to be in the "temperature danger zone" (41°F-135°F; 5°C-57°C). For both cooling and warming conditions, bacterial growth depends on the amount of time a food spends in the optimum growth temperature range during equilibration with its surroundings. As a result, the FDA Food Code has a provision that allows time as a public health control under certain circumstances. *(NOTE: Not all states allow this practice so the facility must first check the appropriate regulations.)* The provision states that hot foods that are potentially hazardous can be stored without temperature control for up to four hours, after which they must be discarded or eaten. *C. perfringens* or *B. cereus* will produce toxins if their optimal temperature range is met for longer than four hours. Food that has been refrigerated can be held for up to six hours without temperature control if the food is at 41°F (5°C) when initially removed from the refrigerator *and* does not exceed 70°F (21°C). If food is held at 41°F (5°C) during refrigeration before being transferred to an ambient temperature of 70°F (21°C) for six hours, the growth rate of *L. monocytogenes* remains slow enough to ensure that the critical limit of 1 log growth is not reached. If a facility uses time as a public health control then the operation must have in place a system for noting when the food has been removed from temperature control, and the local regulatory authority must approve this system. If this notation system is not in place, time as a public health control *cannot* be used.

Provisions within the FDA Food Code also prohibit food handlers from touching ready-to-eat foods (cooked or uncooked) with their bare hands. Instead utensils, such as spatulas, tongs, or single-use gloves, must be used during preparation and serving. Pathogenic microorganisms are less bound to skin than the resident microflora so they are easily transferred from hands to food or food-contact surfaces by direct contact. Single-use gloves are used to prevent bare hand contact with exposed ready-to-eat foods. However, contamination on the gloves is just the same as on hands and failure to change gloves when they are soiled could also lead to contamination of foods and surfaces.

Practices

Hot-Holding Guidelines

- If there is a time gap between preparing hot foods and serving, hold potentially hazardous foods at 135°F (57°C) or hotter. This can be done by using double boilers, keeping foods on a lit burner on the stovetop, or in an oven set at a low temperature.
- Stir or turn the food regularly during hot-holding to more evenly distribute heat throughout the food.
- Cover the food to retain heat and reduce potential contaminants from getting into the food.

Cold-Holding Guidelines

- If preparing chilled potentially hazardous foods, such as cut fruits or vegetables, keep them at a temperature of 41°F (5°C) or colder until served.
- In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set at 39°F (3.8°C).

Food Held Without Temperature Control

If this practice is allowed, the process *must* be approved by the local regulatory authority.

- Hot ready-to-eat (RTE) foods can be kept without temperature control for up to four hours, after which they must be discarded or eaten.
- Refrigerated food can be kept for up to six hours without temperature control if the food is at 41°F (5°C) when initially removed from the refrigerator and as long as the food temperature does not exceed 70°F (21°C) during holding.

Never mix freshly prepared food with foods being held for service as this practice can result in cross-contamination of foods.

Serving Food

- Practice good personal hygiene, such as wearing clean clothes and hair restraints and washing hands frequently and properly (See "Practicing Good Hand Hygiene for Food Workers" fact sheet).
- Serve food as quickly as possible after preparation.
- Use cleaned and sanitized utensils with long handles to serve food.
- Store serving utensils in the food with the handle extended above the container rim or on a clean, sanitized food-contact surface.
- Do not use bare hands to handle food that is cooked or ready-to-eat. Wear single-use gloves or use utensils to handle food.
- The following types of gloves can be used:
    - fitted, disposable, latex gloves (may cause allergic reactions in the user or consumer)
    - fitted, disposable, non-latex gloves (made from polyethylene)
    - non-form-fitted, disposable gloves (made from polyethylene or vinyl)
- Handle plates by the edge or bottom, cups by the handle or bottom, and utensils by the handles.
- For family-style self-service, make sure children do not use their bare hands or dirty utensils to get food out of the shared food containers.
- Throw away single-use items after using them. This includes straws, paper towels, cups, and plates.

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Packing Lunches at the Child-Care Center

Public Health Reasons

Lunches or snacks prepared for a field trip or other outings could cause foodborne disease if they are not properly handled. Frequently foods that are to be eaten on a field trip are prepared several hours or even one day in advance of being served. This advance preparation makes it necessary to safely store these foods before service.

In order to pack foods appropriately, food workers must know the types of foods that are potentially hazardous. The U.S. Food and Drug Administration's (FDA) Food Code defines potentially hazardous food as a food that requires time and temperature control for safety (TCS) to limit pathogenic microorganism growth and toxin formation. Foods that are potentially hazardous must be held at 41°F (5°C) or colder OR at 135°F (57°C) or hotter. Examples of potentially hazardous foods include raw or cooked animal foods (meat, fish, poultry, dairy, eggs); heat-treated plant foods (cooked vegetables, baked potatoes, texturized vegetable protein); cut melons; cut leafy greens; garlic-in-oil that has not been acidified; raw bean sprouts; and cut tomatoes. Because it is impossible to keep foods hot when taking them on a field trip, only cold and room-temperature safe foods should be prepared because the cold foods can be kept cold in a cooler with ice.

The interaction between two intrinsic factors of food is used to determine if a food is potentially hazardous. These two factors are water activity (A_w) and pH. Water activity is the degree to which water is available for biochemical reactions. The optimum water activity for the growth of microorganisms is between 0.97 and 0.99. The pH is a measure of the acidity or basicity of an aqueous (water-based) solution. The interaction between water activity and pH determines if a food is potentially hazardous. For more information about determining if a food is potentially hazardous or not, refer to the 2009 FDA Food Code, Chapter 1.

In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set at 39°F (3.8°C). A study of 37 childcare facilities in North Carolina and South Carolina, found that in 53.1% of the centers and 62.5% of homes, the air temperature inside the refrigerator was not adequate to keep foods at 41°F (5°C). If the refrigerator is not at 39°F (3.8°C) or colder, the food may be in the "temperature danger zone" allowing the growth of pathogens.

Practices

Before Packing Lunches and Snacks

- Wash hands with warm water and soap before and after handling food (See "Practicing Good Hand Hygiene for Food Workers" fact sheet).
- Clean and sanitize food preparation areas and utensils before beginning (See "Cleaning and Sanitizing Food-Contact Surfaces" fact sheet).

Packing Lunches and Snacks

- It is best to use clean sealable lunch boxes for storing and transporting lunches and snacks. Sealable lunch boxes are those that have lids that can lock to the sides of the box to prevent leaking.
- If no lunch boxes are available, use clean plastic bags, paper bags, or resealable zipper bags for foods.
- Use sealable containers or resealable zipper bags to hold foods that are to be placed in lunch boxes. Make sure containers or bags do not leak before placing them in lunch boxes or bags.
- Label lunch boxes or bags with the date and each child's name.
- If potentially hazardous foods cannot be kept cold, pack foods that are not potentially hazardous foods, as they do not need refrigeration. Examples include crackers, chips, breads, mustard, pickles, hard cheese, peanut butter, whole fruits and vegetables, dry fruits and nuts, packaged pudding, dry cereal, canned meat and fish, packaged jerky, and hard or dry sausage.

Storing Lunches and Snacks

- Store all packed lunches and snacks in a refrigerator set at 39°F (3.8°C) or colder until placing them in a cooler before departure.
- In the refrigerator, store-packed lunches and snacks on a shelf above any raw meat to prevent the juice of the raw food dripping onto the lunch boxes.
- Never leave potentially hazardous foods out at room temperature for more than four hours.

Transporting Lunches and Snacks

- Transfer all packed lunches and snacks that are in the refrigerator to a clean cooler just before departing.
    - Place ice packs or bags of ice in the bottom of the cooler.
    - Before placing food in the cooler, make sure lunch boxes or bags have not leaked.
    - Place and arrange the pre-chilled lunches loosely on top of the ice to ensure the cold air inside the cooler circulates.

  - Fill the remaining space in the cooler with ice packs or ice bags. A full cooler will maintain a cold temperature longer than a partially filled cooler.

- Place a refrigerator thermometer in the middle of the cooler to make sure the temperature is maintained at 41°F (5°C) or colder and leave it there until it is time to serve the food.
- Once the cooler is closed, do not open it again. If that is not possible, limit the number of times the cooler is opened. Opening the cooler will increase heat gain.
- When opening the cooler, close the lid as soon as the food has been taken out to prevent heat gain.
- If the cooler is stored outside, keep it in the shade or cover it with towels.
- Keep all lunches and snacks in the cooler until served.
- To avoid water soaking into foods, use the spigot on the cooler to drain off water.
- Throw out all leftover foods after the field trip. The only foods that can be saved and re-served are non-potentially hazardous foods that are in unopened packages.

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Storing and Reheating Lunches Brought From Home

In 1993, a Bacillus cereus outbreak occurred at two jointly owned child-care centers in Virginia, sickening 12 children and 2 staff. The source of the outbreak was chicken fried rice, which was prepared in the morning, kept at room temperature, and not reheated before service.

Public Health Reasons

Many children who attend childcare bring packed lunches from home. Although the exact number is not known, about 50% of child-care facilities require parents to pack lunch for their children. Sometimes the foods that are provided by parents are potentially hazardous, so they must be handled safely before being served to the children.

Potentially hazardous foods are foods that are low acid, moist, and contain protein. Temperature control by refrigeration is one method for keeping potentially hazardous foods, such as meat, dairy, and some cut fruits and vegetables, safe to eat. Refrigerated foods should be kept below 41°F (5°C) to keep bacteria and other microorganisms from reproducing. When lunches brought from home are held at room temperature, the temperature of the food can increase throughout the day possibly reaching temperatures in excess of 62.6°F (17°C). Sometimes lunches are packed with ice packs to keep food cold; however, this may not be enough to ensure the temperature stays below 41°F (5°C). A study conducted in six child-care centers in Texas found that only 22 of 1631 (1.35%) potentially hazardous food items tested were in the acceptable temperature range, including 2.27% of lunches with one ice pack, 8.2% of lunches with multiple ice packs, and 0.9% of lunches kept in the refrigerator. These results may be due to the nature of the lunch sacks, the amount of time at room temperature before refrigeration, or the internal temperature of the refrigerator.

Some lunch foods that are brought from home need to be reheated before service—this must also be done safely. Food that is kept at an unsafe temperature after reheating is an ideal medium for the growth of bacteria because it contains nutrients, water, and has an ideal pH environment. Bacteria can grow and multiply rapidly in the food that is held in a temperature range between 41°F (5°C) and 135°F (57°C), which is called the "temperature danger zone." If the reheated food is kept in the danger zone for over 4 hours, the number of pathogenic bacteria may reach the infectious dose or produce toxins which can cause a foodborne illness once it is consumed. It is important to note that as long as the lunch is served immediately after reheating, it is safe to reheat the lunch to a comfortable temperature for eating. "Immediately" is not strictly defined as a time limit by the Food Code. However, it is viewed as serving the food directly to the consumer without any steps between heating and serving.

Child-care workers must also be cautious of the food's temperature because consuming food that is too hot may burn a child. In addition to burning the mouth or tongue on hot foods or liquids, direct injury to the airway and lungs can occur from consumption of hot liquids. As well, steam inhalation may result in significant airway burns. Cups of liquid can be particularly dangerous because of the discrepancy in temperature that may exist between the outside of the cup and the liquid inside. Bottles must never be reheated in the microwave. (See "Handling and Preparing Baby Food, Breast Milk, and Infant Formula" fact sheet for proper heating of bottles). Sando et al. reported an infant sustained second degree orophryngeal burns from formula that had been heated in a microwave and ingested after the outside of the plastic bottle was judged to be cool. Liquid or food heated in the microwave should be pre-tested directly rather than relying on the temperature of the container.

Practices

Storing Lunches Brought From Home

- Tell parents what students are allowed to bring in their lunches and how lunches should be packed.
- Label all children's lunch packs with their name before storing.
- In order to keep foods at 41°F (5°C) or colder, it is recommended to keep the refrigerator set at 39°F (3.8°C).

If no refrigerator is available at the child-care facility, child-care providers must tell parents to pack foods that do not require refrigeration.

- Keep the following foods below 41°F (5°C):
  - meat
  - poultry
  - fish
  - eggs
  - milk
  - soft cheese
  - yogurt
  - peeled or cut fruits and vegetables
  - fruit juice containers that have been opened
  - sandwiches
  - pasta salad
- Food such as bread, crackers, cereal, peanut butter, whole uncut fruit and vegetables, unopened canned fruit, dried fruit, unopened juice boxes, hard cheese, nuts and seeds, and unopened cans of tuna, meats, or poultry can be kept safe without refrigeration.
- Make sure that individual food and drink items brought from home are in sealed containers, such as screw-top drink bottles, plastic containers, plastic bags, or unopened packages.
- It is best to keep sealed food items in a thermally insulated lunch bag.
- If a lunch container is leaking (such as a container of soup from a lunch bag), remove it and clean the refrigerator and any lunch bags or containers that were soiled. Place the leaking item in a leak-proof container.

Reheating Lunches Brought From Home

- For warming baby formula or breast milk and heating baby food, see the "Handling and Preparing Baby Food, Breast Milk, and Infant Formula" fact sheet.
- Use a microwave, oven, or stovetop to reheat lunches.

Do not *reheat lunches in a slow cooker because the lunch cannot be reheated rapidly and may stay in the "temperature danger zone" between 41°F (5°C) and 135°F (57°C), which may result in the growth of bacteria.*

- Reheat lunches to a comfortable temperature for children to eat. Test the food's temperature before serving it to a child:
    - Use a clean utensil to take a sample from the reheated food to make sure the food is not too hot or too cold for the child to eat.
    - Do *not* put the used utensil back in to the reheated food because the saliva on the used utensil may introduce bacteria into the food.
- Allow the reheated food to cool down, if it is too hot for serving.
- Test the food again to assure that it is safe to serve to the child.

Reheating on a stovetop

- Use a clean pot for reheating lunches.
- Use a clean utensil or single-use gloves to transport the food item from the container into the cookware.
- If the lunch is packed in a plastic bag or wrapped with aluminum foil, unwrap the food item and avoid touching it with bare hands by wearing single-use gloves or using a utensil.
- Reheat lunches in a preheated pot on the stovetop.
- Serve the reheated lunch on a clean plate or in a clean bowl immediately after reheating.
- Be sure to test the temperature of the food before giving it to the child, so she is not burned.

Reheating in an oven

- Preheat the oven to 325˚F (163˚C).
- Use clean, oven safe cookware (check the label on the bottom of the cookware), such as a baking pan, for reheating lunches.
- Use a clean utensil or single-use gloves to transport the food item from the container into the preheated pot.
- If the lunch is packed in a plastic bag or wrapped with aluminum foil, unwrap the food item and avoid touching it with bare hands by wearing single-use gloves or using a utensil.
- Place the oven safe cookware into the preheated oven.
- Stir the food to make sure it is evenly heated before serving.

- Serve the reheated lunch on a clean plate or in a clean bowl immediately after reheating.
- Be sure to test the temperature of the food before giving it to the child, so she is not burned.

Reheating in a Microwave Oven

- Reheat lunches just before serving.
- Before reheating, check the inside of the microwave to make sure there are no spills, spatters, or heavy soil.
- Clean the microwave if there are spills, spatters, or heavy soil.
    - Unplug the microwave before cleaning.
    - To remove spatters and spills, dampen a soft clean cloth or a clean paper towel with warm water and wipe out the spatter or spills.
    - To remove heavy soil, use baking soda or dishwashing liquid on a soft clean cloth or a clean paper towel to wipe out the heavy soil.
    - Steel wool, scouring pads, abrasive cleaners, or oven cleaners *cannot* be used to clean the microwave.
    - If the microwave has a removable turntable, remove it and clean it in the dishwasher, if dishwasher safe, or using the three-compartment sink method (see "Cleaning and Sanitizing Food-Contact Surfaces" fact sheet).
- Before reheating, cover the food loosely with a lid or microwave-safe plastic wrap to help ensure even heating. Allow steam to vent.
    - If using a lid, make sure to vent the lid or loosely cover the food with the lid.
    - If using a microwave-safe plastic wrap, loosely wrap the food to avoid the plastic wrap touching the food.
- If there is no removable turntable in the microwave, rotate or stir the food during microwaving time to ensure the food is heated evenly.
- Serve the reheated lunch immediately after reheating.
- Be sure to test the temperature of the food before giving it to the child, so she is not burned.

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