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 (<1 years 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

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

Table 2. Guide To Storing Thawed Breast Milk

<table>
<thead>
<tr>
<th>Room temperature [60°F (15.6°C)–85°F (29.4°C)]</th>
<th>Refrigerator [39°F (3.8°C) or colder]</th>
<th>Freezer [24°F (-4.4°C) or colder]</th>
</tr>
</thead>
<tbody>
<tr>
<td>No more than 1-2 hours is best. Up to 3-4 hours is okay.</td>
<td>24 hours</td>
<td>Do not re-freeze.</td>
</tr>
</tbody>
</table>
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 running warm 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.
Handling and Preparing Baby Food, Breast Milk, and Infant Formula

- 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 running, warm 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 portion of baby food for one feeding in a microwavable container or bowl or on a microwavable plate.
- 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.
Handling and Preparing Baby Food, Breast Milk, and Infant Formula

- 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 container or jar with the child’s name, as well as the date 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.

**REFERENCES**


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A complete set of child-care training fact sheets can be downloaded from www.fightbac.org.