

# How to Prepare Powdered Infant Formula in Care Settings



This booklet contains new information to help you prepare powdered infant formula for bottle-feeding and cup-feeding as safely as possible.



World Health  
Organization

# **Powdered infant formula is not sterile.**

**It may contain bacteria  
that can cause serious  
illness in infants.**

**Correct preparation  
and handling reduces  
the risk of illness.**

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# Introduction

## Breast is best

The World Health Organization (WHO) recommends that infants are exclusively breastfed for the first six months of life to achieve optimal growth, development and health.

## Why are some babies formula-fed?

There are instances where breast milk is not available, where the mother is unable to breastfeed, where she has made an informed decision not to breastfeed, or where breastfeeding is not appropriate, for example, where the mother is taking medication that is contraindicated for breastfeeding, or the mother is HIV-positive. Similarly, some very low-birth-weight babies may not be able to breastfeed directly, and in some cases expressed breast milk may not be available at all or available in insufficient quantities. Infants who are not breastfed require a suitable breast-milk substitute, for example, infant formula.

## What is the risk with powdered infant formula?

Powdered infant formula is not a sterile product<sup>1</sup>. It may contain bacteria that can cause serious illness in infants, such as *Enterobacter sakazakii*. Although infections caused by *E. sakazakii* in formula are rare, they can be serious and sometimes fatal.

## Infants at greatest risk

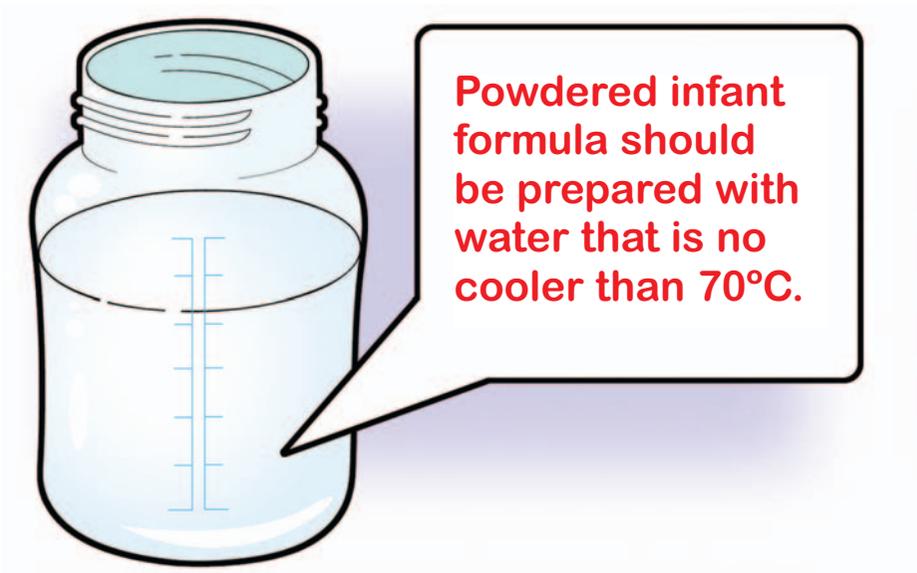
The infants at greatest risk of *E. sakazakii* infection are neonates and those less than two months of age, in particular:

- Pre-term infants,
- Low-birth-weight infants (less than 2.5kg) or
- Immunocompromised infants.

<sup>1</sup>FAO/WHO. 2007. Safe preparation, storage and handling of powdered infant formula: guidelines. Available at: <http://www.who.int/foodsafety/publications/micro/pif2007/en>

## How to reduce the risk

For infants at greatest risk, sterile liquid infant formula should be used where available. If powdered infant formula is used, correct preparation and storage reduces the risk of illness. Powdered infant formula should be prepared with water that is no cooler than 70°C (in order to kill *E. sakazakii*) and prepared feeds should be consumed immediately or stored in a refrigerator (to prevent growth of *E. sakazakii*).



# General requirements for preparing formula in care settings

## Use of infant formula

Infant formula should be selected based on the medical needs of the infant. Where available, use commercially sterile liquid infant formula for infants at greatest risk.

## Use of feeding cups

For areas where sanitation and clean water are a problem, cup-feeding is a safer option than bottle-feeding. This is because the teats and screw tops of bottles are more difficult to clean and can trap harmful bacteria that could make infants ill.

## Written guidelines

Each institution should draw up its own written guidelines for the preparation and handling of formula adapted to the local environment. Staff should be fully trained according to the guidelines, and trained in hygiene requirements for food preparation. The implementation of the guidelines should be monitored.

## Preparation area

There should be a clean, dedicated area for preparing and storing formula. A dedicated hand-washing sink is recommended.

## Refrigerated storage

If feeds are to be prepared and stored before use, there should be a dedicated refrigerator for their storage. The temperature of the refrigerator should be no higher than 5°C, and should be monitored daily.

## Traceability

It is important to have full traceability of all formula prepared in care settings. This means that prepared formula should be labelled with appropriate information such as: formula type, infant's name or ID, preparer's name, date and time of preparation.

# How to clean, sterilize and store feeding and preparation equipment

It is very important that all the equipment used to feed and to prepare feeds for infants, (for example, cups, bottles, teats, lids, spoons) has been thoroughly cleaned and sterilized before use. Cleaning and sterilizing equipment removes harmful bacteria that could grow in the feed and make infants ill.

## Cleaning



### Step 1

Wash your hands with soap and water and dry using a clean cloth.



### Step 2

Wash all feeding and preparation equipment thoroughly in hot soapy water. Use a clean bottle and teat brush to scrub the inside and outside of bottles and teats to make sure that all remaining feed is removed from the hard-to-reach places.



### Step 3

Rinse thoroughly in safe water.

# Sterilizing

Cleaned feeding and preparation equipment can be sterilized using a commercial sterilizer, or a pan and boiling water.

**Commercial sterilizer.** Follow manufacturer's instructions if using an electric or microwave steam sterilizer, or a chemical sterilizer.

**Pan and boiling water.** Follow the steps below:



## Step 1

Fill a large pan with water.



## Step 2

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.



## Step 3

Cover the pan with a lid and bring to a rolling boil, making sure the pan does not boil dry.



## Step 4

Keep the pan covered until the feeding equipment is needed.

# Storing

To prevent recontamination, it is best to remove sterilized feeding and preparation equipment from the sterilizer just before it is needed. If you remove equipment from the sterilizer before you need it, keep it covered in a clean place. Always fully assemble feeding bottles if you remove them from the sterilizer before you need them. This will prevent the inside of the bottle and the inside and outside of the teat becoming contaminated again.

Wash your hands with soap and water, and dry well before handling sterilized equipment. It is recommended that you use sterilized forceps for handling sterilized equipment.

# Cup-feeding

## How to prepare a cup feed



### Step 1

Clean and disinfect a surface on which to prepare the feed.



### Step 2

Wash your hands with soap and water, and dry with a clean or disposable cloth.



### Step 3

Boil some safe water. If using an automatic kettle, wait until the kettle switches off. If using a pan to boil water, make sure the water comes to a rolling boil.



### Step 4

Read the instructions on the formula's packaging to find out how much water and how much powder you need. Adding more or less formula than instructed could make infants ill.



### Step 5

Taking care to avoid scalds, pour the correct amount of boiled water (that has been allowed to cool to no less than 70°C) into a cleaned and sterilized feeding cup. Use a clean, sterile thermometer to check the temperature.



### Step 6

Add the exact amount of formula to the water in the feeding cup.



### Step 7

Mix thoroughly by stirring with a cleaned and sterilized spoon.



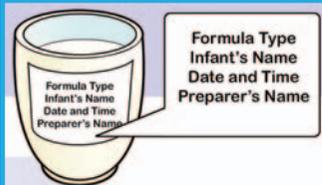
### Step 8

Immediately cool to feeding temperature by holding the feeding cup under cold running tap water, or by placing in a container of cold or iced water. So that you do not contaminate the feed, make sure that the level of the cooling water is below the top of the cup.



### Step 9

Dry the outside of the cup with a clean or disposable cloth.



### Step 10

Label the cup with information such as formula type, infant's name or ID, date and time made and preparer's name.



### Step 11

Check the temperature of the feed by dripping a little onto the inside of your wrist. It should feel lukewarm, not hot. If it still feels hot, cool some more before feeding.



### Step 12

Feed infant.



### Step 13

Throw away any feed that has not been consumed within two hours.

**Warning:** Never use a microwave to prepare or warm-up feeds. Microwaves heat unevenly and may cause 'hot spots' that could scald the infant's mouth.



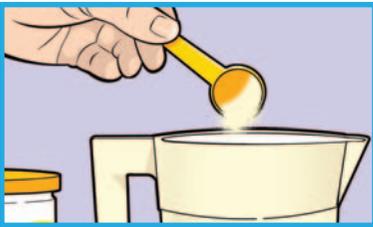
# How to prepare a batch of cup feeds

In care settings, a large number of feeds may need to be prepared at one time. Although it is safest to prepare cup feeds in **individual** cups, this may not always be practical.



## To make a batch of cup feeds

Follow the instructions on pages 8 and 9, but instead of preparing one feed in an individual feeding cup, prepare a number of feeds (batch) in one larger container. The batch can then be poured into individual cups for immediate use, or stored in the refrigerator for use later (see page 12).



When preparing a batch of cup feeds in a larger container **always**:

- Carefully work out how much water and how much formula you need for the batch of feeds. The instructions on the formula's packaging will tell you how much water is needed for one feed. Adding more or less formula than instructed could make infants ill.
- Use a cleaned and sterilized container that is made from food-grade material, and is suitable for pouring hot liquids. The container should be no more than 1 litre in volume. If you use a larger container, the hot feed will take longer to cool down and harmful bacteria may grow in it.

**Warning:** If you do not have a refrigerator it is not safe to prepare feeds in advance - always prepare a fresh feed as it is needed.



# How to store cup feeds

It is safest to prepare formula fresh for each feed and to consume immediately. In care settings, however, feeds may need to be prepared in advance and stored in the refrigerator for use later.

If you intend to store a batch of feed, it should be prepared in a cleaned and sterilized jar or container, that is no larger than 1 litre, is made from food-grade material and has a lid. The batch of feed can be refrigerated in the lidded container, and dispensed into cups when needed.

## Step 1

Prepare a batch of feeds as described on page 11.

## Step 2

Place the cooled, labelled container of feed in a dedicated refrigerator. The temperature of the refrigerator should be no higher than 5°C, and should be monitored daily.

## Step 3

Throw away any refrigerated feed that has not been used within 24 hours.

**Warning:** If you do not have a refrigerator it is not safe to prepare feeds in advance - always prepare a fresh feed as it is needed.



# How to re-warm refrigerated cup feeds

## Step 1

Remove the container of pre-prepared formula from the refrigerator just before it is needed.

## Step 2

Pour the amount you need into a clean, sterilized feeding cup. Replace the lid on the container and put the remaining feed back into the refrigerator.

## Step 3

Re-warm for no more than 15 minutes. Feeds can be re-warmed by placing in a container of warm water, making sure the level of the water is below the top of the cup. Occasionally shake or swirl the feed in its cup to make sure that it heats evenly.

## Step 4

Check the temperature of the feed by dripping a little onto the inside of your wrist. It should feel lukewarm, not hot.

## Step 5

Throw away any re-warmed feed that has not been consumed within two hours.

**Warning:** Never use a microwave oven to re-warm feeds. Microwave ovens heat unevenly, and may cause 'hot spots' that can scald the infant's mouth.



# Bottle-feeding

## How to prepare a bottle feed



### Step 1

Clean and disinfect a surface on which to prepare the feed.



### Step 2

Wash your hands with soap and water, and dry with a clean or disposable cloth.



### Step 3

Boil some safe water. If using an automatic kettle, wait until the kettle switches off. If using a pan to boil water, make sure the water comes to a rolling boil.



### Step 4

Read the instructions on the formula's packaging to find out how much water and how much powder you need. Adding more or less formula than instructed could make infants ill.



### Step 5

Taking care to avoid scalds, pour the correct amount of boiled water (that has been allowed to cool to no less than 70°C) into a cleaned and sterilized feeding bottle. Use a clean, sterile thermometer to check the temperature.



### Step 6

Add the exact amount of formula to the water in the bottle.



### Step 7

Mix thoroughly by gently shaking or swirling the bottle.



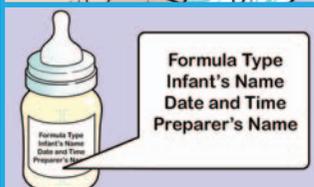
### Step 8

Immediately cool to feeding temperature by holding the bottle under cold running tap water, or by placing in a container of cold or iced water. So that you do not contaminate the feed, make sure that the level of the cooling water is below the lid of the bottle.



### Step 9

Dry the outside of the bottle with a clean or disposable cloth.



### Step 10

Label the bottle with information such as formula type, infant's name or ID, date and time made and preparer's name.



### Step 11

Check the temperature of the feed by dripping a little onto the inside of your wrist. It should feel lukewarm, not hot. If it still feels hot, cool some more before feeding.



### Step 12

Feed infant.



### Step 13

Throw away any feed that has not been consumed within two hours.

**Warning:** Never use a microwave to prepare or warm-up feeds. Microwaves heat unevenly and may cause 'hot spots' that could scald the infant's mouth.



# How to store bottle feeds

It is safest to prepare formula fresh for each feed and to consume immediately. In care settings, however, bottles of feed may need to be prepared in advance and stored in the refrigerator for use later. The steps below show the safest way to prepare feeds and store for use later.

## Step 1

Prepare feeds in individual bottles, following the instructions on page 14 and 15.

## Step 2

Place the cooled, labelled bottle feeds in a dedicated refrigerator. The temperature of the refrigerator should be no higher than 5°C, and should be monitored daily.

## Step 3

Throw away any refrigerated feed that has not been used within 24 hours.

**Warning:** If you do not have a refrigerator it is not safe to prepare feeds in advance - always prepare a fresh feed as it is needed.



# How to re-warm refrigerated bottle feeds

## Step 1

Remove a bottle feed from the refrigerator just before it is needed.

## Step 2

Re-warm for no more than 15 minutes. Feeds can be re-warmed using a bottle warmer, or by standing the bottle in a container of warm water, making sure the level of the water is below the lid of the bottle. Occasionally shake or swirl the feed in its bottle to make sure that it heats evenly.

## Step 3

Check the temperature of the feed by dripping a little onto the inside of your wrist. It should feel lukewarm, not hot.

## Step 4

Feed infant.

## Step 5

Throw away any re-warmed feed that has not been consumed within two hours.

**Warning:** Never use a microwave oven to re-warm feeds. Microwave ovens heat unevenly, and may cause 'hot spots' that can scald the infant's mouth.



# How to transport feeds

In many care settings, feeds are prepared at a central preparation point and transported to different wards or areas. Transporting feeds poses a risk because it increases the time from when the feed is prepared to when it is consumed. This may give harmful bacteria the opportunity to grow in the prepared feed.

## Will the feed be consumed within two hours from when it is prepared?

The feed can be prepared, transported to its destination and used immediately.

## Will the feed be consumed more than two hours after it is prepared?

If feeds will not be consumed within two hours from being prepared, they should be refrigerated until cold before being transported. Prepare feeds and place in the refrigerator following the instructions on page 12 (for cup-feeding) or page 16 (for bottle-feeding). When the feed is cold, remove from the refrigerator and transport immediately to its destination. The feed can then be re-warmed at the destination and used immediately, or stored in a refrigerator and used within 24 hours from when it was first prepared. If the journey-time takes more than 30 minutes, the cold feeds should be transported under refrigeration, or in cool bags with ice packs.

# Holding and feeding times

- ✓ Throw away any feed that has not been consumed within two hours of being prepared (unless refrigerated).
- ✓ Prepared feeds can be stored in the refrigerator (no warmer than 5°C) for up to 24 hours.
- ✓ Throw away all left-over feed.
- ✓ Preferably, the time used for continuous or bolus feeds should be no more than two hours at room temperature.
- ✓ Continuous or bolus feeds should not be re-warmed during feeding.

# Special circumstances

## What about formula that can not be prepared with hot water?

For compositional reasons some formulas, used for special medical purposes, can not be reconstituted with water at 70°C. If this formula is not available in a sterile liquid form, feeds should be made fresh as needed using boiled water that has been allowed to cool below 70°C. Feeds prepared with water cooler than 70°C should be consumed immediately - they should not be stored for use later. Throw away any left-over feed after two hours.

## What if boiling water is not available?

The safest way to prepare a feed is using water that has been boiled and cooled to no less than 70°C. If you do not have access to boiling water you may wish to use sterile liquid infant formula. Alternatively, you can prepare feeds using fresh, safe water at room temperature and consume immediately. Feeds prepared with water cooler than 70°C should be consumed immediately - they should not be stored for use later. Throw away any left-over feed after two hours.

## What if water quality is poor?

Where water quality is poor, boiling, chlorination and filtration are important means to make the water safe. To disinfect water: bring to a rolling boil and add 3-5 drops of chlorine to 1 litre of water; or physically remove pathogens with the appropriate filter.

## What if refrigeration is not available?

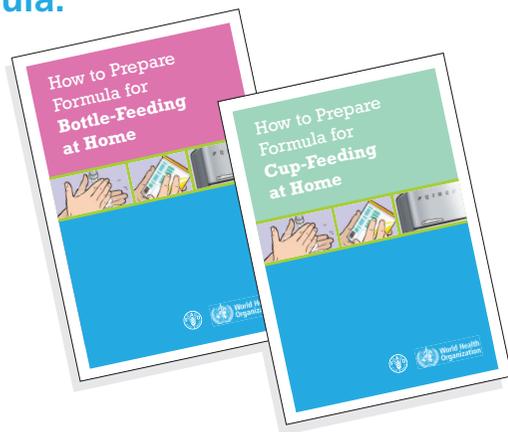
If refrigeration is not available, it is not safe to prepare a feed in advance and store it for use later. Always prepare a fresh feed as it is needed.

## What about crèches?

Child day care centres such as crèches rarely prepare infant formula. Instead, parents prepare all the feeds their infant will need for one day at home, and bring these to the crèche. In these circumstances:

- Parents should prepare feeds with water no less than 70°C and cool.
- Cold feeds can then be transported to the crèche under cool conditions (for example, in a cool bag with ice-packs). WHO has produced leaflets on how to safely prepare feeds at home using infant formula.
- Parents should label each of their infant's feeds carefully so that they do not get mixed up with another infant's feeds in the crèche.
- Crèche staff should place the feeds in a dedicated refrigerator as soon as they arrive at the crèche.
- The temperature of the refrigerator should be no higher than 5°C, and should be monitored daily.

## More advice on preparing powdered infant formula:





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