

# Introduction to Infant Formula

## Introduction

Welcome to Minnesota WIC's training module on Infant Formula. This training was adapted from Wisconsin WIC's Infant Formula training.

## WIC Promotes and Supports Breastfeeding

The Minnesota WIC Program enthusiastically promotes breastfeeding with pregnant women and new moms.

## WIC Supports All Mothers and Their Infant Feeding Decisions

However, WIC staff fully support all mothers in their infant feeding decisions. WIC food packages can include as little as one can of formula and can be tailored to support the goals of the participant.

## Discussing Feeding Choices

You may wonder how to address formula use while still supporting and promoting breastfeeding.

In 2017, 81% of Minnesota moms who participated in WIC initiated breastfeeding; clearly most moms intend to breastfeed. So, prenatally, focus on answering breastfeeding questions. It's a good time to begin talking about baby behavior, including why babies cry and infant sleep patterns.

Knowing what to expect in the first few weeks of breastfeeding and about their baby's behavior will build mom's confidence that their baby is getting enough breastmilk, and may reduce formula supplementation.

If a mom has absolutely decided that she is formula feeding, or cannot breastfeed for some reason, it is appropriate to provide anticipatory guidance on formula preparation prenatally, since a newborn is most vulnerable if proper mixing and sanitation procedures are not followed.

## Objectives

This module provides an introduction to infant formula. After completing this module, you will be able to:

- Differentiate between three forms of infant formulas;
- Explain recommendations for sanitation, storage, and dilution of formula;
- And you will be able to educate a caregiver on how to properly prepare infant formula.

## Infant Formula Forms

Infant formula may be available in three forms: powder, liquid concentrate, and ready-to-feed. The different forms of a given formula are nearly identical in nutrient composition, but small differences may exist due to processing.

Ready-to-feed and liquid concentrate formulas are sterile, meaning they do not contain disease-causing bacteria, but powdered formulas are not sterile. Careful preparation and handling of all types of infant formulas are important to ensure their safety.

Powder and liquid concentrate are the standard forms of infant formula issued, although not all formula WIC offers is available in concentrated form. Ready-to-feed is only provided in rare cases. See Minnesota WIC Policies MOM 7.5 and MOM 7.9 for more detailed information.

## Safe Formula Preparation

One of the most important considerations of mixing and using formula is proper sanitation. Prepared infant formula is a perishable food, and unsafe handling or poor water quality can cause intestinal problems in babies.

Before starting formula preparation, wash hands with soap and water. Clean work surfaces such as countertops and sinks, bottles, and anything else that comes into contact with the formula.

### Safe Formula Preparation cont.

Bottles and nipples can be a source of bacteria if they are not cleaned properly. Before the first use, sanitize bottles and nipples in boiling water for five minutes.

USDA recommends that bottles should be sanitized for the first three months. After three months, for healthy babies, it is generally adequate to wash the bottles and nipples with a bottle brush in hot, soapy water, rinse with hot water, and air dry after each use. They may also be washed in the dishwasher.

Encourage participants to follow the recommendations of their healthcare provider for sanitizing and washing bottles and nipples.

## Water Safety

Caregivers should consider the safety of the water source that they will be using for mixing formula.

Issues with water quality could include lead or harmful substances in tap water, and bacteria and nitrates in well water. Contact the local health department with concerns about tap water or the local environmental health department to learn about resources for testing well water for bacteria and nitrates. Boiling water will decrease bacteria, but may concentrate nitrates and other minerals, which may be harmful to the infant.

If there are concerns with the water source, then bottled or nursery water is recommended. Bottled or nursery water is generally safe; however, it is not sterile unless stated on the label.

## Common Questions about Water Preparation

To boil or not to boil; to cool or not to cool.

Instructions on preparing water for mixing with powder formula has become a hot topic and recommendations vary among different health organizations. This can be confusing, not only to WIC staff, but to participants too. The next few slides will go over WIC and other health organization recommendations. This information is provided so you are informed as to why there may be variations in what you hear or read.

## Manufacturer Recommendation

The instructions provided by Abbott Nutrition for preparing water for standard powder formula are:

1. Bring water to a rolling boil for one minute, then turn off the heat. Excessive boiling can increase the concentration of impurities.
2. Let the water cool to room temperature before adding to formula. Making formula with boiling water can cause clumping and decrease the nutritional value.
3. Once mixed, sprinkle a few drops on the inside of your wrist to make sure it is not too hot.

## WHO and CDC Recommendations

The World Health Organization and CDC recommend using high temperature boiled water to mix powder formula. During manufacturing, powder formulas can become contaminated with harmful bacteria such as *Cronobacter*. The formula is heat-treated during processing, but is not subjected to high temperatures for sufficient time to make the final product sterile. If the powder formula is contaminated, it may cause severe illnesses, although this is very rare. In Minnesota, only one *Cronobacter* bacteria infection was linked to powder infant formula in the past 15 years. Mixing the formula with boiled high temperature water that has been cooled for less than 30 minutes will kill the bacteria. But this recommendation will expose the formula to water temperatures that will destroy the probiotics that may be in the formula, may decrease the nutritional value, and may cause the formula to clump. There is also a risk that the formula won't be adequately cooled before being fed to an infant, causing a risk of burns.

In most cases, following the manufacturer's instructions for mixing powdered infant formula is safe, but parents of infants less than 3 months, infants born prematurely, or infants with a weakened immune system may want to take extra precautions to protect against *Cronobacter* infection by following the World Health Organization and CDC recommendations.

## Refer to Health Care Provider

When in doubt, WIC staff should refer caregivers to their Health Care Provider for recommendations on water temperature for mixing formula. This allows the Health Care Provider to assess the benefits and risks for the individual infant on the use of various temperatures of boiled water to mix formula.

## Fluoride

Fluoride is a mineral that is essential for tooth and bone formation. However, in excess quantities, it can cause a condition known as fluorosis. Some water systems have fluoride, others do not. Check with the health department to see if the water in the community you serve is fluoridated.

Fluoride is present in only small amounts in infant formulas to prevent excess consumption of this mineral. Infants younger than 6 months do not need fluoride supplements regardless of whether they are breastfed or formula fed.

After 6 months of age, fluoride supplementation is recommended for infants whose water does not contain adequate fluoride. Bottled water will list on the label if it contains fluoride or not.

## Preparing Infant Formula

Knowing how to correctly prepare infant formula is very important to assure that the formula is safe for the infant. In this section of the training, we will go over how to prepare each type of formula.

### Powder Formula

Powder formula is prepared by mixing the powder with water following the directions on the container. Standard directions instruct to mix one level scoop of powder with two ounces of water. The directions on each container is referring to the scoop included in the container. Use only the scoop that comes with that container of formula to measure the powder. Do not substitute standard measuring spoons or scoops from other formulas. Powder from different manufacturers provides slightly different amounts of nutrients per unit of volume, and scoop sizes will vary accordingly. It is important to closely follow the manufacturer's mixing instructions on the label.

With powder formula, it is easy to make small amounts of formula at a time. The can of powder can be stored for up to one month after opening. Once the powder is mixed with water, use the prepared formula within 24 hours if freshly mixed or within one hour if baby drinks from the prepared bottle.

### Preparing Powder Formula

Here are general mixing instructions for powder formulas:

- First, check the formula's expiration date on the label or lid to be sure it is not expired. Do not use cans that have dents, leaks, bulges, or rust spots.
- Next, wash hands thoroughly with soap and warm water.

- Check the formula's label for the proper dilution instructions. It is very important to add the right amount of water. Only a Health Care Provider should prescribe a dilution that is different from the directions on the can.
- Start by measuring the water into a clean container.
- Next, add the correct amount of powder formula to the water in the container using the scoop that comes with the powder formula. The scoop must be unpacked and level.
- And finally, carefully shake, rather than stir, the mixture thoroughly.

Keep powder formula lids and scoops clean, being careful about what they touch. Individual bottles or a full day's supply can be mixed using sanitized containers. Store prepared formula in the refrigerator.

To safely warm formula, set the bottle in hot water or run hot water over the bottle. Never use a microwave to warm formula. Before feeding, test the temperature of the formula by dripping a drop on the inside of your wrist to make sure the formula is not too hot.

### Formula Preparation Gadgets

Participants may ask about machines that prepare powdered infant formula. These machines are similar to a Keurig coffee machine. If you have ever used a Keurig, you probably know that sometimes they don't quite work as expected, and you may get less or more water in your cup. Now imagine this happening if you were mixing a formula bottle, and got either an over or under diluted bottle. Not only do these machines result in inaccurate dilution by either improper measurement of the powder or water, they are also difficult to clean and keep sanitary. For these reasons, WIC does not recommend using these machines to mix formula.

### Liquid Concentrate

Liquid concentrate formula is mixed with water in a 1-to-1 ratio. This means mixing one container of liquid concentrate formula with an equal amount of water, using the container to measure the water. Shake the formula container before opening. Mix the liquid concentrate with the water in a clean, sanitized container with a lid. A standard container makes 24 to 26 ounces of formula.

### Preparing Concentrate Formula

When mixing liquid concentrate formula:

- First, check the formula's expiration date on the label or lid to be sure it is not expired.
- Then, wash hands thoroughly with soap and warm water.
- Using hot, soapy water, wash a pitcher, its lid, and any other utensils you will use, such as a can opener or measuring cups. Hot rinse and air dry.
- Before opening the formula, shake the container. Wash the top of the can and open with a clean can opener.
- Check the formula's label for the proper dilution instructions. It is very important to add the right amount of water. Only a Health Care Provider should prescribe a dilution that is different from the directions on the can.

- Mix the container of liquid concentrate formula with an equal amount of prepared water measured in the can or container. Use a clean, sanitized container for mixing.
- Finally, shake carefully to mix thoroughly and pour into bottles.

### Ready-to-Feed

Ready-to-feed formula is never mixed or diluted with water; it can be used directly out of the container. Ready-to-feed formula may only be issued by WIC in certain circumstances, as stated in MOM 7.5.2. These include:

- In emergencies when the water supply is unsanitary or restricted (e.g., in flooding);
- When refrigeration is inadequate;
- When the participant/caregiver may have difficulty preparing formula;
- If the particular formula needed is available only as ready-to-feed;
- Or the ready-to-feed form better accommodates the participant's condition (e.g., premature infants at risk of *Cronobacter* bacteria).

Shake the container of formula before pouring it into the bottle to mix any mineral sediment that may have settled during storage. After a container of ready-to-feed formula is opened, recap and refrigerate. Use within 48 hours.

### Proper Formula Dilution

A key factor in formula preparation is proper dilution. This is the proportion of formula and water mixed in a bottle. For an infant to receive appropriate nutrition, proper formula preparation is critical.

It is very important to mix the liquid concentrate or powdered formula with the correct amount of water. Adding too little or too much water can lead to serious health problems for the infant.

Adding too little water, without instruction from the Health Care Provider, can result in a high osmolality feeding that can impact an infant's immature kidney function.

Over-diluting the formula, which is making the formula with less powder or concentrate than needed for the amount of water, can be harmful as well. When babies are fed over-diluted formula, they are not fully nourished and will attempt to drink more diluted formula to get the calories and other nutrients they need. This can result in overhydration.

### Water Intoxication

Water intoxication, also called water excess or overhydration, is a condition in which the body contains too much water.

In infants under six months, water intoxication can occur when an infant is fed fluids other than

breastmilk or properly mixed formula. It typically occurs in formula-fed infants who are given formula that has been over-diluted with water. This preventable condition can be life-threatening to an infant.

Symptoms of the condition include irritability, sleepiness, a drop in body temperature, fluid retention, and seizures, which are caused by a rapid decrease in sodium levels, or hyponatremia.

Breastmilk and formula provide all the fluids an infant needs. Additional water is not necessary, even in hot, dry climates.

Water intoxication can result when a family is running low on formula and tries to “stretch” the formula by adding extra water. It is important to talk to families about WIC being a supplemental program; it is not intended to cover an infant’s formula needs for a full month. WIC staff can help caregivers understand the dangers of over-diluting formula or giving excess water, as well as provide referrals for the family.

### Formula Dilution

When prepared according to the basic instructions, powdered, liquid concentrate, and ready-to-feed formula will yield an infant formula that is approximately 20 calories per ounce. Only a Health Care Provider should prescribe a dilution or recipe that is different from the manufacturer’s directions.

The Health Care Provider may prescribe a higher caloric concentration per ounce for infants with medical problems such as prematurity, failure to thrive, and cardiac or respiratory problems. Higher concentrations of formula can be mixed by increasing the concentration of the formula. There are specific ratios of formula and water to use to make 22, 24, and up to 30 calories per ounce.

It is not the role of WIC staff to recommend that a parent concentrate formula unless prescribed by the Health Care Provider. Ideally, a concentrated formula recipe should be communicated to the CPA from the Health Care Provider, so participant compliance can be assessed. If the CPA is unsure of the formula prescription, contact the prescribing Health Care Provider.

### Formula Storage

Unopened cans of powder, concentrate, and ready-to-feed formula can be stored at room temperature until the expiration date. Avoid exposing formula to extreme hot or cold temperatures.

Opened cans of powder formula should be discarded if not used within a month. Instruct caregivers to date the container of formula when they open it, so they know how long it has been opened. The opened can should be covered and stored at room temperature, away from heat and moisture.

If not used right away, prepared formula and opened containers of ready-to-feed or liquid concentrate must be refrigerated at 35-40 degrees Fahrenheit. Formula mixed from powder should be kept no longer than 24 hours, while opened containers of ready-to-feed formula, unmixed liquid concentrate, and prepared liquid concentrate can be refrigerated for up to 48 hours. Never freeze infant formula.

## Formula Safety

All unrefrigerated mixed formula should be used within one hour of preparation. This includes opened ready-to-feed formula.

If the baby does not finish the entire bottle, instruct the caregiver to throw away any unused formula after one hour of starting the feeding. To avoid formula waste, instruct caregivers to fill bottles only with the amount of formula that the baby is expected to drink in one feeding.

If the caregiver is not sure how long the formula has been sitting out or how long it's been stored in the refrigerator, to be safe, it should be thrown out rather than fed to the baby.

The old adage, "when in doubt throw it out" will help keep babies from becoming sick from formula that was left out too long.

## Out and About

Taking babies on outings over feeding times involves planning and preparation. Prepared formula needs to be placed in an insulated bag or cooler with an ice pack to keep it cold. Another option for formula could be to take clean bottles with safe water along with the can of powder formula to mix as needed.

## Discussing Formula Preparation

Educating caregivers about how to properly mix formula, including information on how to sanitize equipment and food safety guidelines for storing formula, are all very important.

If a baby is being fed formula, even if only to supplement breastfeeding, check in with parents on how they prepare the formula. Although it is important to assess and evaluate breastfeeding if a mom is supplementing, it is also important to make sure she is following sanitary formula preparation techniques and is mixing and storing the formula properly.

## Discussing Formula Preparation cont.

Ask the parent to describe step by step how they are mixing the formula. Don't assume they know this information. The parent or caretaker may state they know how to mix the formula, but not realize they are doing something incorrectly. Include other caretakers, such as grandparents, in the conversation about formula preparation too if they are at the WIC appointment.

## Scenario

Now that you know about infant formula, recommendations for sanitation, storage and dilution, and the importance of discussing this information with caregivers, let's put this knowledge into practice with a scenario.

Leah and her baby Johnathan are here for their WIC appointment. Johnathan is three months old. Leah lets the front desk staff know that she just stopped breastfeeding a couple weeks ago because she and her boyfriend are moving. They are leaving next week and will be driving a U-Haul truck across the state,



and stopping to camp for a few nights along the way. Leah said she purchased store brand liquid concentrate formula when she stopped breastfeeding because she didn't have enough money for a whole can of powder, and she thought it would be easier to mix than powder. She's not sure which type of formula she would like.

Think about what things you would ask Leah to help her decide what type of formula she would like. What other topics would you explore with Leah? Write your thoughts in the box on the slide. When ready, press submit.

### Scenario cont.

What things did you record in the box? There are no right or wrong answers and what is discussed will depend on your interaction and discussion with Leah. Note that Leah asks a question that can easily begin the conversation. She isn't sure whether she wants concentrate or powder formula. By exploring the pros and cons of the two forms of formula, you could also explore her plans for keeping prepared formula cold and the recommendations for storage. She may not have thought about the need to wash bottles and nipples on the trip, so this would be a good thing to discuss, and can lead to information on recommendations for sanitation. Finally, you can confirm that she is properly preparing the concentrate or if she chooses powder, go over with her the mixing directions on the can of powder.

How did you approach the conversation? What other things did you include?

### End

This concludes the Introduction to Infant Formula Module. Thank you for your time and attention. For more information about formula, please proceed to the modules on Standard Formula and Medical Formula.