**Preparing and handling powdered infant formula**

Young children, especially infants, are vulnerable to foodborne illness. Babies can have difficulties fighting off infections because their immune systems are not yet fully developed. Infants who are at a higher risk of developing an infection include babies who are premature, have a low birth weight, or weakened immune systems.

Health Canada recommends breastfeeding your baby. Breast milk is the best source of nutrients for your baby and can help boost the baby's immune system. When a baby is not breastfed, liquid infant formula and powdered infant formula are acceptable alternatives. Infant formulas available in Canada undergo a strict pre-market review process, which includes the assessment of data to show that the formula supports the normal growth and development of infants.

**Liquid Infant Formula**

Health Canada recommends that infants who are premature, have a low-birth weight, or weakened immune systems, drink sterile liquid infant formula if they're not being breastfed.

There are two types of liquid infant formula: ready-to-feed and liquid concentrates. Ready-to-feed liquid infant formula is heat treated by the manufacturer to produce a formula that is sterile. This type of infant formula is safe for high risk infants to consume. The second type of liquid infant formula is concentrated and requires water in order to dilute it. While the concentrated formula is sterile, you should use boiled water, which is cooled to between room and body temperature, to dilute the concentrated formula before feeding high-risk infants.

For caregivers and parents that may not have access to liquid infant formula, or when a suitable liquid infant formula is not available, powdered infant formula can be used if it's prepared properly.

**Powdered Infant Formula**

Powdered infant formula can be used for infants who are healthy and full term and also for high-risk infants in situations where sterile liquid infant formula is not available. Unlike liquid infant formula, which is heat treated to sterilize the product, powdered infant formula isn't manufactured to be sterile.

Scientific information shows that *E. Sakazakii*can be present in powdered infant formula. While there are no recent cases of illness due to *Enterobacter sakazakii* in Canada, there have been approximately 120 recorded worldwide. As a result, if it's not prepared properly, powdered infant formula could expose a child to potentially harmful bacteria such as*Enterobacter sakazakii* (*Cronobacter* spp.). Caregivers need to make sure that powdered infant formula is prepared properly to reduce the risks of foodborne illness.

**Tips for Preparing and Handling Powdered Infant Formula**

You can reduce the risk of foodborne illness for your infant by following these steps at home:

**Clean your counters and utensils:**

* Wash your hands using soap and hot water, and clean and disinfect utensils, digital food thermometers and counters before preparing infant formula.
* Make sure that all bottles, spoons, nipples, lids and other equipment are sterilized by placing the items into a pot of water and bringing it to a rolling boil for 2 minutes. If these items aren't used immediately, you can cover and store them in a clean place.

**For premature and low birth weight infants under two months of age or immunocompromised infants:**

Always follow recommendations from your doctor or your health care professional. If you don't or can't breastfeed your child, it's safer to use a sterile liquid infant formula.  However, if you are using powdered infant formula, you should follow these steps:

* Bring the water you're using for preparing the powdered infant formula to a rolling boil for 2 minutes. After cooling the water to 70°C (this takes about 30 minutes), pour the required amount of water into a sterilized bottle and add the formula powder according to the instructions on the label. You should make sure that the temperature of the water does not go below 70°C during the mixing period. You can use a clean, digital food thermometer to make sure.
* The powdered infant formula should be used immediately after preparation after having been cooled to the right temperature. Cool the bottle to between room and body temperature by quickly placing the bottle under cold running water or into a container of cold or ice water. Check feeding temperature by shaking a few drops of the formula onto the inside of your wrist.
* In some cases, powdered infant formula cannot be prepared with boiled water cooled to 70°C because of potentially heat-sensitive ingredients, such as human milk fortifiers or formulas for special medical purposes. You should consult and follow the advice from your doctor or health professional before using these formulas.
* Prepared formula can be kept in the refrigerator for 24 hours. You should follow the instructions for preparing formula for later use below.
* Once you have started feeding your child, the bottle should be used within 2 hours. All leftovers should be thrown out.

**Alternatives for healthy, full term infants:**

* For healthy, full-term infants, you can use previously boiled water that has been cooled to room temperature to prepare powdered infant formula. It's best to feed your child immediately. However, the prepared formula can be kept in the refrigerator for 24 hours. If you choose to refrigerate the formula, you should follow the instructions for preparing formula for later use below.
* Remember, once you've started feeding your child, the bottle should be used within 2 hours.

**Preparing formula for later use:**

* Follow the instructions above for preparing powdered infant formula for high risk infants. The formula should be placed in individual sterilized bottles and quickly cooled under cold, running water and kept refrigerated at a temperature of 4°C or below until you're ready to use it. Use any prepared formula within 24 hours.
* When you're ready to use the prepared formula, re-heat it by placing the bottle in a bottle warmer or hot water for no more than 15 minutes until it's between room and body temperature. Don't use a microwave because it doesn't heat the formula thoroughly and can create hotspots that can scald your baby's mouth.
* Once you've re-heated the prepared infant formula, feed your child immediately. The bottle should be used within 2 hours. All leftovers should be thrown out. Don't refrigerate and reuse re-heated formula.

Health Canada strongly supports breastfeeding and encourages the promotion of its benefits towards infants and young children. Infant formulas should be chosen based on the nutritional requirements and the medical needs of the individual when a substitute for breast milk is needed. Powdered infant formula (PIF)[Footnote1](http://www.hc-sc.gc.ca/fn-an/nutrition/infant-nourisson/pif-ppn-recommandations-eng.php#fnb1) has been consumed by infants around the world for many years, and is considered to be a safe product. However, there have been a number of outbreaks among infants due to the consumption of PIFcontaminated with harmful bacteria such as *Enterobacter sakazakii* (*Cronobacter* spp.) and *Salmonella enterica*. Proper preparation, handling and storage practices for PIF are recommended to reduce the risk of bacteria-related illness.

Health Canada is drawing attention to the fact that PIF are not sterile products. For infants at greatest risk i.e., pre-term, low-birth weight, immunocompromised, commercially produced liquid infant formulas (i.e., both concentrated and ready-to-use) are recommended to be used unless otherwise advised by a physician or dietitian, as these products are sterile. Unlike liquid formulas, which are subjected to sufficient heat to render them sterile, PIF cannot be manufactured to achieve commercial sterility.

Health Canada's recommendations are based on the Guidelines for the Safe Preparation, Storage and Handling of Powdered Infant Formula prepared by FAO/WHO, which cover general aspects of cleaning and sterilization of feeding and preparation equipment, as well as the safe preparation of PIF. The FAO/WHO Guidelines recommend that PIF should be mixed or prepared with water that has been boiled and then cooled to no less than 70 degrees centigrade (°C) to kill any harmful bacteria that may be contaminating a PIF product. Health Canada would like to inform care providers that it is also safe to prepare infant formula with previously boiled water that has been cooled to room temperature, if the formula is fed immediately after preparation. Formula that is prepared for later use can be stored for up to 24 hours when refrigerated at 4°C.

**The following recommendations should be followed when using PIF in the home or in a professional setting (i.e., hospitals and day-care centres):**

* Preparation should take place in a clean environment where counters have been cleaned and sanitized. Hands should be thoroughly washed using soap and lukewarm water.
* Bottles, spoons and nipples should be sterilized in boiling water for 2 minutes and then air-dried before use or storage. Bottles and equipment should be left covered until ready-for-use.
* For pre-term and low birth-weight infants under two months of age or immunocompromised infants, water used for preparing PIF should be brought to a rolling boil for 2 minutes, dispensed into containers of a maximum size of 1 L and cooled down to no less than 70°C before adding the powder.
* To avoid the potential for scalding of the infant's mouth, further cool to room or body temperature.
* For all other infants, previously boiled water that has been cooled to room or body temperature (37°C) can be used to prepare PIF, but it should be served immediately to the infant.
* It is best to prepare and serve PIF immediately after cooling to body temperature. Reducing the time from preparation to consumption will reduce the risk to infants. Formula in bottles can be cooled quickly by holding the bottle under running tap water or placing in a container of cold water, as long as the cooling water is below the nipple.
* If it is not possible to serve immediately, all prepared formula in bottles or other types of containers should be refrigerated at 4°C or lower immediately after the powder has been added and dissolved in water. The prepared formula should be used within 24 hours.
* Due to the possibility of the growth of harmful bacteria at temperatures above 4°C, stored formula should only be removed from the refrigerator and re-warmed to room or body temperature immediately before feeding. Warm prepared PIF in a bottle warmer or by placing the bottle in a container of warm water for no more than 15 minutes. Warming for extended periods means that the PIF will be held at a temperature that is ideal for the growth of harmful bacteria.
* Microwave ovens should not be used in the preparation or warming of PIF as uneven heating may result in "hot spots" that can scald the infant's mouth.
* Once feeding has started, the individual bottle should be used within two hours. Any leftover formula should be discarded.

**Guidance on using water that is cooled to 70°C for infants at highest risk (i.e., pre-term and low birth-weight infants under two months of age or immunocompromised infants):**

* When using boiled water cooled to 70°C, thermometers with digital read-outs work best for determining the temperature of the water used to prepare the formula. Approximately 30 minutes is needed to cool 1 L of boiled water to 70°C if left at room temperature.
* In some cases, PIF cannot be prepared with boiled water cooled to 70°C due to the addition of potentially heat-sensitive ingredients, for example, when adding human milk fortifiers or using formulas for special medical purposes. In addition, if boiled water is not available and potable water must be used instead, it is recommended that the formula be fed immediately, once it is prepared, to prevent the growth of harmful bacteria.
* Formula that has been mixed or prepared with boiled water that has been cooled to 70°C should be further cooled to room or body temperature, before serving, to avoid scalding of the infant's mouth. The temperature should be checked with a thermometer, preferably digital.