BREASTFEEDING PROTOCOL #19:

Expressing, Collecting, and Storing of Human Milk

Toronto Public Health

Background

In 2018, a partnership was formed with the Baby-Friendly Initiative (BFI) Strategy for Ontario and Toronto East Health Network (TEHN) to update and revise the Breastfeeding (BF) Protocols for Health Care Providers to create a current and evidence informed resource. With the support of partner organizations and service providers, five BF Protocols were revised and released in 2019 and early 2020. This project was then paused due to the COVID-19 Pandemic.

In 2024, TPH resumed work on the protocols independently with acknowledgement from TEHN. TPH has reviewed and updated protocol content and references based on current breastfeeding resource information. Resources used in this review include Government references, breastfeeding texts, medication use during lactation guides and websites, and recognized organizations such as Academy of Breastfeeding Medicine and La Leche League.

Use of this Protocol

This Protocol is intended to support evidence-informed clinical practice. This Protocol may be copied or printed for the purpose of educating health care professionals, provided the authors are acknowledged and content is not altered, nor used or reproduced for commercial gains.

Disclaimer

This Protocol is a guideline. Every breastfeeding dyad and their circumstances must be assessed on an individual basis. In doing so, health care providers use their own professional judgement along with the evidence in assessing the care and support that the family needs. At times, consultation with another breastfeeding expert or advice from a medical practitioner, e.g., physician, midwife, or nurse practitioner, will be required.

Acknowledgements

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Introduction

It is important for all mothers and their support person to be taught how to express, store, and handle human milk. Various factors will influence the method of expression a mother uses, including whether the milk is stored or not and the frequency of expression. For some mothers, expression is a key aspect of meeting their breastfeeding goals. This Protocol is for healthy term infants in hospital or at home, and includes information to support preterm infants, and infants who are unwell or separated from their mother.

Key Messages

- It is important for all mothers to learn how to hand express their milk (Becker et al., 2016; Breastfeeding Committee for Canada [BCC], 2017).
- Mothers require the knowledge and skill to safely and effectively collect and store human milk (Jones, 2019).
- Expressed or stored human milk maintains unique qualities with important implications for health of mothers and infants (Academy of Breastfeeding Medicine [ABM], 2017).
- Collect human milk as cleanly as possible to avoid outside contamination. Human milk can be contaminated at several points in the expressing, collection, transferring, storage, or administration process (Jones, 2019; Peters et al., 2016).
- For the at-risk infant, it is a priority to have conversations with parents about the importance of human milk and expressing as part of the plan of care.
- Health care providers play a necessary role in educating and supporting families regarding the importance of human milk, human milk expression, and the safe handling and storage of expressed human milk.

Possible Reasons for Human Milk Expression

- Physical separation from an infant, which may be short or long term, such as infant in NICU, surgery, illness, mother returning to work or school, social engagement, infant taken into protective custody (Becker et al., 2016).
- Preterm infant or infant who is unable to breastfeed directly or latch and transfer milk effectively from the breast (Becker et al., 2016).
- Use of a medication that is incompatible with breastfeeding and for which there is no safe alternative (Canadian Agency for Drugs and Technologies in Health [CADATH], 2016).
- Full breasts, blocked ducts, mastitis, or breast abscess requiring regular and almost complete breast drainage (Becker et al., 2016).
- Mother needs to increase the supply (Becker et al., 2016).
- Mother makes an informed decision to partially or exclusively express and provide human milk by bottle (Becker et al., 2016).
- Mother is expressing for the purpose of human milk donation (Becker et al., 2016).

Preparation For and Collection of Human Milk

- There are three methods of expression (National Health and Medical Research Council [NHMRC], 2012):
  - Hand expression.
  - Expression with a breast pump.
  - A combination of both hand expression and pumping.
- A mother's decision as to which method of expression she chooses to use depends on (Becker et al, 2016):
  - The reason for expression.
  - Time since birth.
  - Cost.
  - Duration of expression.
  - Personal preference.

Photo: Bill Ivy, Nursing Moms Project

- Hand expression is the most effective way to remove colostrum, especially in the first 24 hours after delivery (Becker et al., 2016; BCC, 2017).
- Education regarding hand expression is best initiated prenatally and continued postnatally, ideally within the first hour after birth (NHMRC, 2012). Appendix A, *How to Hand Express (example)*, outlines steps for effective hand expression.
- If a mother chooses to use a breast pump, there are many types available that can meet the specific needs (Meier et al., 2016). See Appendix B, *Types of Breast Pumps Available and Their Characteristics*. See Appendix C, *Sample Instructions for Using Breast Pumps*.

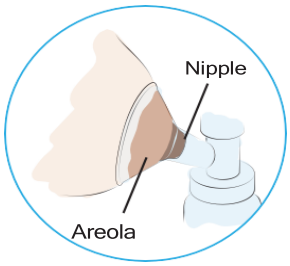
Prior to expression

- Careful handwashing with soap and warm water is important before expressing and handling milk or feeding equipment. If hands do not appear dirty, a waterless hand cleanser may be used (Provincial Infectious Diseases Advisory Committee [PIDAC], 2015).
- In hospital or in a community setting, when using a hospital grade, electric breast pump, ensure mothers have been instructed to clean the outer surface of the pump machine prior to use (ABM, 2017). A low-level disinfectant, provided by the institution, can be used for this purpose (PIDAC, 2015).
- At home, follow the manufacturer's instructions for cleaning the breast pump before each use.
- Breast pump kits are for single person use only (used by one mother), and may be reusable or disposable (PIDAC, 2015):
  - Single person use, reusable pump kit: breast pump kits that can be re-used by the same mother, but must be cleaned, rinsed, and dried between each use. These kits must not be reprocessed or autoclaved.
  - Single-use, disposable: breast pump kits that have been designated by the manufacturer for single-use only. Single-use equipment or devices must not be reprocessed or re-used even by the same mother.
  - In hospital, all mothers should be provided initially with a sterile pump kit for expression (ABM, 2017).
- Choosing the correct size pump flange is important (State of Victoria, 2014). If the flange is too tight, the milk ducts can become compressed which prevents milk from flowing freely. Also flanges that are too small can rub on the side of the nipple causing damage (Becker et al., 2016; Mohrbacher, 2010).

NOTE:

- Flange size will vary between pump companies and brands. All mothers should refer to the manufacturer's instructions to determine a suitable flange size (Mohrbacher, 2010).
- When a mother is using the proper flange size, space will be visible around the nipple as the mother pumps (Mohrbacher, 2010).
- The needed flange size may be different between breasts, and may change over time (Mohrbacher, 2010).
- Mothers do not need to:
  - Clean their breasts before expressing milk (ABM, 2017).
  - Discard the first few drops prior to collecting milk; this has not shown to decrease milk contamination (PIDAC, 2015).

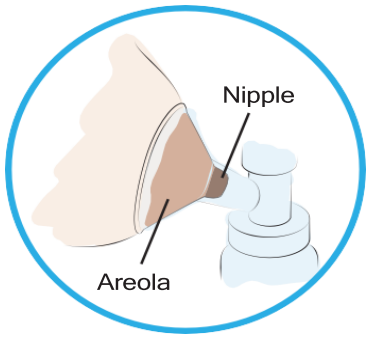
Proper fitting



Too small

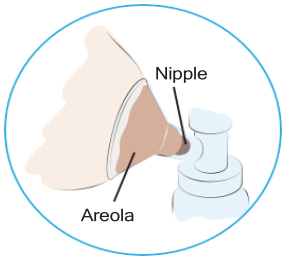
The nipple rubs along the side of the tunnel.

Try a larger size. Some mothers need a different size on each breast.



Correct fit

The nipple is centered and moves freely.



Too big

The nipple and excessive areola are pulled into the tunnel.

Try a smaller size. Some mothers need a different size on each breast.

Signs a mother needs a larger or smaller flange size.

A larger flange size may be needed if:

- Nipple rubs along the tunnel of the flange, despite efforts to center it.
- Nipple blanches or turns white.
- Nipple does not move freely in the tunnel of the flange.
- Discomfort around the nipple and areola, even on low suction settings

A smaller flange size may be needed if:

- Areola is going into the flange and getting hurt, pinched, or bruised.
- Nipple bounces in and out of the nipple tunnel of the flange.
- Air seal is difficult to maintain.

Adapted from: Mohrbacher, N. (2010). *Breastfeeding Answers Made Simple*. Texas: Hale Publishing.

Process of expression

- Regardless of the reason for expression (Becker et al., 2016):
  - The average time needed to express will vary.
  - Minimum or maximum length of time to express is not clear.
- Mothers expressing to establish and maintain their milk supply need to:
  - Be shown how to hand express milk as soon as possible – at least within the first hour of birth (Becker et al., 2016).
  - Keep their infant skin-to-skin as much as possible (BCC, 2017; Moore et al., 2012).
  - Express both breasts at least 6 times in the first 24 hours with continued expression at least 8 times in 24 hours to mimic normal infant feeding patterns (ABM, 2017).
  - Express at least once during the night as this is when prolactin levels are highest (Jones, 2019).
  - Be taught about double pumping (i.e., pumping both breasts at the same time). This takes less time than pumping each side individually. Although the evidence is unclear, it may also result in more milk being pumped (Becker et al., 2016).
  - Continue to express until milk flow stops and continue pumping for 1-2 minutes thereafter.
  - Pump one side and then the other if doing one-sided pumping (Becker et al., 2016; Jones, 2019).
- If a mother is away from the infant for a short time, encourage her to express when the mother would normally breastfeed. This helps to maintain milk production and avoid blocked ducts and mastitis (State of Victoria, 2014).

- If a mother is expressing for comfort to manage an overfull breast, the most appropriate time to pump would be immediately after feeding the infant (State of Victoria, 2014). The baby will drain most of the breast during the feeding, which will decrease the amount of pumping required.
- Strategies that can help increase the amount of breast milk expressed include:
  - Skin-to-skin contact before expressing (Becker et al., 2016).
  - Using "hands-on pumping" (i.e., massaging or compressing the breasts before and during expression, can increase expressed milk volumes by up to 50% (Morton, 2012).
  - Expressing while holding, touching, or being close to their infant, or looking at pictures or videos of their baby (Jones, 2019).
  - Conscious relaxation or visualization (Jones, 2019).
  - Listening to music (Becker et al., 2016).
  - Applying warm compresses to the breast during expression (Becker et al., 2016).

Photo: Bill Ivy, Nursing Moms Project

Expected pumping volumes

- Pumping volumes may vary between mothers and by the method of expression. Many factors can influence pumping volumes, including whether the baby is doing any direct breastfeeding, time since last pumping session, the mother's breast storage capacity, time of day, emotional state, etc. (Mohrbacher, 2010).
- After the first few days following birth, expressed milk volumes often increase from a few drops to a few ounces per feeding for a mother who needs to exclusively pump.
- Full milk production peaks at approximately 750ml to 1035ml daily and is generally reached by the time an infant is 5 weeks old (Mohrbacher, 2010).
- For mothers pumping exclusively, if milk production is not approaching 500ml per 24 hours by the end of the first week, interventions to assist with increasing milk supply should be considered (Jones, 2019).

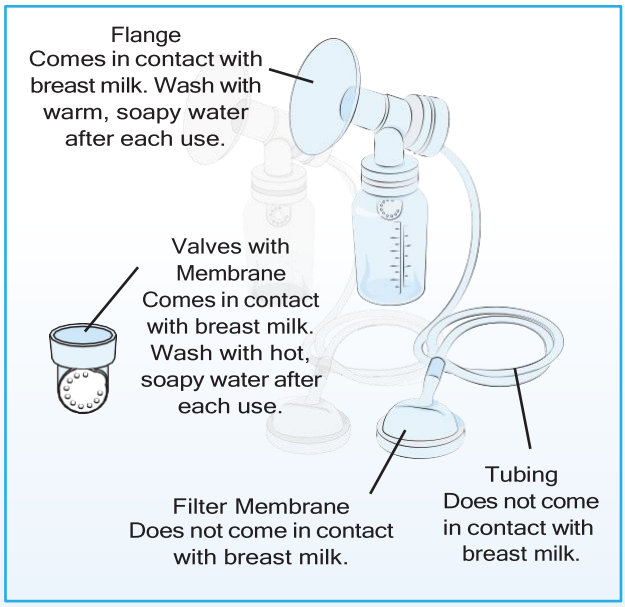
After expression with a breast pump

- Thorough cleaning of breast pumps and supplies is important to avoid contamination, as this can increase the risk of neonatal infections (Peters et al., 2016; PIDAC, 2015).
- Cleaning of breast pump parts and supplies should be done as per manufacturer's instructions or as directed by the health care setting policy where pumping is taking place (ABM, 2017).
- In hospital, use a designated low-level disinfectant product to wipe down pump machines after each use (PIDAC, 2015). Pump machines should be serviced regularly, suction pressure checked and equipped with a mechanism to prevent back flow of milk into the pump (Jones, 2019).
- In hospital and at home, single-use, reusable pump kits need to be cleaned as soon as possible after each use. To clean pump kits both at home and in hospital (Centers for Disease Control and Prevention [CDC], 2024; PIDAC, 2015):

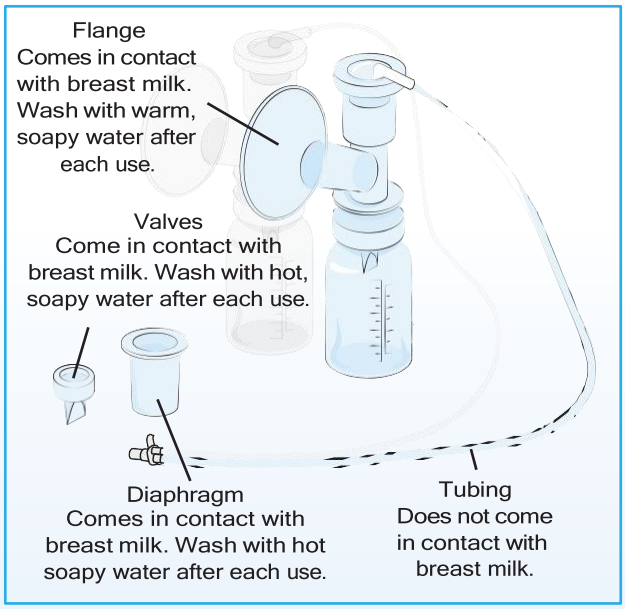
1. Disassemble the used kit.
2. Inspect tubing after each use. Do not submerge tubing in water. If the outside of the tubing is soiled, wipe with a damp cloth.
   - Moisture in the tubing can lead to growth of bacteria and mould affecting the quality of your milk.
   - In hospital, discard breast pump tubing and membrane filters that are exposed to human milk.
   - At home, if moisture is in the tubing, remove the flange and run the pump for a few minutes after pumping to dry the tubing out.
3. Rinse parts that have come in contact with milk with cool water to remove milk residue.
4. Wash parts in a clean basin, not a sink, with warm soapy water.
5. Rinse thoroughly and place on clean paper towel or clean dish cloth to air dry.
6. Wash the basin, rinse, and dry it after each use.
7. Store dry kit in a clean, re-sealable plastic bag or plastic container with fitted lid.
   - In hospital, follow organizational procedures regarding the length of time a breast pump kit can be used prior to replacement. A mother may reuse a breast pump kit if washing, rinsing, and drying takes place between uses. Replacement of breast pump kits may be more frequent for the preterm or at-risk infant (refer to institutional policy). It is important to assess a mother's ability to clean pump equipment effectively.
   - If a physical setting does not provide an appropriate opportunity for a cleaning to take place, or if the mother in unable to comply with cleaning instructions, a clean pump kit will need to be provided for each pumping session.
   - Alternatively, at home, and if stated in the manufacturer's instructions, pump kits may be rinsed with cool water and placed in the dishwasher to clean (CDC, 2024). Microwave bags designed for this purpose can also be used if indicated by the manufacturer.
   - Kits should be discarded when no longer needed for use by the mother. To avoid infection, kits should not be passed on to another mother (PIDAC, 2015).

Types of pumps

Pump type 1



Pump type 2



Storage and Handling of Human Milk

Storage containers

Considerations when choosing an appropriate container to store human milk include:

- Effect of the container on the nutritional and immunologic composition of the milk.
- Gestational age and health status of the infant.
- Whether or not the expressed milk requires transport to a different location.
- Size of storage area.
- Amount of milk to be stored.

Recommendations for infants in hospital

	Container	Lid	Use & Cleaning Instructions
Healthy Term Infant	Single-use, pre-sterile* container. BPA-free, food grade, hard plastic.	Single-use, pre-sterile* and solid.	Wash between uses as per pump kit washing instructions outlined above. Obtain new container and lid every 24 hours.
Preterm Infant	Single-use, pre-sterile* container. BPA-free, food grade, hard plastic.	Single-use, pre-sterile* and solid.	Do not clean. Use a new single-use, pre-sterile* container and lid at each pumping session.

References:

1. Academy of Breastfeeding Medicine. (2017). ABM clinical protocol #8: Human milk storage information for home use for full term infants. *Breastfeeding Medicine*, *12*(7), 390-395.
2. Canadian Agency for Drugs and Technologies in Health. (2016). Storage, handling, and administration of expressed human breast milk: A review of guidelines. Rapid Response Report: Summary with Critical Appraisal. Retrieved from www.ncbi.nlm.nih.gov/books/NBK368235
3. Jones, F. (2019). *Best practices for expressing, storing and handling human milk in hospitals, homes, and child care settings.* (4th ed.). Texas: Human Milk Banking Association of North America (HMBANA).
4. Ontario Agency for Health Protection and Promotion, Provincial Infectious Diseases Advisory Committee. (2015). *Best practices for infection prevention and control in perinatology.* Toronto, ON: Queen's Printer for Ontario. Retrieved from www.publichealthontario.ca/en/search#q=pidac%20documents&sort=relevancy.

*Note re term pre-sterile: product comes sterilized and pre-packaged from manufacturer.

Recommendations for healthy infants at home

Container	Lid	Cleaning Instructions
Glass or BPA-free hard plastic. Containers need to be clean, but do not need to be sterile. Small jars and bottles with lids, such as a glass jar. Pre-sterilized, sturdy bags meant for human milk storage that can be tightly sealed.	Solid lids do not have to be sterile.	Rinse container in cool water. Wash container in hot soapy water, rinse in warm water and allow to air dry. If soap is not available then place items in a pot, cover with water and bring to a boil. Boil for 5 minutes and remove items with clean tongs. Dry containers should be covered and stored in a dry, clean area away from food.

References:

1. Academy of Breastfeeding Medicine. (2017). ABM clinical protocol #8: Human milk storage information for home use for full term infants. *Breastfeeding Medicine*, *12*(7), 390-395.
2. Jones, F. (2019). Best practices for expressing, storing and handling human milk in hospitals, homes, and child care settings. (4th ed.). Texas: Human Milk Banking Association of North America (HMBANA).
3. Peters, M. J., McArthur, A, & Munn, Z. (2016). Safe management of expressed breast milk: A systematic review. *Women and Birth: Journal of The Australian College Of Midwives*, *9*(6), 473-481. doi:10.1016/j.wombi.2016.05.007.
4. Canadian Agency for Drugs and Technologies in Health. (2016). *Storage, handling, and administration of expressed human breast milk: A review of guidelines*. Rapid Response Report: Summary with Critical Appraisal. Retrieved from www.ncbi.nlm.nih.gov/books/NBK368235

Other information and considerations

- When freezing human milk, fewer antibodies are lost with glass than with plastic (ABM, 2017).
- When using glass containers, care must be taken to avoid breakage (State of Victoria, 2014).
- When using pre-sterilized polypropylene bags meant for human milk storage, there is a possibility that the bag can become punctured causing the milk to become contaminated (ABM, 2017). Suggest to mothers that they place these bags within another container or larger bag.
- Human milk should not be stored in hospital plastic specimen storage containers as they are not indicated as “food grade safe”. There is insufficient evidence on their chemical safety and effects on infant health (ABM, 2017).
- Disposable bottle liners are not recommended as they are not manufactured for the purpose of milk storage. In addition, they are unable to be tightly sealed and increase the possibility of milk contamination (ABM, 2017).
- Bottle nipples are not recommended for a lid as milk contamination is possible through the nipple holes (Jones, 2019).
- Avoid touching the inside of the lid and bottle or container used to store expressed human milk to help decrease contamination (Jones, 2019).

Storage and transport of human milk

The length of time human milk may be stored depends on the gestational age and health status of the infant, as well as the situation and storage location. If most of the infant's nutrition is from expressed milk, use appropriate storage conditions for the shortest storage time possible. This will minimize the loss of antibodies and nutrients, and bacterial growth (Jones, 2019). For a summary of milk storage guidelines, refer to Appendix D, *Storage Times for Expressed Human Milk*.

Recommendations for infants in hospital

	Labeling	Storage	Transport/Shipping
Healthy Term Infant	Label containers with name, hospital identification number and date expressed or frozen to reduce risk of giving milk to the wrong infant. Have a system in place to ensure that the correct milk is being provided to the correct infant, (e.g., double check and sign off with another health care professional, or the infant's parent, or bar-coding) before each feed.	Store milk in a dedicated, clean, labeled bin to reduce risk of giving milk to the wrong infant. Wash/disinfect bin between each use. If a bin is not available, a labeled re-sealable plastic food storage bag may be used.	Transport expressed human milk from home to the hospital in an insulated cooler with freezer gel packs or ice packs. (See Appendices for storage times) Avoid using regular ice (ice is warmer than frozen milk and will cause the milk to thaw). Wash cooler with disinfectant provided by organization between each use. Expressed human milk can be stored safely while being transported in a cooler for up to 24 hours with frozen gel packs. Bottles filled completely with frozen milk will stay frozen longer than partially filled bottles. Additional frozen gel packs may be needed if using containers that are only partly filled. Limit opening cooler bag. Length of time milk stays frozen or chilled will depend on the outside temperature. If donating or receiving milk from a milk bank, follow milk bank instructions.

Recommendations for infants in hospital

	Labeling	Storage	Transport/Shipping
Preterm Infant	Label containers with name, hospital identification number and date expressed/frozen to reduce risk of giving milk to the wrong infant. Have a system in place to ensure that the correct milk is being provided to the correct infant, (e.g., double check and sign off with another health care professional or the infant's parent, or bar-coding) before each feed.	Store milk in a clean, dedicated, and labeled bin to reduce risk of giving milk to the wrong infant. Alternatively, milk may also be stored in a labeled resealable, clean, plastic food storage bag may be used. Wash or disinfect bin between each use.	See above for transport recommendations. It is important to follow transport recommendations, especially for the preterm or at-risk infant. Allowing milk to warm during transport will increase risk of bacterial growth. If donating or receiving milk from a milk bank, follow milk bank instructions.

References:

1. Academy of Breastfeeding Medicine. (2017). ABM clinical protocol #8: Human milk storage information for home use for full term infants. *Breastfeeding Medicine*, *12*(7), 390-395.
2. Jones, F. (2019). *Best practices for expressing, storing and handling human milk in hospitals, homes, and child care settings*. (4th ed.). Texas: Human Milk Banking Association of North America (HMBANA).
3. Ontario Agency for Health Protection and Promotion, Provincial Infectious Diseases Advisory Committee. (2015). *Best practices for infection prevention and control in perinatology*. Toronto, ON: Queen's Printer for Ontario. Retrieved from www.publichealthontario.ca/en/search#q=pidac%20documents&sort=relevancy.

Recommendations for when at home and in other community settings

Container	Storage container	Transport/Shipping
Label milk with the date it was expressed to facilitate using the oldest milk first.	Store containers of milk in a designated clean container. A labeled resealable, clean, plastic food storage bag is sufficient for storage.	Always keep ice packs in contact with milk containers, and limit opening cooler bag. See above for transport recommendations for healthy term infants.

References:

1. Academy of Breastfeeding Medicine. (2017). ABM clinical protocol #8: Human milk storage information for home use for full term infants. *Breastfeeding Medicine*, *12*(7), 390-395.
2. Jones, F. (2019). *Best practices for expressing, storing and handling human milk in hospitals, homes, and childcare settings*. (4th ed.). Texas: Human Milk Banking Association of North America (HMBANA).

Other Information and Considerations

- If not being used, freshly expressed milk should immediately be transferred to the refrigerator or if possible, immediately frozen (ABM, 2017).
- Freshly expressed warm milk should be cooled prior to adding it to older, cooled, stored milk that has not yet been frozen or thawed (ABM, 2017).
- Avoid mixing human milk with formula to make a full feed. When cow's milk formula is mixed with expressed human milk, there is a decrease in the number of lysozymes in human milk and a potential increase in E-coli (Jones, 2019).
- Package expressed milk in approximate feeding size portions. For healthy term infants, follow infant cues to determine the amount of milk that is required per feeding. For preterm infants, feeding size portions will depend on the age and size of the infant (Jones, 2019).
- Leave a small space (1.5cm or .5 inch) in the container so the milk can expand when freezing (ABM, 2017).
- Store milk in the back of a fridge or freezer where there is less temperature variation. Avoid storing milk on the door of the fridge or freezer (ABM, 2017).
- For a self-defrosting freezer, place the milk on a shelf, because the bottom of the freezer warms up when it is defrosting (ABM, 2017).

Thawing and Use of Thawed Human Milk

- Human milk that is freshly expressed has the greatest immunologic activity, compared to refrigerated or frozen milk (ABM, 2017).
- Human milk that has been thawed, needs to be handled with care to minimize opportunities for bacterial growth. This is because once frozen milk is brought to room temperature, its ability to inhibit bacterial growth is lessened, especially by 24 hours after thawing (ABM, 2017).
- Methods for thawing frozen milk include (ABM, 2017; PIDAC, 2015):
  - Slow thawing in the refrigerator. This causes less fat loss than thawing in warm water.
  - Running container of expressed milk under warm water.
  - Setting container of expressed milk in a clean, warm water bath. Reusable containers used for warming, must be dried between uses and cleaned according to a schedule (e.g., daily).
  - To avoid contamination, untreated tap water (tap water that has not been treated by filtration and/or ultraviolet) should not be used for thawing.
  - Using a waterless warmer as per the institutional policy or per manufacturer instructions if using at home.

Other Information and Considerations (ABM, 2017; Jones, 2019)

- Use fresh milk whenever possible.
- Use colostrum and oldest milk first whenever fresh milk is not available.
- When milk is set out to thaw, it should be given a new date and time once completely thawed (i.e., no ice crystals present). Use the time when completely thawed to base acceptable time limits for use, rather than when it is taken from the freezer.
- Gently swirl thawed milk to ensure an even distribution of fat and micronutrients.
- Avoid partially thawing a container of milk and pouring off only enough for a small feed. This is not recommended as it does not allow for an even distribution of milk components.
- Frozen milk should not be left to thaw at room temperature. This will increase the bacterial count.
- Thawing human milk in the microwave or on the stove is not recommended as it causes milk to heat unevenly. Microwaving can also decrease some of the immunological components of human milk.
- Refrigerated and frozen human milk may have an odor different from fresh milk. The odor likely comes from the oxidation of fatty acids. This oxidation process has antimicrobial effects which prevent the growth of microorganisms in thawed refrigerated milk.
- In the event of a power outage or freezer failure, evaluate each container of stored human milk. Partially defrosted milk with the presence of ice crystals may be re-frozen. In the absence of ice crystals, expressed milk should be discarded.
- Expressed human milk does not require special handing as is required for other bodily fluids such as blood.

Warming Human Milk

- For term or older infants, human milk may be fed at room temperature, body temperature, or straight from the refrigerator (Jones, 2019). Infants may demonstrate a preference (ABM, 2017).
- Expressed human milk may be warmed using one of the following methods:
  - In a clean container of warm water.
  - Under running warm water.
- When warming human milk ensure that:
  - Milk is warmed over a period of about 20 minutes to minimize fat loss and the risk of overheating (ABM, 2017).
  - Contact between the cap of the container and the water is avoided.
  - Warming containers are cleaned and dried between uses.
  - Guidelines developed by each organization for the use and cleaning of warming systems,

Additional Information

- Direct breastfeeding: Provides higher protection against infection as it provides antibodies targeted towards the microbes that the baby is exposed to at real time (Pannaraj et al., 2017). For more information on direct breastfeeding versus breast milk feeding, see *Informed Decision Making* Protocol.
- Human milk colours: Human milk comes in a variety of colours and can be affected by food dyes, foods, and medications in a mother's diet (Jones, 2019).
  - Expressed milk that is pink or blood-tinged is safe for consumption, unless the mother is hepatitis C positive (Mohrbacher, 2010).
  - Blood-tinged milk is common and usually clears without treatment after a couple of weeks post-birth, but if it persists, should be brought to the attention of the mother's health care provider (Mohrbacher, 2010).
  - Blood-tinged expressed milk may result from one of the following (Lawrence, 2015):
    - Vascular engorgement: This occurs when ducts and milk-making cells grow and stretch in the first few days and is referred to as "rusty pipe syndrome". This usually occurs following birth and will clear up after a few days. Colostrum, or early milk, may appear brown, orange, or a rust colour.
    - Breast/nipple trauma: This can be caused by incorrect latching, aggressive expression, or using a breast pump incorrectly. Broken capillaries can cause blood in the expressed milk.
    - Intraductal papilloma: A benign growth in a milk duct that causes bleeding as it erodes. The bleeding stops spontaneously without treatment a couple weeks after birth.
- Policy: Facilities need policies and procedures in place in order to prevent and deal with any accidental feeding of a mother's milk to the wrong infant/child (PIDAC, 2015).
- Infection: A mother who has a bacterial or yeast infection (Candida), does not need to discard the stored, expressed milk as human milk contains non-pathogenic bacteria that create conditions that are unfavourable to the growth of pathogenic organisms (ABM, 2017). Breast milk storage containers and breast pump equipment may need to be sterilized according to hospital policy, if the infant is premature or hospitalized.
- Antenatal expression: One rigorous, randomized control study completed in 2014, showed no harm from advising women with diabetes in pregnancy at low risk of complications, to express human milk from 36 weeks gestation (Forster, et al., 2017). Supplementation of the infant of a diabetic mother is common as women with diabetes often have delayed lactogenesis and insufficient milk supply. As well, initially after birth, infants of diabetic mothers may have low blood sugars. Antenatal expression can ensure that infants receive their own mother's milk if supplementation is needed.
- Lactation after loss: Milk expression and donation to a human milk bank are viable options that can have physical and emotional benefits following perinatal loss (Wellborn, 2012). For other options, such as lactation suppression, refer to Protocol #21: *Weaning*.
- Milk donation: Promotion of milk donation is important to ensure all infants have access to human milk. Provide mothers who have extra milk with information about milk donation to a certified milk bank. Expressed milk collected for donation should be labeled and frozen as soon as possible to maintain the nutritional and microbiological quality of the milk. Recommendations from the milk bank for safe expression, storage, and handling should be followed. To locate an appropriate milk bank for donations, look up the Human Milk Banking Association of North America at www.hmbana.org.

- Informal milk sharing: In some situations, parents may look for alternative sources of human milk to feed their babies. Health Canada, the Canadian Paediatric Society (CPS), and the Human Milk Banking Association of North America (HMBANA) do not endorse the use of unpasteurized donor human milk. Should parents make an informed decision to do so, harm reduction education should be provided. For more information see *Key Resources* below.
- Oral immune therapy (OIT): Placing a drop of colostrum or mother's own milk inside an infant's cheek, provides immediate immune protection for preterm or at-risk infants. Initiation of OIT and early expression is expected to increase exclusive use of mothers' own milk for infants admitted to the NICU and can make a significant impact on the prevention of Necrotizing Enterocolitis (NEC) (Snyder, et al., 2017).

Appendices in this Protocol (see below)

A) How to Hand Express Milk (example)
B) Overview of Breast Pumps and Their Characteristics
C) Sample Instructions for Pumping
D) Storage Times for Expressed Human Milk

Key Resources

The following key resources may assist you or your clients with expressing, collecting, and storing human milk.

Academy of Breastfeeding Medicine

Position Statement on Informal Breast Milk Sharing for the Term Healthy Infant
www.liebertpub.com/doi/abs/10.1089/bfm.2017.29064.nks?journalCode=bfm

Best Start by Health Nexus

Breastfeeding and Infant Feeding Resources: Expressing and Storing Breastmilk Factsheet
Expressing_and_Storing_Breast_Milk_EN_2018

Breastfeeding Resources Ontario

Quality evidence-informed resources that support the Baby-Friendly Initiative such as videos, written resources, and links in one centralized source. Multiple hand expression resources are available. Breastfeeding Archives - Best Start

Centers for Disease Control and Prevention: How to Keep Your Brest Pump Kit Clean Factsheet. https://www.cdc.gov/hygiene/pdf/breastpumpkit-clean-508.pdf

Milk Expression Videos

- How to Hand Express, Healthy Families BC A video on hand expressing breastmilk | HealthLink BC
- Maximizing Milk Production with Hands-On Pumping, Stanford University www.youtube.com/watch?v=_btCMw5WYas

Perinatal Services BC

- Informal (Peer-to-Peer) Milk Sharing: The Use of Un-pasteurized Donor Human Milk Practice Resource for Informal Human Milk Sharing
- Information for Families: Informal (Peer-to-Peer) Human Milk Sharing http://www.perinatalservicesbc.ca/Documents/Guidelines-Standards/HealthPromotion/Informal-MilkSharing_FamilyInfo.pdf

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Appendix A

How to Hand Express Milk (example)

Instruct a mother to:

1. Wash her hands well.
2. Hold the baby skin-to-skin prior to expression.
3. Gently stroke and massage the breasts to help begin the flow of milk.
4. Form a “C” with the fingers about 1 – 1.5 inches back from the edge of the areola.
5. Press back toward the chest wall.
6. Compress the breast by bringing the fingers towards each other. Avoid sliding the fingers down toward the nipple.
7. Relax the pressure.
8. Repeat rhythmically, moving around the breast so the mother is expressing from the entire breast. Continue this until the flow of milk has stopped. The mother may switch hands and switch from one breast to the other as often as works for her.

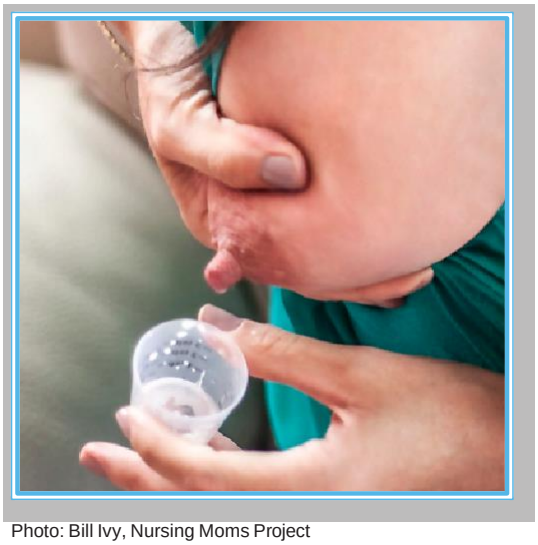

Photo: Bill Ivy, Nursing Moms Project

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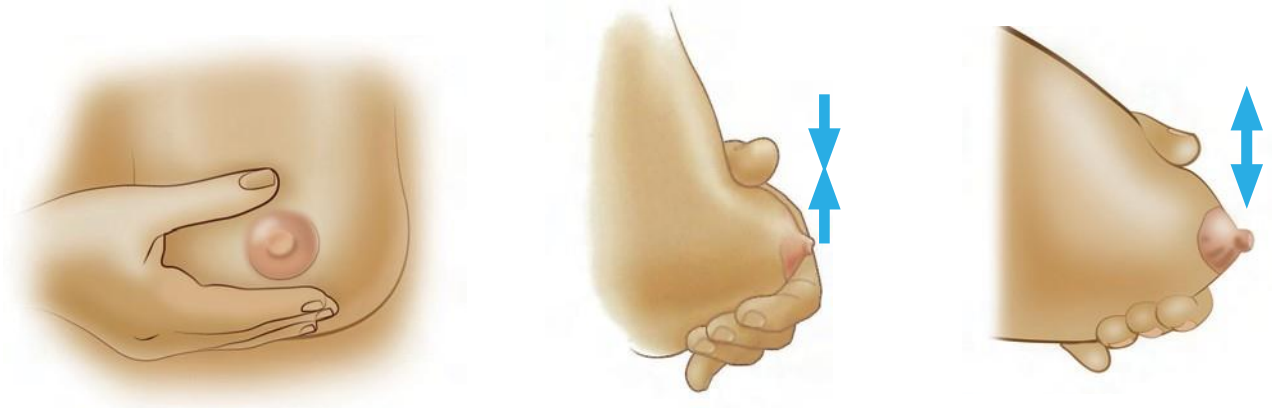

Press (back towards your chest) Compress Relax

Illustration adapted with permission from: Breastfeeding Matters (2017). Best Start Resource Centre.

Appendix B

Overview of Breast Pumps and Their Characteristics

Pump Type	Manual	Battery Operated, Small Electric	Electric Personal Use Pumps	Electric Hospital Grade Pump
Usage	Single user	Single user	Single user	Can be multiuser or can be purchased or rented by single user
Availability	Purchase	Purchase	Purchase	Rental or purchase
Collection Kit	Single (may be limited to no alternatives for flange size)	Double/Single (limited alternatives for flange sizes depending on brand)	Double/Single (limited alternatives for flange sizes depending on brand)	Double/Single (different flange sizes available)
Suction Pattern	Determined by user	Depending on brand, some may have adjustable suction, rate, and suction strength	Depending on brand, some may have adjustable suction, rate, and suction strength	Adjustable rate, rhythm, and suction strength are standard features
Advantages	• Convenient • Lightweight • Small in size	• Convenient • Lightweight • Small in size	• Smaller in size than hospital grade pump • Efficient • Effective • Portable • Some models are hands-free	• Maximum effectiveness • Efficient
Intended Use	Brief separations from healthy infant	Brief separations from healthy infant	• Return to employment • Travel separations	Partially or completely breast pump-dependent mothers during any stage of lactation
Not Intended Use	Partially or completely breast pump-dependent mothers during any stage of lactation	Partially or completely breast pump-dependent mothers during any stage of lactation	Partially or completely breast pump-dependent mothers during any stage of lactation	No exclusions

References:

Meier, P., Patel, A., Hoban, R., & Engstrom, J. 2016. Which breast pump for which mother: An evidenced-based approach to individualizing breast pump technology. Journal of Perinatology, *36*(7), 493-499.

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Appendix C

Sample Instructions for Pumping

Technique for using manual pump

- Massage and/or use hand expression to start the flow of milk.
- Centre the nipple in the flange of the breast pump and place the rim of the flange against the breast. Ensure the flange is firmly in place (but not too hard) so a seal is created.
- Lean slightly forward so milk flows with gravity into the collection container.
- Begin pumping lightly and rapidly to help initiate the letdown reflex.
- Once milk is flowing, slow pumping into a rhythmic compress-then-release action. If there is an option, use more suction.
- When the milk flow begins to slow down, perhaps after 10-15 minutes of pumping, switch to the other breast. The pump can be alternated from breast to breast as often as needed to maintain milk flow.

Technique for using electric pump

- Massage and/or use hand expression to start the flow of milk.
- Centre the nipple in the flange of the breast pump and place the rim of the flange against the breast. Ensure the flange is firmly in place (but not too hard) so a seal is created.
- Lean slightly forward so milk flows with gravity into the collection container.
- Begin pumping with a quick cycle speed and low suction if these settings are available.
- Once the letdown reflex is stimulated and the flow of milk begins to increase, change the pump to a slower, rhythmic cycle speed and increase suction to the highest comfortable level. If there is pain or discomfort the suction pressure needs to be turned down.
- Continue pumping until the flow of milk slows down, often about 10-15 minutes.
- If the pump has double pumping ability, pump both sides at the same time. For single, electric pumping, repeat on the other breast.

Reference: State of Victoria Department of Education and Early Childhood Development. (2014). Victorian Breastfeeding Guidelines. Retrieved from https://www.education.vic.gov.au/Documents/childhood/professionals/health/brestfeedguidelines14.pdf

Helpful expression videos:

- Maximizing Milk Production with Hands-On Pumping, Stanford University www.med.stanford.edu/newborns/professional-education/breastfeeding/maximizing-milk-production.html
- How to Hand Express, Healthy Families BC A video on hand expressing breastmilk | HealthLink BC

Appendix D (updated 2024)

Storage Times for Expressed Human Milk

1. Human Milk Storage Times for Healthy Term Infants

Human Milk	Room Temperature (25°C) or colder	Refrigerator (4°C)	Freezer (separate door freezer of refrigerator) (-18°C)	Deep Freezer (-20°C)
Freshly expressed	≤ 4 hours	≤ 4 days	≤6 months	≤12 months
Thawed in refrigerator, but not warmed	1-2 hours	≤24 hours	Do not refreeze	
Thawed and brought to room temperature or warmed	1-2 hours	1-2 hours	Use thawed breastmilk within 2hrs of bringing to room temperature or warming. Do not refreeze.	
Freshly expressed milk that infant has started feeding	Once feeding begins any leftover milk should be used within 2 hrs., then discard.	Discard	Do not freeze or refreeze	
Thawed, previously frozen, pasteurized donor human milk	1-2 hours	≤24 hours	Do not refreeze	
Frozen, pasteurized donor human milk	Not applicable	Not applicable	No recommendation provided	9-12 months from pumping date

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1. Academy of Breastfeeding Medicine. (2017). ABM clinical protocol #8: Human milk storage information for home use for full term infants. *Breastfeeding Medicine*, *12*(7), 390-395.
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2. Human Milk Storage Times for NICU & High-Risk Infants

Human Milk	Room Temperature (25°C) or colder	Refrigerator (4°C)	Freezer (separate door freezer of refrigerator)	Deep Freezer (-20°C)
Freshly expressed Colostrum for oral immune therapy should be freshly expressed and not refrigerated	≤ 4 hours, immediate refrigeration ideal (Fresh milk that is being fed to an infant via a continuous feed, may be safely administered over 4 hours)	48 hours	Ideal: ≤1 month Acceptable: ≤ 3 months	≤12 months
Thawed in refrigerator, but not warmed	1-2 hours	≤24 hours	Do not refreeze	
Thawed and brought to room temperature	Immediate refrigeration ideal	1-2 hours	Use thawed breastmilk within 2hrs of bringing to room temperature or warming. Do not refreeze.	
Infant has started feeding	For completion of feed, then discard	Discard	Do not refreeze	
Thawed, previously frozen, pasteurized donor human milk	Completion of current feed, then discard	≤48 hours	Do not refreeze	
Frozen pasteurized donor milk	Not applicable	Not applicable	Ideal: 3 months	
Fortified Expressed Human Milk (human milk with added nutrients)				
Fortified, freshly expressed	Refrigerate immediately if not using	≤24 hours	Do not freeze	
Fortified, thawed in refrigerator, but not warmed	Refrigerate immediately and use for next feed	≤12 hours	Do not refreeze	
Fortified, thawed and brought to room temperature	For completion of current feed, then discard	Discard	Do not refreeze	
Infant has started feeding	Discard	Discard	Do not refreeze	
Previously frozen, fortified, donor human milk	Refrigerate immediately	≤24 hours	Do not refreeze	

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1. Academy of Breastfeeding Medicine. (2017). ABM clinical protocol #8: Human milk storage information for home use for full term infants. *Breastfeeding Medicine*, *12*(7), 390-395.
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3. Human Milk Storage Times for Healthy Older Children (> 1 year)

Human Milk	Room Temperature (25°C) or colder	Refrigerator (4°C)	Freezer (separate door freezer of refrigerator)	Deep Freezer (-20°C)
Freshly expressed	≤4 hours	≤4 days	6 months optimal	≤12 months
Thawed in refrigerator, but not warmed	1-2 hours	≤24 hours	Do not refreeze	
Thawed and brought to room temperature or warmed	1-2 hours	1-2 hours	Use thawed breastmilk within 2hrs of bringing to room temperature or warming. Do not refreeze.	
Infant has started feeding	Once feeding begins any leftover milk should be used within 2 hrs., then discard.	Discard	Do not freeze or refreeze	
Thawed, previously frozen, pasteurized donor human milk	1-2 hours	≤24 hours	Do not refreeze	

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1. Academy of Breastfeeding Medicine. (2017). ABM clinical protocol #8: Human milk storage information for home use for full term infants. *Breastfeeding Medicine*, *12*(7), 390-395.
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