Protocol #19
Expressing and Storing Breast Milk

Protocol #19: Expressing and Storing Breast Milk

The expression or collection of breast milk is a learned skill. The reason the mother is expressing her breast milk will determine the method she uses, whether and how she stores the breast milk, and whether it is long-term or occasional.

Observation and Assessment

Indications for expressing and storing breast milk

Assess the mother for:

- Separation from the baby, e.g., due to return to work or school, illness, or surgery.
- A decreased breast milk supply that she wants to increase (*Protocol #12: Insufficient Breast Milk Supply*).
- Engorged breasts that are too hard for the baby to latch onto (*Protocol #5: Engorgement*).
- Use of a medication that is incompatible with breastfeeding and for which there is no safe alternative (*Protocol #16: Drugs and Breastfeeding*).

Assess the baby for:

- Separation from the mother such as prematurity, illness, or surgery.
- Inability to latch and breastfeed effectively (*Protocol #9: Breast Refusal or Difficulty Achieving or Maintaining a Latch; Protocol #10: Ineffective Suck*; *Protocol #17: Indications for Supplementation or Cessation of Breastfeeding*).

Suggestions

Expressing Breast Milk

1. Assess the mother and baby for indications for expressing and storing breast milk (see *Observation and Assessment*).

2. Encourage the mother in understanding information to support her choice of a method of expression:

- Expression, both by hand and mechanically, is a learned skill. It will become easier and faster as she gains experience.
- Hand expression is a foundational skill for the breastfeeding mother, and is particularly important in the first 24 hours postpartum, when the volume of breast milk is very small. It is recommended that all mothers learn how to hand express prenatally (BFI Step 3, BCC, 2011) or before they leave hospital (BFI Step 5, BCC, 2011). Waiting until the last few weeks of pregnancy (37+ weeks) to practice hand massage on the mother's breasts will decrease any potential risk of triggering preterm labour.
- It is easier to see a positive output with hand expression for a small volume of breast milk. The volume may be too small to collect in the reservoir of a mechanical pump. This may negatively impact the mother's breastfeeding self-efficacy, leading her to believe that she is not able to produce enough breast milk. It can be more affirming for the mother to express her breast milk into a small reservoir such as a medicine cup or shot glass.
- See Methods of Breast Milk Expression chart that follows.

Methods of Breast Milk Expression

Method	General Comments	Advantages	Disadvantages
A. Hand Expression	• Hand expression is an effective method for expressing breast milk when done correctly. • As with any form of breast milk expression, hand expression is a skill that the mother will need practice to do effectively. • All mothers should be shown hand expression before leaving hospital (BFI Step 3, BCC, 2011).	• Can be less time-consuming than using a breast pump, as there are no parts to be put together or washed. • Some mothers may find it easier to trigger the hormones that control lactation with the skin-on-skin contact from her hands on her breast rather than from a plastic pump on her breast. • Involves no cost. • Always available anywhere, anytime.	• May be difficult to sustain adequate breast milk supply during a prolonged period of time or separation. • May trigger hand cramping in mothers prone to repetitive strain injury if they don't pause periodically to relax their hands.

Methods of Breast Milk Expression (continued)

Method	General Comments	Advantages	Disadvantages
B. Hospital Grade Electric Pump	• This is the most effective type of pump to increase or maintain a breast milk supply, especially if breastfeeding is stopped for any length of time. These pumps are useful to establish a breast milk supply when the mother and baby are separated after birth or to maintain a breast milk supply if breastfeeding is temporarily stopped due to a medication or illness. • In general, this type of pump generates a maximum of 220 mm Hg of suction at between 48–60 cycles per minute, which most closely mimics a baby's sucking rate. Each cycle represents a suction and release of pressure to simulate one suck. Pumps that generate more cycles per minute tend to be more effective than those that produce fewer cycles. • Pumps that generate 30 cycles per minute or less may cause nipple damage because of the prolonged time that the nipple is drawn in by the suction.	• Most effective type of breast pump. • Easy to use due to the automatic regulation of suction and release on the pump. • Suction control allows the mother to adjust the suction to her own comfort level. • Allows the use of a double-pump kit that decreases pumping time by half and increases the likelihood that lactation will be sustained for a longer period of time. • Closed system; breast milk cannot reach the motor. Safe for multiple users, when used with a separate pump kit for each user. • Has a quiet motor. • May be covered by some insurance plans or social assistance.	• Heavy to transport (11–22 lbs). • Requires an electrical outlet. • Can be expensive to use over a long period of time. • May cause nipple trauma if the flange is incorrectly sized, or if too much suction is used. • May become a reservoir for microbes if it is not cleaned appropriately.

Methods of Breast Milk Expression (continued)

Method	General Comments	Advantages	Disadvantages
C. Mid-Size Automatic Electric Piston Pump	• Less powerful than the full-size automatic electric piston pump. • Appropriate for mothers who have an established breast milk supply but need to pump on a regular basis, e.g., while at work. • In general, this type of pump generates less than 220 mm Hg of suction at between 30–60 cycles per minute.	• Less heavy to transport than a full-size automatic electric piston pump (5–7 lbs). • An electrical outlet is not needed if the pump uses a rechargeable battery or has a separate battery pack (this feature costs extra). • Some models offer a speed control that regulates the speed of the cycling rate. This feature can enhance the letdown reflex in some women. • Easy to use due to the automatic regulation of suction and release on the pump. • Suction control allows the mother to adjust the suction to her own comfort level. • Allows the use of a double-pump kit that decreases pumping time by half and increases the likelihood that lactation will be sustained for a longer period of time. • Closed system; breast milk cannot reach the motor. Safe for multiple users, when used with a separate pump kit for each user. • Has a quiet motor. • May be able to operate with one hand, leaving the other free. • May be covered by some insurance plans or social assistance.	• Not as effective as a full-size automatic electric piston pump. • May require an electrical outlet if the pump does not use a rechargeable battery or does not have a separate battery pack. • Can be expensive to use over a long period of time. • May cause nipple trauma if the flange is incorrectly sized, or if too much suction is used. May become a reservoir for microbes if it is not cleaned appropriately.

Methods of Breast Milk Expression (continued)

Method	General Comments	Advantages	Disadvantages
D. Portable Automatic Electric Diaphragm Pump	• This pump has a lower suction power and cycling rate than automatic electric piston pumps. • Appropriate for mothers who have an established breast milk supply but need to pump on a regular basis, e.g., while at work.	• Easy to transport; has a carrying case and built-in cooler to help keep expressed breast milk cool. •Can be powered from an electrical outlet, battery (may cost extra), or automobile using a special adapter (purchased separately). • Easy to use due to the automatic regulation of suction and release on the pump. • Suction control allows the mother to adjust the suction to her own comfort level. • Allows the use of a double-pump kit that reduces pumping time by half and increases the likelihood that lactation will be sustained for a longer period of time. • Possible to operate with one hand, leaving one hand free.	• Available for purchase only and is expensive. • May involve extra cost for batteries. • Recommended for a single user only by the manufacturer. Internal diaphragm cannot be replaced and may be a source of potential cross-contamination. • May cause nipple trauma if the flange is incorrectly sized, or if too much suction is used. • May become a reservoir for microbes if it is not cleaned appropriately.

Methods of Breast Milk Expression (continued)

Method	General Comments	Advantages	Disadvantages
E. Small Motorized Single Pump	• This pump has a lower suction power and suction/release cycle rate than automatic electric diaphragm pumps. It operates with a small electric motor that provides continuous suction and release. • Appropriate for short-term or occasional use by a mother who has an established breast milk supply. • Some models require that the mother intermittently interrupt the suction to simulate the baby's suck pattern by placing a finger over the suction and release valve or by depressing a lever or button.	• Small, light, and easy to transport. • Some models are very quiet. • An electrical outlet is not needed when a battery is used. • Can double pump if the mother has two pumps and can manage to use one hand to operate each pump separately.	• The models that require the mother to simulate the baby's suck pattern can take time to practice and master. • Models that generate 30 cycles per minute or less may cause nipple damage because of the prolonged time that the nipple is drawn in by the suction. • Some models are noisy. • May cause nipple trauma if the flange is incorrectly sized, or if too much suction is used. • May become a reservoir for microbes if it is not cleaned appropriately. Recommended for a single user only by the manufacturer. Internal diaphragm cannot be replaced and may be a source of potential cross-contamination.

Methods of Breast Milk Expression (continued)

Method	General Comments	Advantages	Disadvantages
F. Hand Pumps ° One-hand operated handle squeeze pumps ° Two-hand operated pumps ° Cylinder pumps ° Rubber bulb pumps (**Not recommended)**	• Appropriate for short-term or occasional use by a mother who has an established breast milk supply. • Portable; can be used with one or two hands, depending on model. • More affordable than the other types of pump; however, not all hand pumps are effective. • Squeezing and releasing a handle creates suction in the pump.	• Small, light, and easy to transport. • No batteries or electrical outlet needed. • Some models have air vents to regulate the suction to safe levels (cylinder and rubber bulb pumps do not have this feature). • Easily cleaned. **One-hand operated squeeze pumps** • Can double pump if the mother has two pumps and can manage to use one hand to operate each pump separately.	• Models that do not have a self-regulating suction/release feature will require the mother to practice simulating the baby's suck pattern. • Can tire the hands and wrist, so should not be used by mothers with hand, wrist, or arm problems, e.g., carpal tunnel syndrome. • Two-hand operated pumps do not allow for double pumping. **Cylinder pumps** • Difficult to regulate the suction. • Have a rubber gasket that may crack and harbour bacteria if not removed and cleaned properly after each use. **Rubber bulb pumps** • Very difficult to regulate the suction. • High risk of breast milk contamination as the bulb is hard to clean. **Not recommended**

General Suggestions for Breast Milk Expression

Before expressing, encourage the mother to:

- Wash her hands with soap and water.
- Clean all collection equipment that will have contact with her breast or breast milk.
- Have container(s) ready to store the breast milk. For healthy full-term babies use clean, air-dried glass, or hard plastic containers. For premature or hospitalized babies use sterilized glass or hard plastic containers. See *Cleaning Instructions* below.
- Express in the morning when the breasts feel the fullest or after breastfeeding, when the letdown reflex has already occurred. If the mother is single pumping and her baby is with her, she may pump one breast while breastfeeding the baby on the other side.
- Allow enough time to express to avoid feeling rushed –approximately 20–30 minutes with single pumping (10–15 minutes per breast) or 10–15 minutes with double pumping.
- Sit in a familiar and comfortable setting.
- Decrease distractions, e.g., turn off the phone and TV, and close the door.
- Have something to eat or drink available.
- Use relaxation techniques, e.g., play relaxing music, use breathing exercises to minimize stress that could interfere with the hormones that control lactation (see *How the Breast Works*).
- Use stimuli that remind her of her baby, such as a picture of the baby, recording of the baby sounds, or an article of clothing with the baby's smell. If the baby is present, suggest that she keep the baby close to her when expressing.
- Hold her baby skin-to-skin before trying to express breast milk, in order to relax and help trigger the hormones that control lactation.
- Initiate the letdown or breast milk ejection reflex by using one of the following techniques:
    - Use relaxation strategies to be calm, e.g., a warm shower, heat applied to her back and shoulders, relaxation breathing, a warm drink, or supportive positions.
    - Manage pain to increase comfort and relaxation and facilitate breast milk letdown.
    - Gently massage the breasts. Apply moist or dry heat to her breasts for a few minutes before or during massage until letdown occurs. Heat may be applied with a warm, wet towel or disposable diaper, a warm bath or shower, a bowl of warm water, a heating pad on low, or a hot water bottle wrapped in a cloth. Then gently express some breast milk (*Protocol #19: Expressing and Storing Breast Milk*).
    - Stimulate the nipples. Gently roll the nipples between the index finger and thumb for several minutes or until the letdown reflex occurs. Then gently express some breast milk (*Protocol #19: Expressing and Storing Breast Milk*).

During expressing, encourage the mother to:

- Visualize the direction of breast milk flowing out of her breast.
- Use a rhythmic motion that mimics the baby's suck rhythm.
- Massage her breast(s) as described above.
- Switch breasts several times during the expression, whenever the flow of breast milk decreases, if she is expressing one breast at a time. This will stimulate several letdown reflexes more effectively than continuously expressing each breast for a specified time.
- Be aware that she may only get a few drops when first learning to express, especially in the early days after birth, when her breasts are producing breast milk in small amounts.

Hand Expression

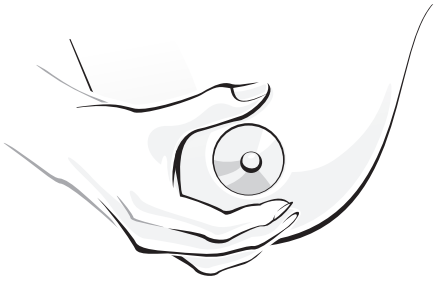
Encourage the mother to:

- Wash her hands with soap and water.
- Have a clean, dry bowl or glass measuring cup ready to collect the expressed breast milk.
- Stimulate the letdown reflex as discussed above, especially if her breasts are engorged.
- Gently massage her breasts to soften them and to encourage the breast milk to move down toward the areola. She may try one or more ways to massage her breasts. For example, some women massage their breasts in a warm shower or bath. Some women may use their fingertips; others may support their breast with one hand while stroking the breast with the other hand.
- Place the thumb and fingers about 1–1½ inches

behind the nipple or along the edge of the areola. The thumb and fingers are on opposite sides of her breast (see the diagram *Position for Hand Expression* below).

- Massage using small circles to rotate all around her breast.
- Push straight back towards the chest wall.
- Gently compress the breast between the thumb and fingers and roll the fingers toward her nipple; then relax her fingers. If no breast milk comes, shift the thumb and finger placements either further from or closer to the nipple and compress again; this will help the mother identify the sweet spots or ducts that will yield breast milk (Mohrbacher, 2010). Rotate her fingers and thumb around the breast.
- Repeat the above procedures in a rhythmic motion that mimics the rhythm of the baby's suck, e.g., position, push back, compress and/or roll, relax.
- Some practitioners may suggest that mothers compress their fingers using a pulsating motion.
- Switch breasts whenever the flow of breast milk decreases, which may occur several times during the expression. This will stimulate several letdown reflexes more effectively than continuing on one side for a set time before switching.
- Rotate the thumb and fingers in different positions around the nipple to ensure that all the breast milk ducts are emptied.
- Expect that it may take about the same time as it does to breastfeed, about 20 minutes or more, to effectively hand express at the beginning. It may become faster once she is more proficient.

(Source: Adapted from Riordan, 2010; Biancuzzo, 2003; Mohrbacher, 2010.)



Position for Hand Expression

Push Back

Compress and/or Roll Forward

Breast Pumps

Encourage the mother to:

- Wash her hands with soap and water.
- Assemble the breast pump according to the manufacturer's instructions.
- Moisten her breast with water before positioning the breast shield over the nipple to help create a better seal.
- Position the breast shield on her breast so that it is centred over the nipple.

For electric breast pumps, set the pump to the lowest setting before turning it on. The mother can gradually increase the setting during the pumping session. Inform the mother that an increased setting that causes her discomfort can inhibit the letdown reflex. The pump should also be kept on the minimal setting if the mother's breasts are engorged. Once the areola has softened, the mother can gradually increase the setting according to comfort. Using

a setting that is too high may contribute to nipple trauma. The container should be changed when it is three quarters full to prevent breast milk from backing up into the pump.

Pump each breast until the breast is effectively drained, or just until softened if pumping to relieve engorgement:

- Double pumping is recommended, if possible, as this will decrease the pumping time in half and increase the mother's prolactin levels.
- If the mother is single pumping, encourage her to switch breasts whenever the flow of breast milk decreases, which may occur several times during the pumping session. This will help to stimulate several letdown reflexes.
- When finished, the breast shield should be slowly and carefully removed from her breast.

Cleaning Instructions for Breast Pumps and Collection Equipment

For Healthy Full-Term Babies at Home

- Wash your hands with soap and water before touching the breast milk containers.
- **Prior to first use**, sterilize all pump parts that come in contact with your breast or breast milk. Sterilization may not be necessary if you have purchased a pump that indicates that it is already sanitized or sterilized.
- Sterilization can be achieved by boiling pump parts for ten minutes, by using an electric sterilizer, by using a sterilizer made for the microwave, or by washing them in the top rack of a dishwasher.
- **After each use**, rinse all pump parts in cool water to remove breast milk residue and then wash them with hot water and mild soap or detergent. Avoid using bottle brushes, abrasives or chemicals because they might scratch or damage the pump parts. Rinse the pump parts thoroughly with clear water and air dry them on a clean towel or dish rack. Cover parts with a clean towel when not in use. Avoid storing wet or damp parts.
- Cleaning the tubing is necessary only if condensation or breast milk appears in the tubing. If condensation appears in the tubing, continue running the pump for another 1–2 minutes. If breast milk gets in the tubing, remove the tubing from the pump, wash in warm soapy water and rinse in cold, clear water. To dry, shake out the droplets and hang to air dry or reattach the tubing and run the pump for 1–2 minutes.

For Premature or Hospitalized Babies/Mother and/or Babies with Candidiasis

- All breast pump and collection parts should be sterilized after each pumping session (hospital policies may vary).
- At home, the parts should first be washed in hot soapy water and rinsed in hot water. The pump parts should then be boiled in a covered pot of boiling water for 10 minutes, then removed from the pot to air dry (*Protocol #15: Candidiasis (Thrush) and CPSO, 2005*).

Frequency of Breast Milk Expression

- If breastfeeding is stopped for any length of time, encourage the mother to express each breast on a regular basis in order to maintain breast milk supply. Generally, this is at least 8 times a day, with a minimum of 1 expression overnight. The mother may need to express more often if her breasts become uncomfortable or full. A rented hospital-grade electric breast pump is the most effective device for maintaining breast milk supply if breastfeeding is stopped for any length of time.
- During the first 24 hours, if the baby is not effectively transferring breast milk, expression should be initiated, beginning within 6 hours of birth and continuing 8 or more times in 24 hours to promote establishment of lactation (BFI Step 6, BCC, 2011). The preferred method is hand expression during the first 24 hours after birth.

Storage of Breast Milk

Provide the mother with information regarding the storage of breast milk.

Containers for Storing Breast Milk in the Refrigerator or Freezer

- Glass or BPA-free hard plastic containers with an airtight lid should be used. Most mothers use containers manufactured specifically for breast milk collection, but small jars and bottles with lids, such as Mason jars, may be used. The mother can also use specially manufactured breast milk freezer bags.
- Disposable bottle liners should be avoided because

they are made from a thin plastic that may break when frozen. These bags also do not have an airtight seal and can contaminate the breast milk or leak. Bottle liner bags are made for bottle feeding and not for storage.

Note: If most of the baby's nutrition is from expressed breast milk, glass containers are the first choice for freezing, followed by hard plastic containers. Fewer antibodies are lost with glass than with plastic when freezing breast milk.

Cleaning Instructions for Storage Containers

For Healthy Full-Term Babies at Home

- Containers should be washed in hot soapy water, then rinsed in hot water and allowed to air dry. Once the containers are dry, they should be covered and stored in a dry, clean area away from food preparation until they are needed.

For Premature or Hospitalized Babies/Mothers and/or Babies with Candidiasis

- Containers should first be washed in hot soapy water and rinsed well in hot water. They should then be boiled in a covered pot of boiling water for 10 minutes, and removed from the pot to air dry. In the hospital, sterilized containers may be provided.

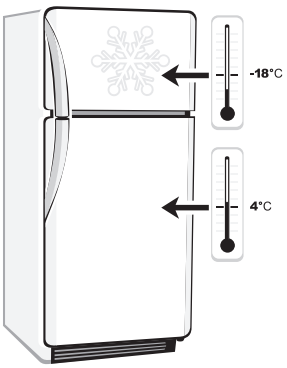
Storage Tips

Encourage the mother to:

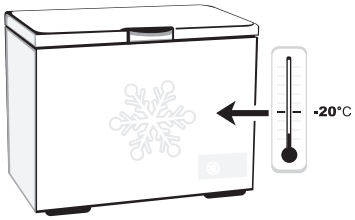
- Refrigerate or chill freshly expressed breast milk within 1 hour of expression if it is not going to be used within 6–8 hours.
- Expressed breast milk left at room temperature for more than 6–8 hours should be discarded.
- Store breast milk in small portions to minimize waste, e.g., 60–120 ml (2–4 ounces).
- Combine smaller amounts of chilled breast milk expressed on the same day to get the desired amount.
- Always chill freshly expressed breast milk before adding it to frozen breast milk. This will prevent the frozen breast milk from thawing, and prevent potential bacterial growth.
- Place the breast milk at the back of the fridge or freezer, where it is coldest.
- When freezing, leave a 1 inch space at the top of the storage container or breast milk freezer bag because breast milk will expand when frozen. If a breast milk freezer bag is used, remove as much air as possible from the bag. Label each container with the date and time. Add the child's name if being used outside of the home.

Storage Times

- Room Temperature: ≤ 25°C or 77°F for 6–8 hours.
- Insulated cooler with ice pack: 24 hours.
- Refrigerator: ≤ 4°C or 40°F: 5 days



Freezer of a refrigerator
–18°C or 0°F:
3–6 months



Chest or Upright freezer
–20°C or –4°F:
6–12 months

(*Source: Adapted from ABM, 2010 and TPH, 2011)*

Thawing Frozen Breast Milk

- Check the date on the container to make sure that the storage time has not expired (see previous section on *Storage Times*). Any expired breast milk should be discarded.
- Use the container with the earliest date first.
- Thaw the frozen breast milk by using one of the following techniques:
  - Place the container in the refrigerator for 4–24 hours;
  - Place the container under running water or in a bowl of water. Do not permit the tap or water to touch the opening of the container.

Caution: Frozen breast milk should never be left to thaw at room temperature, as this will increase the bacterial count in the breast milk.

- Do not thaw frozen breast milk on the stove top or in a microwave. Extreme heat from the stove or microwave will destroy vitamin C and antibodies in breast milk.
- Use the thawed breast milk immediately or store it in the refrigerator for no longer than 24 hours.
- Never refreeze thawed breast milk.
- Shake the thawed breast milk. Breast milk that has been frozen and thawed will separate into layers, with the fat rising to the top. The breast milk can be gently shaken or mixed before it is fed to the baby. Thawed breast milk may have a different smell and taste than freshly expressed breast milk. It is still safe for use if the date of the thawed breast milk has not expired.
- Warm the thawed breast milk by placing it in a bowl of warm water. Do not heat it in a microwave.
- The warmed breast milk should then be used within an hour. Do not return to the fridge after it has been warmed. It can be offered using an alternative feeding method *(Protocol #18: Alternative Feeding Methods)*.

General Principles

The establishment of a healthy breast milk supply requires early breast stimulation and frequent removal of breast milk from the mother's breasts, beginning soon after birth (*Protocol #1: The Initiation of Breastfeeding*). Early and frequent breast stimulation causes the mother's blood prolactin levels to rise, which contributes to increased breast milk production (see *How the Breast Works*).

When breast milk is not regularly removed from the mother's breasts, the mother may be at risk for developing complications such as engorgement, plugged ducts, mastitis, and decreased breast milk supply. In addition, unrelieved engorgement may cause the mother's breast milk supply to decrease (*Protocol #5: Engorgement*).

Elicit the letdown or breast milk ejection reflex before initiating any method of breast milk expression (Riordan, 2010).

If the baby is not frequently and effectively breastfeeding, the expression of breast milk will be necessary to either establish or maintain a breast milk supply. Breast milk expression may be achieved by hand or with a mechanical device such as a breast pump.

Hand expression is a foundational skill for the breastfeeding mother, and is particularly important in the first 24 hours postpartum, when the volume of breast milk is very small. It is recommended that all mothers know how to hand express prenatally (BFI Step 3, BCC, 2011) or before they leave hospital (BFI Step 5, BCC, 2011). Waiting until the last few weeks of pregnancy (37+ weeks) to practice hand massage of the mother's breasts will decrease any potential risk of triggering preterm labour.

It is easier to see a positive output with hand expression for a small volume of breast milk. The volume may be too small to collect in the reservoir of a mechanical pump. This may negatively impact the mother's breastfeeding self-efficacy, leading her to believe that she is not able to produce enough breast milk. It can be more affirming for the mother to express her breast milk into a small reservoir, such as a medicine cup or shot glass.

A recent qualitative descriptive study reflects a concern expressed by some lactation experts that there is a growing over-dependence on breastfeeding technology by both practitioners and parents (Buckley, 2009). Buckley interviewed experienced lactation consultants (LCs), who observed that with increased medical interventions and technology in births, there has been an increased use of breast pumps, as a consequence. She reported a perception that pump use increased a mother's control over feedings. In addition, it quantifies breast milk. Some mothers plan to purchase breast pumps prior to birth, in anticipation and expectation that they will need them, and before they know specifically how they will use them. The assumption that a pump is needed can further undermine a mother's breastfeeding self-efficacy.

Double pumping (pumping both breasts at the same time) with a hospital-grade electric breast pump is the most effective method for increasing or maintaining breast milk supply if breastfeeding is stopped for any length of time. Double pumping also decreases pumping time by half and increases the mother's blood prolactin levels when compared to single pumping or pumping one breast at a time (Neifert & Seacat, 1985 in Riordan, 2010).

The suction from the breast pump removes breast milk but does not completely empty the breast. Combining pumping and breast massage has been shown to increase breast milk production in research conducted by Jane Morton, MD, Stanford University, and

Lucile Packard Children's Hospital. She found that using both breast massage and "hands-on pumping" increased a mother's average daily volumes by 48% (Morton et al., 2009).

Breast milk expression is physical as well as psychological in nature. When the mother expresses breast milk, the physical cues that she would receive from her baby for a letdown reflex to occur are absent. The mother needs to understand that breast milk expression does not replicate putting her baby to her breast to remove breast milk. She will need continued support and practice to successfully express breast milk.

Chilled or thawed previously frozen breast milk may be reported to be sour, rancid, or have a soapy odour, and may be rejected by the infant. This has been attributed to a change in the lipid structure during the freeze-thaw process, but does not mean that the breast milk is spoiled or unsafe. Some women may have more lipase activity than others. Lawrence reports that when these mothers heated their breast milk to scalding (not boiling) prior to chilling the effect was not apparent and the breast milk was accepted by their infants (Lawrence, 2010). To avoid the disappointment of discarding large amounts of expressed breast milk, a mother could first chill a small amount of expressed breast milk to ensure that it does not smell or taste rancid before planning to freeze large amounts of it.

Storage times recommended for breast milk depend on when the breast milk will be used, the conditions under which it is collected and stored, and a balance between preventing contamination and protecting the physiochemical and antibacterial properties of breast milk. Most contamination of stored breast milk occurs during collection regardless of how it is stored (Orgundele, 2002).

- Breast milk should be refrigerated or chilled within 1 hour of expression if it will not be used within 6–8 hours.
- Breast milk should be frozen immediately if it will not be used within 5 days.

Room Temperature – Although the recommended storage times for breast milk at room temperature vary from 4 hours at 25°C (77°F) to 24 hours at 15°C (59°F) (Hamosh, 1996), up to 8 hours (Ogundele, 2002) and up to 10 hours at 19–22°C (66–71° F) (Barger & Bull, 1987 in Mohrbacher, 2010), the Academy of Breastfeeding Medicine recommends storage at 6–8 hours at room temperatures from 16–29°C (60–85°F) under very clean conditions (ABM Protocol #8, 2010).

Refrigerator – Similarly, there is variability in the recommended times for refrigerator storage of breast milk. Pardou (1994) found that storage at 0–4°C was safe for up to 8 days, Health Canada proposed 3 days in its updated *Nutrition for Healthy Term Infants* (Health Canada, 2012), and Lawrence recommends 48 hours in the refrigerator (Lawrence, 2010). The Academy of Breastfeeding Medicine recommends that breast milk may be safely stored in a refrigerator for up to 72 hours in optimal conditions (not defined), or for up to 5 days if it is collected under very clean conditions (ABM, 2010). Toronto Public Health recommends that the refrigerator temperature be ≤ 4°C or 40°F (TPH, 2011). Breast milk should be stored at the back of the refrigerator, furthest away from the door.

Freezer – The type of freezer determines the recommended storage times for frozen breast milk. A freezer with a separate door is able to maintain a more stable temperature. The less frequently a freezer is opened, the longer the breast milk can be stored safely. A deep freezer, chest, or upright freezer at ≤ –20°C or –4°F can safely store breast milk for 6–12 months. A refrigerator/freezer with separate doors at ≤ –18°C or 0°F will store breast milk safely for 3–6 months. A freezer compartment located within a fridge can store frozen breast milk for only 2 weeks (CDC, 2010) because the door opens frequently and the temperature varies. Breast milk should be stored at the back of the freezer, furthest away from the door.

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