

SECTION 4

INFANT NUTRITION



TABLE OF CONTENT

- 4.0 Infant Nutrition
 - 4.0.1 Introduction
 - 4.0.2 Purpose
 - 4.0.3 Objectives
- 4.1 Nutritional Needs of Infants
 - 4.1.1 Macronutrients
 - 4.1.2 Vitamins and Minerals
 - 4.1.3 Water
- 4.2 Development of Feeding Skills
 - 4.2.1 Ways to Develop a Positive Feeding Relationship
- 4.3 Breastfeeding
 - 4.3.1 Benefits of Breastfeeding
 - 4.3.2 Making the Decision to Breastfeed
 - 4.3.3 The Basics of Breastfeeding
 - 4.3.4 Breastfeeding Techniques and Tips
 - 4.3.5 Feeding Patterns
 - 4.3.6 Feeding Cues
 - 4.3.7 Common Breastfeeding Problems
 - 4.3.8 Breastfeeding Aids and Devices
 - 4.3.9 Breast Milk Expression, Storage and Warming
 - 4.3.10 Use of Cigarettes, Alcohol and Other Drugs during Breastfeeding
 - 4.3.11 Weaning
- 4.4 Infant Formula Feeding
 - 4.4.1 Types of Infant Formula
 - 4.4.2 Feeding Patterns and Techniques
 - 4.4.3 Purchasing, Preparing and Storing Infant Formula
- 4.5 Complementary Feeding
 - 4.5.1 Introducing Complementary Food
 - 4.5.2 Infant Meal Patterns
 - 4.5.3 Preparing Infant Foods at Home
 - 4.5.4 Purchasing, Serving and Storing Store-bought Infant Food
 - 4.5.5 Use of Specific Types of Food
 - 4.5.6 Choking Prevention
- 4.6 Common Gastrointestinal Problems
 - 4.6.1 Spitting Up
 - 4.6.2 Gastroesophageal Reflux (GER)
 - 4.6.3 Vomiting
 - 4.6.4 Diarrhea
 - 4.6.5 Constipation
 - 4.6.6 Colic

- 4.7 Oral Health
 - 4.7.1 Oral Care for Infants
 - 4.7.2 Teething Tips
 - 4.7.3 General Prevention of Tooth Decay
- 4.8 Preventing Obesity
- 4.9 Self-Test Questions
- 4.10 References
- 4.11 Resources

4.0 INFANT NUTRITION

4.0.1 Introduction

Good nutrition is essential for the growth and development that occurs during an infant's first year of life. When developing infants are fed the appropriate types and amounts of food, their health is promoted. Positive and supportive feeding attitudes and techniques demonstrated by the caregiver help infants develop healthy attitudes toward food.

Throughout the first year, many physiological changes occur that allow infants to consume food of varying composition and texture. As an infant's mouth, tongue and digestive track mature, the infant shifts from being able to only suckle, swallow, and take in liquid food, such as breast milk or infant formula, to being able to chew and receive a wide variety of complementary food. At the same time, infants progress from needing to be fed to feeding themselves. As infants mature, their food and feeding patterns must continually change.

4.0.2 Purpose

The purpose of Section 4 is to teach the importance of nutrition in the growth and physical and intellectual development of an infant.

4.0.3 Objectives

Upon completion of Section 4, you will be able to:

1. State several major nutrients that are considered to be of public health significance to infants in the United States.
2. Identify infant hunger and satiety cues in relationship to developmental readiness skills.
3. Identify factors that affect a woman's decision to breastfeed.
4. Identify methods to support breastfeeding mothers in the WIC clinic.
5. Identify characteristics of breast milk and explain how to maintain a good milk supply.
6. Provide basic breastfeeding information and techniques that can help mothers have a successful breastfeeding experience.
7. Specify common breastfeeding problems and indicate measures to provide relief to the breastfeeding woman.
8. Identify when it is necessary for a woman to express breast milk and how to store and warm expressed breast milk.
9. Identify the risks and counseling recommendations for use of caffeine, alcohol, drugs and tobacco during lactation.
10. Identify the different types of infant formula available and under what condition they are used.
11. Identify how to purchase, prepare and store infant formula.
12. Identify when an infant should be fed complimentary food, including how to introduce food, how much and how often to feed.
13. Explain how to prepare infant food at home.
14. State how to purchase, serve and store commercial infant food.

15. Identify common gastrointestinal problems an infant may experience and counseling recommendations.
16. Identify general prevention of tooth decay and proper cleaning of infant teeth.
17. Identify safe sleep guidelines.

4.1 NUTRITIONAL NEEDS OF INFANTS

The following section provides information on essential nutrients, including major nutrients considered to be of public health significance for infants in the US. Food sources, functions of and special concerns for these nutrients are discussed.

4.1.1 Macronutrients

ENERGY

- Energy needs (calories) and growth patterns of infants are individual. The best indicator that an infant is getting enough calories is his growth rate in length, weight and head circumference. An infant's growth should be evaluated by plotting his anthropometric data on a Centers for Disease Control and Prevention (CDC) growth chart.
- In general, most healthy infants double their birth weight by 6 months of age and triple it by 12 months of age. However, there are normal differences in growth between healthy breastfed infants and formula fed infants during the first year of life. After 3 months of age, the rate of weight gain in the breastfed infant may be slower than that of formula-fed infants, but differences are generally not reported between these infants for length and head circumference. Ultimately, each infant's growth must be individually assessed.



CARBOHYDRATES

- Carbohydrates are the body's primary energy source to fuel normal day-to-day activities. Infants need carbohydrates to gain weight and grow properly.
- The primary carbohydrate normally consumed in early infancy is lactose, the carbohydrate source in breast milk and cow's milk-based infant formula. For infants who cannot tolerate lactose or galactose (a component of lactose), a lactose-free infant formula will need to be prescribed. The carbohydrate source in lactose-free formula is sucrose, corn syrup solids or tapioca starch.
- Some fruit juices, especially apple, pear, white grape and prune juice contain sugars that can cause diarrhea in infants. They should not be given until after 6 months of age and limited to 4 to 6 ounces per day.
- During the second six months of life, infants should be gradually introduced to fiber containing foods, such as whole grain cereals, fruits, vegetables and legumes.

PROTEIN

- Protein is necessary for building, maintaining and repairing tissues, producing enzymes, hormones, antibodies and other components and performing very specialized functions in regulating body processes.
- Breast milk and infant formula are good sources of protein. No additional protein sources are needed in the first 6 months of life. Protein sources that can be added as complementary foods are introduced include meat, poultry, fish, egg yolks, cheese, yogurt and legumes.
- In developing countries, infants deprived of adequate types and amounts of food for long periods of time may develop kwashiorkor, resulting primarily from protein deficiency; marasmus, resulting from inadequate energy intake; or maramus-kwashiorkor, resulting from both a deficiency of calories and protein. In the United States, very few infants suffer from true protein deficiency and cases of kwashiorkor are rare.



LIPIDS

- Lipids comprise about 50 percent of the calories in breast milk and infant formula.
- Lipids are needed for the absorption of the fat-soluble vitamins A, D, E and K.
- Lipids provide essential fatty acids required for normal brain development, healthy skin and hair, normal eye development and resistance to infection and disease.
- Fat and cholesterol should not be limited in the diet of infants or children less than 2 years of age.

4.1.2 Vitamins and Minerals

VITAMIN D

- Vitamin D is manufactured in the skin by action of ultraviolet light (the sun) on chemicals naturally present in the skin. The dietary requirement for vitamin D depends on the amount of sunlight exposure.
- Vitamin D is added to infant formula and cow's milk. Fish, liver and egg yolk are also sources of this vitamin.
- Infants who are breastfed and do not receive supplemental vitamin D or adequate sunlight exposure are at increased risk of developing vitamin D deficiency or rickets. Due to concerns that sunlight exposure may increase one's risk of skin cancer, the American Academy of Pediatrics (AAP) recommends that all breastfed and partially breastfed infants be supplemented with 400 IU per day of vitamin D daily, beginning in the first few days of life and continuing through infancy, unless weaned to 1 liter (1 quart) of infant formula. Advise caregivers to consult their health care provider regarding vitamin D supplementation.
- Infants with dark skin tones, such as African American infants, are at increased risk for vitamin D deficiency as people with dark and pigmented skin are less efficient at producing vitamin D.

VITAMIN K

Vitamin K is manufactured by bacteria normally found in the intestine. This process is not fully developed in the early stages of an infant's life. Since breast milk is normally low in vitamin K, exclusively breastfed infants are at risk of developing a fatal brain hemorrhage due to vitamin K deficiency. Therefore, it is recommended that all infants be given an intramuscular injection of vitamin K at birth, regardless of the mothers' plan to breast or formula feed. No requirement for vitamin K supplementation of breastfed infants after hospital discharge has been established, but some experts recommend that mothers be supplemented while they are breastfeeding.

VITAMIN B₁₂

Vitamin B₁₂ status at birth is strongly associated with the mother's vitamin B₁₂ status and the number of previous pregnancies. Signs of B₁₂ deficiency in infancy include failure to thrive, movement disorders, delayed development and megaloblastic anemia.

Special Considerations for Breastfed Infants

Exclusively breastfed infants' vitamin B₁₂ intake depends on the mother's intake and stores. Vitamin B₁₂ concentrations in breast milk are adequate as long as the maternal diet is adequate. However, infants of breastfeeding mothers on strict vegetarian (vegan) diets or of mothers who limit dairy products, meat or eggs are at risk for developing vitamin B₁₂ deficiency. In these infants, B₁₂ status may be abnormal by 4 to 6 months of age. It is recommended that breastfeeding infants of vegan mothers be supplemented from birth with vitamin B₁₂. Vitamin B₁₂ is also a concern for an infant on a strict vegetarian or vegan diet and supplementation is indicated. Advise caregivers to consult their health care provider regarding B₁₂ supplementation. Section 6 of this manual provides more information on vitamin B₁₂ deficiency.

IRON

The AAP carefully reviewed the need for iron supplementation in infancy.

To ensure adequate iron intake, the AAP recommends the following:

- Full-term, appropriate for gestational age breastfed infants need a supplemental source of iron starting at 6 months of age (approximately 1 mg/kg/day), preferably from complementary food. Iron-fortified infant cereal and/or meats are good sources for initial introduction.
- An average of two servings of iron-rich complementary foods (½ oz or 15 g of dry cereal per serving), in addition to breast milk or infant formula, are needed to meet an infant's daily iron requirement.
- If a full-term, breastfed infant is unable to consume sufficient iron from dietary sources after 6 months of age the caregiver should be referred to a health care provider for advice on iron supplementation.
- All formula-fed infants should receive only iron-fortified infant formula during the first year of life.
- No common medical indication exists for the use of a low-iron infant formula. The AAP has recommended discontinuation of the manufacturing of low-iron formula and that all infant formulas contain at least 4 mg/L of iron. Although

some believe that iron-fortified infant formula increases gastrointestinal symptoms, no scientific evidence supports this belief.

- Infants should not drink cow's milk, goat's milk, or soy beverages (other than soy based formula) because they contain a small amount of iron that is poorly absorbed by infants. Consumption of these milks may lead to iron deficiency anemia.

See Section 6 of this manual on Iron Deficiency Anemia for more information about iron.

FLUORIDE

When fluoride is consumed at appropriate levels, it decreases the teeth's susceptibility to dental caries (tooth decay). Since continued exposure to fluoride throughout one's lifetime is effective in reducing the prevalence of dental caries, many communities add fluoride to the water supply.

If fluoride content of the drinking water is unknown, the water should be tested or alternate sources of fluoridated water should be found. The majority of bottled waters do not contain adequate fluoride to meet daily needs. Bottled waters manufactured and marketed specifically for infants may contain fluoride and must be labeled as such. In some cases, fluoride in these products may exceed the safe amount for an infant to ingest if used to prepare infant formula. Advise caregivers to discuss use of these products with a health care provider.

Recommendations for fluoride supplementation depend on the total amount of fluoride available to the infant from all food sources, including infant formulas, water and commercially and home-prepared infant food. The AAP, the American Academy of Pediatric Dentistry (AAPD) and the CDC recommend infants under 6 months of age not receive fluoride supplementation. For infants older than 6 months, whose community water contains <0.3 ppm fluoride, supplementation of 0.25 mg sodium fluoride/day may be recommended.

Fluoride Considerations for Breastfed Infants

Breast milk contains little fluoride even in areas with fluoridated water. Since fluoride intake during the first 6 months does not affect the development of dental caries, no supplementation is indicated. It should also be noted that fluoride supplementation may not be appropriate for older breastfed infants who are consuming either fluoridated drinking water, infant formula mixed with fluoridated water or complimentary food (beverages and solids) prepared with fluoridated water. Given the above controversies and concerns, caregivers of exclusively or partially breastfed infants should consult their health care provider for advice on fluoride.

Fluoride Considerations for Formula-Fed Infants

The amount of fluoride provided from concentrated or powdered infant formula depends on the amount of fluoride in the infant formula and in the water used for mixing. Ready-to-feed infant formulas are manufactured with non-fluoridated water. Infants receiving ready-to-feed infant formula as well as concentrated or powdered infant formula in areas where the water is not

fluoridated may receive little or no fluoride. Infants fed infant formula made with fluoridated water may receive up to 1.0 mg/day of fluoride. Given the variability of exposure to fluoride from infant formula and water used for mixing, caregivers should consult their infant's health care provider for advice on fluoride.

Remind caregivers, when providing vitamin or mineral supplements to infants, to follow the instructions carefully and to use the dropper that comes with the product. Ensure the dropper is marked so that the units of measure are clear and that the units of measure correspond to those on the instructions.

4.1.3 Water

Under normal circumstances, the water requirement for healthy infants fed adequate amounts of breast milk or properly reconstituted infant formula is met through breast milk or infant formula intake.

- Instruct caregivers to follow correct infant formula preparation procedures. Mixing formula improperly so that it is either too concentrated or too diluted can be very harmful to an infant.
- Commercially available “nursery” water, plain water or other liquids (e.g., fruit juices; soda; diluted fruit punches, drinks or ades; tea; broth; or gelatin water) should not be used to treat diarrhea, fever, vomiting or any other illness. Refer caregivers to their infant's health care provider.

WATER INTOXICATION

Water intoxication can occur in either breastfed or formula-fed infants fed excessive amounts of water. This condition can develop in infants who consume over-diluted infant formula, are force-fed water or are fed bottled water in place of breast milk or infant formula. This condition, while preventable, can be life threatening to an infant. Symptoms of this condition include irritability, sleepiness, hypothermia, edema and seizures. Infants fed excessive water will not receive adequate calories to meet their needs for growth and development.

- Instruct caregivers to not substitute water or diluted beverages (fruit juice, sweetened beverages, tea, etc.) for feedings of infant formula or breast milk. Water should not be offered to an infant after breastfeeding or infant formula feedings. These practices can lead to water intoxication which can be life threatening for an infant.
- Infants should not be allowed to drink at will from a bottle of water or dilute liquid all day or for extended periods. Young infants need to be fed a sufficient amount of breast milk and/or infant formula and appropriate complementary food to meet their calorie and other nutrient needs.
- If a caregiver's water comes from a private or community well, they should have their water tested annually for contaminants.

4.2 Development of Feeding Skills

An infant's developmental readiness determines the type and texture of food to feed and which feeding style to use. Each infant



develops at his or her own rate. Although age and size often correspond with developmental readiness, these should not be used as the only factors considered when deciding what and how to feed an infant.

- A good feeding relationship exists when an infant can express his or her needs and the caregiver responds to them. Developing a good feeding relationship is important to an infant’s growth and development. When this relationship is not going well, infants can either be underfed or overfed.
- Caregivers need to learn and pay attention to their infant’s hunger and satiety cues.

Table 1 Infant Hunger and Satiety Cues		
Infant’s Approximate Age	Hunger Cues	Satiety (Fullness) Cues
Birth through 5 months	<ul style="list-style-type: none"> ▪ Wakes and tosses ▪ Sucks on fist ▪ Cries or fusses ▪ Opens mouth while feeding to indicate wanting more 	<ul style="list-style-type: none"> ▪ Seals lips together ▪ Turns head away ▪ Decreases or stops sucking ▪ Spits out the nipple or falls asleep when full
4 through 6 months	<ul style="list-style-type: none"> ▪ Cries or fusses ▪ Smiles, gazes at caregiver or coos during feeding to indicate wanting more ▪ Moves head toward spoon or tries to swipe food towards mouth 	<ul style="list-style-type: none"> ▪ Decreases rate of sucking or stops sucking ▪ Spits out the nipple ▪ Turns head away ▪ Distracted or pays more attention to surroundings
5 through 9 months	<ul style="list-style-type: none"> ▪ Reaches for spoon or food ▪ Points to food 	<ul style="list-style-type: none"> ▪ Eating slows down ▪ Clenches mouth shut or pushes food away
8 through 11 months	<ul style="list-style-type: none"> ▪ Reaches for food ▪ Points to food ▪ Gets excited when food is presented 	<ul style="list-style-type: none"> ▪ Eating pace slows ▪ Pushes food away
10 through 12 months	<ul style="list-style-type: none"> ▪ Expresses desire for specific food with words or sounds 	<ul style="list-style-type: none"> ▪ Shakes head to say “no more”

4.2.1 Ways to Develop a Positive Feeding Relationship

Caregivers need to be sensitive to their infant’s hunger, satiety and food preferences. They should act promptly and appropriately to meet their infant’s feeding needs. It is best to avoid rigid feeding schedules. An older infant can be offered food at around the time when he or she usually eats but, in general, the caregiver should watch for the infant to indicate hunger. Feeding at specific intervals may be necessary if an infant has certain medical conditions or is a sleepy infant who needs to be awakened to feed.

- Food should be offered in a positive and accepting fashion without forcing or enticing the infant to eat.
- Infants are biologically capable of regulating their own food intake to meet their needs for growth. Their diets may vary in the amount and types of food eaten each day.

FEEDING ENVIRONMENT

The environment in which feeding occurs is also important in establishing a positive feeding relationship.

- A comfortable place should be designated in the home for feeding.
- Caregivers should be calm and relaxed during feedings. Caregivers need to have patience and take time to communicate with and learn about their infant during feeding.
- Caregivers should show their infant lots of love, attention, and affection in addition to feeding. Reassure parents that doing so will decrease fussiness and will not "spoil" the infant.
- In some instances, social and financial problems within a household may cause anxiety with detrimental effects on the interaction and feeding relationship between caregiver and infant—this can lead to failure to thrive in an infant.

4.3 Breastfeeding



Breast milk is the optimal food for infants. The AAP and many other authorities on infant feeding recommend exclusive breastfeeding for the first six months of life and continued breastfeeding up to 1 year and beyond. Breastfeeding helps to establish a secure loving relationship between a mother and her infant and offers many other positive benefits. For this reason, breastfeeding should be actively promoted and supported as the most desirable method of infant feeding.

4.3.1 Benefits of Breastfeeding

For the infant, breast milk or breastfeeding:

- Provides the right balance of nutrients to support the infant's growth and development. These nutrients are provided in a form that is easy to digest and absorb. Breast milk composition changes over time to meet the infant's changing nutritional needs.
- Is sanitary and at the right temperature all the time.
- Provides skin-to-skin contact that is important for making the infant feel secure and loved.
- Contains unique bioactive factors that improve the infant's immune system and protects against illnesses, including gastrointestinal and respiratory illnesses and ear infections.
- May be associated with improved cognitive development.
- May have a protective effect against childhood obesity.

For the mother, breastfeeding:

- Helps speed the recovery from childbirth and may suppress ovulation.
- May protect against breast and ovarian cancer.

- Is less expensive, more convenient and takes less time than bottle-feeding.
- Stimulates hormones that make mothers feel more relaxed and at peace.

4.3.2 Making the Decision to Breastfeed

Factors that affect a mother's decision to breastfeed include the attitudes of health care providers; the mother's support network; hospital practices, such as providing infant formula to breastfeeding newborns; a mother's personal experience; and workplace environment. Mothers typically know that breastfeeding is the best way to feed their infants, however, they may not know about the personal health benefits associated with breastfeeding. Some mothers are challenged with combining breastfeeding with other competing demands and may focus on the barriers to breastfeeding rather than the benefits.

Research has shown that common barriers to breastfeeding are embarrassment, lack of social support, lack of time and competing demands on the mother.

- **Embarrassment** is the primary barrier for women of all backgrounds and in all regions of the country. Strategies to address embarrassment include teaching mothers how to breastfeed discretely, providing opportunities to discuss their concerns and reassuring them they are doing something good for their infant.
- **Lack of social support** has a major influence on the decision to breastfeed and on breastfeeding duration. Family and friends are often not aware of the importance of breastfeeding and how to be involved in the care and nurturing of a breastfed infant. Mothers should be encouraged to talk with their family and friends about breastfeeding and to invite them to attend prenatal classes to learn more about breastfeeding.
- **Time and competing demands** are a reality of life. New mothers can benefit from information on how breastfeeding can be successfully combined with other commitments in their busy lives.

SUPPORTING BREASTFEEDING MOTHERS

Breastfeeding mothers benefit from education, support and encouragement. Appropriate, accurate instruction and support can help women breastfeed successfully.

Some methods to support breastfeeding mothers in your clinic or program site include:

- Make a place or room available for mothers to breastfeed their infants when visiting a clinic or program site.
- Offer all breastfeeding mothers a list of professional and peer resources (e.g., WIC clinic breastfeeding coordinator, WIC peer counselors, public health nurses, breastfeeding mothers group, etc.) to contact for ongoing encouragement, information, breast pumps and assistance.
- Display culturally appropriate posters and materials on breastfeeding (do not display infant formula and materials with infant formula brand names and logos).
- Demonstrate positive attitudes towards breastfeeding and deliver positive and supportive breastfeeding messages.



- Provide education about the benefits of breastfeeding to individuals and groups. Use printed materials and audiovisuals on breastfeeding that portray breastfeeding as the preferred infant feeding choice and are appropriate to participants' cultural and ethnic background, language and reading level.
- Encourage the mother's family and friends to participate in breastfeeding education and support sessions.
- Coordinate breastfeeding support with other health care programs in your community.
- If your program is in a hospital clinic, encourage hospital practices that are supportive of breastfeeding.
- Have peer counselors and/or staff available who can provide regular and ongoing counseling and support services to breastfeeding women.

4.3.3 The Basics of Breastfeeding

MAKING A GOOD MILK SUPPLY

During pregnancy, the breasts undergo physiological and anatomical changes that enable them to produce milk for an infant. The breast has many parts, each with very specific functions that help the mother produce milk.

- Milk production occurs within the *alveoli*, which are grape-like clusters of cells located deep within the breast.
- Once the milk is produced, it is squeezed out through the alveoli into the *milk ducts*, which resemble highways, to transport the milk through the breast.
- Milk is released through openings in the nipple that many mothers cannot see until lactation begins.

The size of a woman's breasts does not affect her ability to breastfeed; women with small breasts produce the same quantity and quality of milk as those with larger breasts. A woman's breasts should increase in size from pre-pregnancy to after delivery. Typically the breasts double or triple in weight by the time a woman is near term. If a woman expresses concern that there is no change in the size of her breasts during pregnancy, refer her to her health care provider.

When the infant suckles, nerve endings inside the breast send a message to the brain. The brain then signals the pituitary gland to release two important hormones: prolactin, which causes the alveoli to begin making milk, and oxytocin, which causes the muscles around those cells to contract and squeeze the milk through the ducts. When milk is released it is called a "Milk Ejection Reflex," also known as "let down." Being relaxed helps oxytocin release milk, so the more relaxed and comfortable mom is the more milk available for her infant.



The infant also plays an important role in milk production through suckling at the breast and removing milk. When the infant is latched on correctly so that he or she has a mouth full of breast, the special nerve endings that signal the brain to release milk-producing hormones are stimulated. The infant also helps by removing milk. The more milk the infant removes, the more milk the mother will make. Length of time at the breast is not an indicator that the infant is

removing milk. Some infants are efficient at removing milk quickly, while others take longer. An incorrect latch may also hinder milk removal. If the infant cannot go to the breast soon after birth, the milk needs to be removed with a breast pump or through hand expression so the mother can establish good milk supply. Frequent breastfeeding or milk removal (8 to 12 times every 24 hours) helps mothers establish a good milk supply.

CHARACTERISTICS OF BREAST MILK

- **Infant's First Milk.** Colostrum, the milk first produced for an infant after birth, is thick and yellow. Although it is produced in limited quantity, it is rich in nutrients and antibodies the infant needs in the initial days following birth. Mothers should not express any colostrum from their breasts before giving birth. Pumping of the breasts may stimulate uterine contractions, risking premature delivery.
- **Transitional Milk.** This is the intermediate milk produced from about day 2-5 postpartum to two weeks postpartum. During the transition to mature milk, concentrations of fat, lactose, water-soluble vitamins and total calories increase, while protein, immunoglobulins, fat-soluble vitamins and minerals decrease.
- **Mature Milk.** This milk looks thinner than colostrum and is produced by 10 to 15 days after birth. Mature milk consists of foremilk and hind milk. Foremilk, the milk available at the beginning of a feeding, is watery or pale in appearance. Hind milk, the richer milk available toward the later part of the feeding, is more opaque and creamy. This thicker hind milk is high in fat and helps the infant feel full and sleepy. Some mothers may need reassurance that although their milk looks thinner than the richer-looking colostrum, mature milk is still full of nutrients for the infant.

4.3.4 Breastfeeding Techniques and Tips

This section reviews basic information and techniques that can help mothers have a successful breastfeeding experience. When a mother knows what to expect and how to handle common concerns, she can better prevent and cope with most breastfeeding problems that occur.

COMFORT DURING BREASTFEEDING

Breastfeeding is easier and more enjoyable when the mother and infant are able to breastfeed in a relaxed setting.

- Encourage mothers to find a comfortable place for breastfeeding.
- Special equipment is not necessary, but pillows and a footstool may help the mother get into a comfortable position and bring her infant closer to her breasts.
- In the early weeks postpartum, a mother may be more comfortable during breastfeeding if she has privacy and can relax with her infant. During this period, encourage mothers to take time to interact and learn about their infants.

FEEDING POSITIONS

The way a mother holds her infant and the infant's position on the breast can influence breastfeeding success. Incorrect positioning can make it difficult for an infant to suckle properly on the breast, result in inadequate milk consumption by the infant, and

lead to sore nipples. To help a mother learn feeding positions, demonstrate them using a doll.

There are three commonly used positions that assist an infant and mother to breastfeed comfortably. In these positions, the infant's ear, shoulder and hip should be in a straight line to enhance swallowing.

1. Lying down or side-lying

In this position, the mother lies on her side with pillows under her head and behind her back. The infant lies on his or her side facing the mother with his or her chest to the mother's chest and with the infant's mouth level with the nipple. Small pillows can be placed either under the infant's head to bring the infant's mouth to nipple level or under the mother's arm holding the infant. It is possible for a mother to breastfeed her infant from either breast in a reclining position without turning over. However, mothers may wish to roll to the other side and reposition the infant during the feeding. This position is typically recommended for a mother who has had a cesarean birth because it allows her to breastfeed without putting pressure on her incision.



2. Across the lap or cradle hold



In this position, the mother sits upright in a chair or couch with her back supported while holding her infant securely. The mother supports the infant's head with her arm and places the infant on his or her side with the infant's chest facing the mother's chest. It is easier for the mother to keep her infant at the level of her nipples if she places one or more pillows on her lap under the infant. Alternately, she could cross her legs and bring the infant up to nipple level with her raised leg. To prevent straining her back, the mother should avoid leaning down to the infant and instead bring the infant to her. This position may be useful for the infant who has difficulty latching on because the mother can easily guide the infant's mouth to the breast.

3. Football hold or clutch hold

In this position, the infant's torso is held on the side of the mother's body and supported by a pillow. The mother's forearm supports the infant's back and head. The infant's head is facing the mother's nipple and is supported by the mother's hand, which can raise the infant's head to the breast. It is best for the mother to avoid leaning down toward the infant (this could strain her back) or pushing the infant's head into her breast.



ATTACHMENT (LATCH-ON)

Encourage mothers of healthy infants to breastfeed as soon as possible after birth. Skin-to-skin contact between mother and baby at birth reduces crying, improves mother-baby interaction, keeps the baby warmer and helps women breastfeed successfully.

Before starting a feeding, it is advisable for mothers to wash their hands. It is recommended that mothers support their breast while breastfeeding by using the “C” hold. This hand position involves placing only the thumb on the top of the breast well behind the areola, with the other four fingers on the bottom of the breast to lift and support it. With the breast well supported, the nipple and breast can be easily directed into the infant's mouth. It is especially helpful for the mother to support the breast in this manner while breastfeeding the young infant.

Steps to initiate breastfeeding:

- Aim the infant’s mouth so his or her chin is touching the mother’s breast and the nose is aimed toward the top of the mother’s nipple.
- Stroke the infant’s lower lip with the nipple of the breast the mother is holding. The infant will respond by opening his or her mouth, ready to accept the nipple.
- When the mouth is wide open and the infant's tongue is down on the floor of the mouth, the mother should move the infant quickly onto the breast.
- Check that the infant has both the nipple and a large part of the areola in his or her mouth with his or her lips sealed around the areola. When the infant suckles in this position, the infant's gums press against the base of the areola causing the milk to eject into the mouth.
- If the infant is not attached correctly the first time, a mother may need to repeat the attachment procedure until a proper latch is achieved. Reassure the mother that sometimes she may have to try several times to get a good latch-on.
- If the infant is properly latched on, any pain or tenderness experienced during latch-on in the early weeks of breastfeeding should subside after the first 30 seconds to 1 minute.

An infant will not receive enough milk if suckling occurs while only the nipple is in his or her mouth. This is because an infant's mouth needs to rhythmically compress the milk-containing lactiferous sinuses, located under the mother's areola, in order to both draw the milk out and to provide the stimulation needed to bring on the milk ejection reflex. An infant's attempts at trying to breastfeed when attached only to the nipple may result in inadequate milk production and nipple soreness.

COMING OFF THE BREAST

Some infants will automatically come off the breast when they are finished breastfeeding. At the end of a feed, the infant will slow or stop suckling and his or her fists will relax. Some infants fall asleep. A mother can either wait until the infant stops suckling and comes off the breast, or she may break the suction between the mouth and breast by slipping a finger down into the corner of the infant's mouth alongside the gums until the release can be felt or heard. If a mother pulls her infant off the breast without breaking the suction first, she could hurt her nipple.

4.3.5 Feeding Patterns

FREQUENCY AND DURATION

Frequent breastfeeding helps to maintain and increase a mother's milk supply. Exclusively breastfed newborn infants should breastfeed 8 to 12 times in 24 hours. A newborn infant should not go longer than 2 to 3 hours during the day or 4 hours at

night without breastfeeding. If a newborn sleeps longer than 4 hours at night, she or he should be awakened to breastfeed. The time period between hospital discharge and the first well infant visit is critical for successfully establishing breastfeeding. If a newborn infant is breastfeeding fewer than 10 times per day and is not gaining weight properly, encourage the mother to breastfeed more frequently and offer both breasts at each feeding. The infant should be referred to a health care provider for assessment.

As an infant grows older, the amount of time between feedings will increase. Each infant establishes his own feeding pattern. Some infants breastfeed for shorter periods at more frequent intervals, while others feed longer and less often. After a usual feeding pattern is established, an infant may suddenly demand to be fed more frequently, e.g., during appetite spurts (resulting from growth spurts) or when teething. Also, the longer an infant sleeps at night, the more frequently they may demand to be fed during the day.

Daily breastfeeding patterns will vary from infant to infant, and an individual infant's breastfeeding pattern may change from day to day as he grows. Infants should be fed on demand, i.e., fed when they indicate hunger. Mothers should learn and follow their infants' feeding cues (e.g., comes off the breast spontaneously, falls asleep) in determining the length of each feeding. An infant's feeding period should not be restricted by time. Infants should be allowed to breastfeed for as long as they indicate the desire.

4.3.6 Feeding Cues

Crying is considered to be a late sign of hunger; mothers should be encouraged to begin feeding when the infant shows any of the following signs:

- Rooting reflex
- Hand-to-mouth activity (e.g., sucking on hands)
- Small fussing sounds
- Pre-cry facial grimaces
- Smacking lips

Healthy, full-term infants learn trust and feel secure when their mothers respond to feeding cues. Thus, putting healthy, exclusively breastfed infants on a strict feeding schedule is generally not recommended. Encourage mothers to watch their infants for hunger signs and put them to the breast when they see those signs. Remind mothers that it is normal for infants to have fussy times and cry when they are not hungry. They may cry because they need a diaper change, want to be held or want to suck.



NORMAL FULLNESS OF BREASTS

It is normal for a mother of a newborn infant to experience her breasts becoming larger, heavier and tender a few days after giving birth. This normal postpartum fullness is caused by an increased milk volume and blood flow to the breasts as well as temporary swelling of the breast tissue. Breastfeeding 8 to 12 times every 24

hours during the first few weeks after birth removes the colostrum and incoming milk so that painful engorgement will not develop. Engorgement hampers the infant's ability to latch on and breastfeed and may lead to poor weight gain in the infant. Normal fullness usually decreases within the first 2 or 3 weeks after birth if the infant breastfeeds frequently and unrestrictedly.

When the infant stops suckling on the first breast offered, the mother should gently remove the infant from the breast, burp the infant, and switch the infant to the other breast. Breastfed infants ingest less air during feeding than bottle-fed infants. However, it is generally recommended that breastfed infants be burped at least once after feeding on each breast. The infant may breastfeed on the second side as long as she or he is sucking effectively. Over the first 4 months, the average, exclusively breastfed infant feeds between 10 and 20 minutes per breast for a total period of 20 to 40 minutes. Some infants are very efficient and will spend less time at the breast while others are slower and tend to spend more time at the breast. Limiting breastfeeding to specific times is not recommended.

BOWEL MOVEMENTS OF BREASTFED INFANTS

Breastfed infant's bowel movements are different in color, consistency and frequency from those of formula-fed infants. In the first few days after birth, all infants eliminate the meconium; this is the first stool the infant passes and is sticky and a very dark color (greenish black). After the meconium is passed, the stools of an exclusively breastfed infant generally look like mustard colored cottage cheese (although stools may be a darker brown or green color) and have a mild odor. In comparison, the stools of formula-fed infants are darker, more formed and infrequent.

INDICATORS OF ADEQUATE MILK INTAKE

To reassure mothers that their milk supply is adequate and that their infants are consuming a sufficient amount of milk, specific indicators can be examined.

An exclusively breastfed infant is probably consuming a sufficient amount of breast milk if he or she:

- Gains weight consistently. Weight gain is the most important indicator of sufficient milk intake. Infants generally double their birth weight by 6 months of age and triple their birth weight by 12 months of age.
- Breastfeeds frequently and is satisfied after each feeding.
- Wakes to feed.
- Can be heard swallowing consistently while breastfeeding.
- Has plenty of wet and soiled diapers, with pale yellow or nearly colorless urine, while not being given any fluids besides breast milk. The infant should have:
 - At least 4-8 wet and 3 soiled diapers per day in the first 3-5 days of life
 - 6 or more wet and 3-4 soiled diapers per day by age 5-7 days
 - After 6 weeks, the number of bowel movements can vary from less than once a day to many per day

If there is any question whether the infant is receiving adequate nourishment, assess the infant's breastfeeding history, feeding patterns and growth (using CDC growth

charts). Refer the infant to his health care provider or a WIC breastfeeding expert for further assessment.

4.3.7 Common Breastfeeding Problems

FLAT OR INVERTED NIPPLES

Flat or inverted nipples do not protrude properly when stimulated. Inverted nipples pull inward instead of protruding out when pressure is applied to the areola. Flat nipples neither retract nor protrude, but remain flat when the areola is gently squeezed. Some infants may have difficulty latching on to flat or inverted nipples. If a woman has or thinks she has flat or inverted nipples refer her to a health care provider or a WIC breastfeeding expert for assistance.

SORE NIPPLES

Some women may experience nipple sensitivity or tenderness during early breastfeeding, as they are learning and adapting to breastfeeding. However, this sensitivity usually diminishes after the first week or two. A mother should not feel pain during breastfeeding.

Sore nipples may be caused by several factors, including:

- **Incorrect positioning and latch-on to the breast.** If an infant is not positioned appropriately for breastfeeding or his or her mouth is not attached to the breast with a good portion of the areola in the mouth, the nipple can become irritated. The infant's grasp on the nipple should not feel painful to the mother if the infant is properly attached to her breast. *Refer the mother to a WIC breastfeeding expert, lactation consultant or peer counselor for assistance.*
- **Inappropriate breast care practices.** Mothers should avoid harsh soaps, use a properly fitting nursing bra and use breast pads. Expressing some milk onto the nipples at the end of a feeding and letting them air dry may help sore nipples heal.
- **Inappropriate frequency and duration of breastfeeding.** An infant who is allowed to become overly hungry may traumatize the nipple by sucking too vigorously. Also, if the mother's breasts are engorged from infrequent feedings, the infant may not be able to grasp the nipple and areola properly in the mouth and thus increase irritation to the nipple.

An infection called thrush can cause nipples to suddenly become sore or cracked. A woman with a thrush infection on the nipples will usually complain of itching or burning nipples. The skin may also become pink and flaky. Thrush may also appear as white spots on the inside of the infant's cheeks, tongue, or gums. *A health care provider should be consulted; medication or other treatment may be prescribed for both the mother and infant.*

ENGORGED BREASTS

Engorgement may occur due to infrequent or ineffective removal of milk from the breast. When engorgement occurs, the breasts feel full, hard, warm, tender and painful. It may be difficult for an infant to latch onto the breast because the nipple and areola become very taut and hard to grasp. Cases of severe engorgement are

associated with abrupt changes in breastfeeding frequency, such as when a mother skips several feedings in a day.

Common recommendations to relieve engorgement include the following:

- Apply moist heat (hold a washcloth soaked in warm water to the breasts or stand under a warm or hot shower) for 10 - 20 minutes **before** a feeding to facilitate the milk ejection reflex.
- Express some milk to soften the areola and breast. This should allow the nipple to protrude more easily.
- Massage the breasts to encourage the milk to flow and relieve pressure.
- Apply cold compresses to the breasts **after** feedings to reduce swelling and pain.
- The best management for engorgement is prevention. Breastfeed frequently and effectively every 1 to 3 hours. *A WIC breastfeeding expert can provide assessment, counseling and follow-up services to women complaining of engorgement.*

PLUGGED MILK DUCT

A plugged milk duct can occur when a milk duct becomes clogged with milk. A mother with a plugged milk duct will commonly complain of a localized tender area on her breast or a lump she can feel in her breast. Fever or other flu-like symptoms are not associated with plugged ducts. Plugged ducts can be caused by improper positioning of the infant on the breast, severe engorgement, consistently breastfeeding on one breast only, infrequent or skipped feedings, or pressure applied on the breast (e.g., by a tight bra or other constricting clothing, or certain sleeping positions).

Recommendations to release a plugged milk duct:

- Take a hot shower or apply warm, moist cloths to the area where the plugged duct is located and the rest of the breast.
- Massage the breast from the plugged area down to the nipple before and during breastfeeding.
- Breastfeed frequently (at least every 2 hours) and use different positions.
- Position the infant's chin toward the plugged duct and empty the affected breast first.
- Loosen tight clothing, especially the bra.
- Get plenty of rest.

Mastitis can result if plugged milk ducts are not relieved. A mother should contact her health care provider if the plugged duct does not go away or if she starts developing symptoms of mastitis.

MASTITIS

Mastitis is an infection of the breast. It can occur if a mother does not breastfeed frequently and effectively, and thus often appears following engorgement or plugged ducts. A mother with mastitis may have any of the following symptoms: tenderness and/or redness of the breast or flu-like symptoms such as body aches, headache, nausea, fever, chills, malaise or fatigue. *A breastfeeding mother complaining of any of these symptoms should be referred to her health care provider immediately.*

Treatment is the same as for plugged ducts: apply heat, get plenty of rest, drink adequate fluids and breastfeed often. Antibiotics will usually be prescribed to cure the infection. To prevent the recurrence of mastitis, it is important that a mother take the entire course of prescribed medication, even if her symptoms have disappeared before the medication is finished. Mothers should continue breastfeeding, using both breasts at each feeding, and breastfeed frequently to remedy and prevent this condition. If mastitis is not quickly or completely treated, a more serious condition such as a breast abscess may result.

APPETITE/GROWTH SPURTS

Appetite or growth spurts are short periods of time when the infant breastfeeds more frequently than normal. Around 8 to 12 days of age, mothers may notice the infant acts hungrier than normal and may not seem satisfied. During this time, the fullness of the mother's breasts may have also subsided. Consequently, a mother may feel these signs indicate that she is not producing enough milk for her infant. Many mothers begin to supplement their feedings with infant formula, try to feed their infant complementary food, or even stop breastfeeding completely.

Although a mother may feel that she has an insufficient milk supply, what is actually happening is the infant is signaling the mother's body to produce more milk to meet his growing needs. Encourage the mother to keep the infant at the breast as often as the infant demands to feed during this period. Frequent feeding will increase her milk supply to meet her infant's increased needs and eventually he or she will resume a more normal feeding pattern.

Appetite spurts may also occur at 6 weeks, 3 months and 6 months, however, this may vary for each infant. Anticipatory guidance to breastfeeding mothers regarding infant feeding patterns often eliminates supplementation and premature weaning. If a mother expresses concern that an appetite spurt lasts longer than a few days, refer her to a WIC breastfeeding expert.

REFUSING THE BREAST

An infant's sudden refusal to breastfeed is often referred to as a "nursing strike" and may occur at any time. Mothers may perceive this as a personal rejection, which may lead to early or unplanned weaning.

Many mothers never determine the cause of a nursing strike but some common causes include:

- Onset of a mother's menses
- Maternal stress
- Change in maternal diet
- Change in soap, deodorant or perfume the mother uses
- Infant nasal congestion
- A mother returning to work, or a period of separation of the mother/infant dyad
- Infant nasal obstruction or gastroesophageal reflux disease

Efforts to restore or continue breastfeeding may take several days. Mothers will need reassurance to continue the breastfeeding relationship. Encourage mothers to continue putting the infant to the breast especially when he shows signs of hunger or

when he is just awakening or sleepy. Additionally, mothers should increase the amount of time spent holding or cuddling their infant, including skin-to-skin contact. Minimize distractions during this time. Mothers should be advised to maintain their milk supply by pumping or hand expression to assure continued adequate milk production. Instruct mothers to provide pumped breast milk in a cup, spoon, or dropper until breastfeeding resumes.

SLOW WEIGHT GAIN

An infant's weight gain is the most reliable sign of breastfeeding success. When an infant does not gain weight adequately, appropriate action should be taken to increase the infant's weight as well as ensure that premature weaning does not occur. It is common for infants, both breastfed or formula-fed, to lose a few ounces in the first 3 or 4 days of life. During this period, infants pass their first stools and eliminate extra fluids they are born with. Weight loss should stop as the mother's milk production increases. As this happens, an infant breastfeeding effectively should begin gaining weight and ultimately exceed his or her birth weight by 14 days after birth. After infants experience this weight loss and regain to their birth weight, they usually gain around 6 ounces per week during the first 6 months. If an infant is under birth weight at 2 weeks of age or a mother is concerned about her infant's weight, advise her to consult her infant's health care provider.



COMPLEMENTARY BOTTLES

Complementary bottles of infant formula and pacifier use can interfere with establishing a good breast milk supply. Advise mothers to avoid feeding complementary bottles of infant formula and water or using pacifiers for the first 2 to 4 weeks of an infant's life. Supplementation with fluids other than breast milk and pacifier use can interfere with establishing effective breastfeeding and have been associated with early weaning.

Some problems that may be caused or aggravated by feeding complementary bottles or using a pacifier include:

- **Nipple preference**—Artificial nipples on bottles and pacifiers require different movements of the infant's tongue, lips, and jaw and may make it difficult for infants to easily go back to the mother's nipple and breast.
- **Engorgement**—Bottles and pacifiers decrease the amount of time the infant spends breastfeeding decreasing milk removal.
- **Refusal of the breast**—after using a bottle, the infant may become frustrated and not express as much interest in suckling from the breast.
- **Early weaning**—as the infant fills up on infant formula he suckles less on the breast, causing a reduction in milk production.

Mothers who report any of the above problems can be referred to a WIC breastfeeding expert for assistance. Some mothers may wish to partially breastfeed. It is possible to combine breastfeeding and formula feeding, however, as a mother increases the

amount of infant formula fed and decreases the number of breast feedings, her breast milk production will decrease, possibly resulting in total weaning.

4.3.8 Breastfeeding Aids and Devices

Special equipment is not needed in order to breastfeed. However, there are some aids to assist breastfeeding mothers.

NURSING BRA

Nursing bras are designed to allow a mother to uncover each breast separately so that she can easily feed her infant with one breast at a time while maintaining some privacy. The mother should shop for a nursing bra one or two weeks before delivery. Her breasts will be close to the size they will be during breastfeeding. The bra should be comfortable, made with cotton cups (permitting adequate air circulation) and made with adjustable straps. There should be enough room inside the bra cups for nursing pads and, if used, breast shells.

NURSING PADS

Nursing pads are placed in a bra to soak up leaking milk. Washable or disposable pads without plastic liners are recommended because they allow air circulation. It is best to change nursing pads frequently to assure that moisture is not sitting on the nipples. Alternatives to commercial nursing pads include cotton handkerchiefs or squares cut from terry cloth, cotton diapers or cotton t-shirts.

BREAST SHELL

A breast shell is a two-piece hard plastic device that contains an inner center ring and an attached overlying dome. Shells can be used to correct inverted or flat nipples or to alleviate nipple soreness. A breast shell with the small inner center ring can be worn inside a bra during the end of pregnancy or for 30 minutes prior to each feeding to bring out an inverted nipple. A breast shell with the larger inner center ring can be worn inside a bra to alleviate chaffing and allow for air circulation around a sore nipple. If a woman has flat or inverted nipples refer her to a health care provider or a WIC breastfeeding expert for assistance for proper use of a breast shell.

NIPPLE SHIELD

A nipple shield is an artificial silicone nipple that rests on a mother's nipple while she is breastfeeding. Nipple shields are a short-term solution and should be used under the guidance of a lactation consultant.

Improper use of nipple shields can lead to:

- Insufficient milk volume which can potentially lead to inadequate weight gain in the infant
- Increased nipple damage if positioned incorrectly
- Nipple confusion
- Interference with proper latch

It is important that the underlying problem be addressed rather than using the nipple shield as a quick fix. Possible indications for a nipple shield are a mismatch between baby's mouth size and mother's nipple size (usually small mouth to large nipple), baby with a weak or disorganized suck or an infant with a palate deformity.

4.3.9 Breast Milk Expression, Storage and Warming

EXPRESSING BREAST MILK

A woman may need to express breast milk under these circumstances:

- Premature or hospitalized infant or mother
- Low milk supply
- Temporary breastfeeding problems such as engorgement
- Mother returning to work or school
- Infant with feeding or latching problems
- Mother of multiple infants
- Mother taking a medication contraindicated for breastfeeding

All breastfeeding mothers can benefit from knowing how to express their breast milk. Breast milk can be expressed by hand or with a breast pump. Manufacturer instructions on how to use the pump should be followed.

Breast milk should always be collected in a clean container (rigid plastic or glass containers are generally recommended). Since breast milk is not homogenized, the fat in it will separate and come to the top. Also, if breast milk sits for a while, there may be small lumps of cream that do not dissolve. These characteristics are all normal.



STORING EXPRESSED BREAST MILK

Expressed breast milk is a perishable food that must be stored properly for safe consumption.

The following guidelines are recommended to prevent contamination of breast milk:

- Store expressed breast milk in clean glass bottles, rigid plastic bottles or disposable plastic nursing bags tightly capped after filling.
- Clean used bottles and their parts with soap and hot water. If the infant is less than 3 months old, sterilize these items in boiling water or wash in a dishwasher before reusing.
- Label the container of expressed milk with the collection date. Use the oldest milk first.
- Store bottles of breast milk, in the back section of a properly functioning refrigerator at 39 degrees Fahrenheit (F) or below. Breast milk is remarkably resistant to bacterial growth but, to be safe, use refrigerated breast milk within 48 hours of collection.

Published guidelines on the storage of breast milk differ among pediatric authorities, but the above guidelines are based on the current recommendations from the United States Department of Agriculture (USDA) and should be used for education and risk factor assignment. Since research states that longer storage times are also acceptable, mothers should not necessarily be instructed to discard milk that has been stored longer.

- Breast milk that will not be fed within 48 hours of collection should be frozen. Frozen breast milk should be stored in the back of a properly functioning

refrigerator freezer, where the temperature is at 0 degrees F. It can be stored for as long as 3 to 6 months.

- Breast milk can be frozen immediately after collection in portions generally needed for a single feeding. When filling a bottle, leave room (about 1 inch) at the top for expansion. Never add fresh breast milk to already frozen breast milk.
- If traveling with bottles of expressed breast milk, store them in a cooler with ice or ice pack.

WARMING EXPRESSED BREAST MILK

The following guidelines are recommended to thaw and warm breast milk:

- Milk should be thawed quickly. To thaw and warm a container of frozen breast milk, hold the bottle under running lukewarm water. Shake the bottle gently to mix (breast milk separates into a fatty layer and a watery layer when stored).
- The temperature should be tested before feeding to make sure the milk is not too hot or cold (test by squirting a couple of drops onto the back of the hand). The milk should be used immediately after warming.
- Only as much breast milk needed for one feeding should be thawed and/or warmed. Once frozen breast milk is thawed, it should be refrigerated at 39 degrees F or below and used within 24 hours. It should not be refrozen.
- A microwave oven should never be used to thaw or warm breast milk. Liquid in a bottle may become very hot when heated in a microwave oven and remain hot after removal from the oven even though the bottle feels cool. Also, many of the immunities in breast milk can be destroyed if the milk is heated in a microwave oven.

4.3.10 Use of Cigarettes, Alcohol and Other Drugs during Breastfeeding

There are instances when breastfeeding is contraindicated. While a breastfeeding mother's use of cigarettes, alcohol and/or caffeine is not healthy for her infant, it does not mean she cannot breastfeed.

CIGARETTES

- A mother who smokes cigarettes can still provide her infant the benefit of breastfeeding; however she should be encouraged to quit smoking or reduce the number of cigarettes she smokes.
- Mothers should not smoke during feedings or around their infant.
- Mothers who cannot quit smoking should be instructed to refrain from smoking until right after a feeding so that nicotine levels will have time to decrease before the next feeding.
- Smoking can decrease a mother's milk supply.

ALCOHOL

- It is recommended that mothers avoid habitual use of alcohol while breastfeeding.
- Breastfeeding mothers who want to occasionally consume alcoholic beverages should wait at least 2 hours after alcohol consumption before breastfeeding their infant.

- The AAP Committee on Drugs further suggests that if alcohol is used, intake should be limited to no more than 0.5 grams of alcohol per kilogram of maternal body weight per day. A 132 pound woman (60 kilograms) should not consume more than 2 to 2.5 ounces of liquor, 8 oz. of wine or 2 cans of beer.

CAFFEINE-CONTAINING PRODUCTS

- Mothers should be encouraged to avoid drinking more than 2-3 cups per day of coffee, hot chocolate, tea or soft drinks containing caffeine.
- Excessive intake (5 caffeinated beverages per day) may result in a more fussy and irritable infant. If an infant exhibits these symptoms, decreasing the mother's caffeine intake is recommended.
- Herbal preparations should be avoided while breastfeeding; the mother should discuss the use of herbal teas with her health care provider.



OTHER DRUGS

- Mothers should be instructed to talk to their health care provider before taking any drugs or medicines, even over-the-counter drugs like aspirin, cold medicines and vitamin supplements.
- Use of illicit drugs is contraindicated to breastfeeding due to the potential effects on the infant as well as hazards to the mother.

4.3.11 Weaning

- Mothers who wish to wean their exclusively breastfed infants onto infant formula tend to experience less discomfort if the weaning process is gradual.
- Mothers can wean their infant by replacing feedings from the breast with feedings of infant formula (or whole cow's milk if the infant is over 1 year of age). Start weaning by replacing the feeding the infant is least interested in or when the breasts do not feel full. Gradually, other feedings can be replaced.
- If an infant is over 6 months old, the infant can be weaned to a cup and/or bottle.
- Even though mostly weaned, an infant can still be breastfed for comfort or to relax.

4.4 INFANT FORMULA FEEDING

Breast milk is the optimal source of nutrition for infants, but when it is not available, iron-fortified infant formula is an appropriate alternative for the first year of life. A variety of infant formulas are available for healthy, full term infants who are not breastfed or are partially breastfed.

DHA and ARA are long chain polyunsaturated fatty acids that are added to some infant formulas to mimic the composition of breast milk. Research demonstrating better cognitive function in breastfed infants has led some to support the addition of ARA and DHA to infant formula. The AAP has not taken a position on the addition of DHA and ARA to infant formula.

4.4.1 Types of Infant Formula

- **Iron-fortified cow's milk-based formula.** This is the most appropriate choice for infants who are not breastfed. There are no known medical conditions for which the use of iron-fortified infant formula is contraindicated.
- **Soy-based formula.** This is a safe and appropriate alternative to cow's milk infant formula. Soy-based infant formulas are indicated when:
 - The infant has galactosemia or hereditary lactase deficiency.
 - Caregivers choose a vegetarian diet for their infant.
 - Infants have documented IgE-mediated cow's milk protein allergy.
- **Hypoallergenic formula.** A number of infant formulas have been developed and marketed for infants with allergies or intolerances to milk or soy-based infant formulas or those with a family history of allergies. All suspected cases of food allergy should be referred to a qualified health care professional for further diagnosis and treatment. The AAP recommends the use of hypoallergenic infant formulas be limited to infants with well-defined clinical indications.
- **Lactose-Free formula.** This is given to infants who cannot tolerate lactose, which may lead to excess gas, diarrhea or fussiness. A very small number of infants produce insufficient amounts of lactase, the enzyme needed to breakdown lactose. Premature infants may have lower levels of lactase than term infants, proportional to their degree of prematurity. Transient lactose intolerance may occur following acute diarrhea, however enzyme activity is restored quickly and switching to lactose-free formula is usually not necessary.
- **Exempt formula.** These formulas are the ones labeled for use by infants who have inborn errors of metabolism, low birth weight or who otherwise have unusual medical or dietary problems.

OTHER MILKS

The AAP Committee on Nutrition recommends that cow's milk not be fed to infants during the first year of life. Breast milk or iron-fortified infant formula is recommended instead of cow's milk for a number of nutritional and medical reasons.

Intake of cow's milk is associated with:

- Inappropriate nutrient content to meet infant nutrient needs
- Microscopic gastrointestinal bleeding (causes iron deficiency anemia)
- Strain placed on infant's immature kidneys to process cow's milk
- Hypersensitivity allergic reaction

Goat's milk is **not** recommended for infants. Goat's milk contains inadequate nutrients and places stress on an infant's kidneys. This milk has been found to cause a dangerous condition called metabolic acidosis when fed to infants in the first month of life.

4.4.2 Feeding Patterns and Techniques

WHEN AND HOW MUCH TO FEED

Infant formula intake will vary as the infant grows and develops.

- Newborn infants may initially feed 8 to 12 times per day (every 3 to 4 hours) and may drink from 2 to 3 ounces at a feeding. As the infant gets older, he or she will gradually drink more infant formula at each feeding, feed fewer times per day and drink a larger total amount of infant formula in a day.
- Infants should be fed when showing signs of hunger. Hunger cues include waking, sucking on a fist, crying or fussing, or looking like he or she is going to cry. It is important for caregivers to respond to early signs of hunger and not wait until the infant is upset or crying from hunger.
- Caregivers should continue to feed until their infant indicates fullness. Signs of fullness include: sealing the lips, decrease in sucking, spitting out the nipple and turning away from the bottle.

Between 6 and 12 months old, most infants begin eating more complementary food thus decreasing their intake of infant formula.

HOW TO FEED WITH A BOTTLE

- Infants should be gently and slowly calmed to get ready for a feeding.
- Caregivers should wash their hands with soap and hot water before feeding.
- Infants should be fed in a smooth and continuous fashion. Caregivers should follow their infant's lead on when to feed, how long to feed and how much to feed.
- Infants should be held during bottle feedings. The bottle should be tipped so that formula fills the nipple and air does not get in. The infant's head should be held a little higher than the rest of their body to prevent formula from backing up in the inner ear and causing an ear infection.
- The nipple hole should be large enough so that if the bottle is held upside down, the formula drips, but does not make a stream. The nipple ring should be adjusted so that some air can get into the bottle to avoid a collapsing nipple.
- Bottles should never be propped—this can cause ear infections and choking, and deprives the infant of important cuddling and human contact.
- The caregiver should wait for the infant to pause or stop eating before burping. Infants should be burped by gently patting or rubbing their back, while he or she is held against the caregiver's shoulder and chest or held in a sitting position in the caregiver's lap. A small amount of spitting up is common in formula-fed infants.
- Infants should not be offered a bottle at nap or bedtime. Allowing an infant to go to sleep with a bottle may lead to choking or early childhood tooth decay.

4.4.3 Purchasing, Preparing, and Storing Infant Formula

INFANT FORMULA PURCHASE AND STORAGE

- When buying cans of infant formula, the formula's expiration date, which may be on the label, lid, or bottom of the can, should be checked. Formula should not be used if the date has passed.
- Do not use infant formula that has dents, leaks, bulges, puffed ends, pinched tops or bottoms or rust spots.
- Store cans of infant formula in a cool, indoor place.

- Before opening a can of infant formula, wash the lid with soap and water to remove dirt that could contaminate the formula.

INFANT FORMULA PREPARATION

- Prepare concentrated, ready-to-feed, or powdered infant formulas according to directions on the container.
- Bottles should be cleaned well using soap, hot water and bottle and nipple brushes. If the infant is less than 3 months old, the bottles and their parts (nipples, caps, rings) should be sterilized either in boiling water for 5 minutes or washed in a properly working dishwasher machine prior to use.
- After an infant is 3 months of age, unless otherwise indicated by a healthcare provider, bottles and bottle parts can be washed using soap and hot water and bottle and nipple brushes, or in a dishwasher.
- Until infants are 3 months of age it is recommended that water for infant formula preparation be brought to a rolling boil for 1 to 2 minutes, and then cooled. Encourage caregivers to consult their healthcare provider about whether to boil the water used to prepare infant formula after 3 months of age.

STORAGE OF PREPARED INFANT FORMULA

- When preparing infant formula for storage, the formula should be poured into bottles in single feeding portions (e.g., pour 26 ounces of standard dilution infant formula into five bottles each containing 4 to 6 ounces).
- Store bottles of prepared infant formula in a properly functioning refrigerator until ready to use. Bacterial growth is reduced when infant formula is kept in a refrigerator, at temperatures at or below 39 degrees Fahrenheit.
- In general, it is recommended that caregivers:
 - Use refrigerated bottles of concentrated or ready-to-feed infant formula within 48 hours of preparation.
 - Use refrigerated bottles of prepared powdered infant formula within 24 hours of preparation.
 - Do not freeze infant formula.
 - Do not leave prepared bottles of infant formula out at room temperature longer than 1 hour.
 - Throw out any infant formula left in a bottle after a feeding. The mixture of infant formula with an infant's saliva promotes the growth of disease-causing germs.

TRAVELING WITH INFANT FORMULA

When traveling, caregivers can take along a can of powdered infant formula and separate water in clean bottles (or sterilized bottle if infant is less than 3 months old). Single bottles of infant formula can be mixed when needed. Infant formula should not be made in advance unless properly stored in refrigeration.

WARMING INFANT FORMULA

The following guidelines are recommended to warm refrigerated infant formula:

- For infants who prefer a warmed bottle, the bottle should be warmed immediately before serving.

- A safe method of warming a bottle is to hold it under warm running tap water. The bottle should be shaken before testing the temperature. The temperature should always be tested before feeding to make sure that it is not too hot or cold (it should be tested by squirting a couple of drops onto the back of the hand).
- Only as much infant formula needed for a feeding should be warmed.
- **A microwave oven should never be used to warm infant formula because this practice is dangerous.** Liquid in a bottle may become very hot when heated in a microwave oven and remain hot afterwards even though the bottle feels cool. Infants have been seriously burned while being fed liquids warmed in microwave ovens.

4.5 COMPLEMENTARY FEEDING

Complementary foods are foods (liquids, semisolids and solids) other than breast milk or infant formula introduced to an infant to provide nutrients. When complimentary foods are introduced appropriate to the infant's developmental stage, nutritional requirements can be met and eating and self-feeding skills can develop properly. Full-term, healthy infants reach development readiness to begin complementary food around 6 months of age.

SIGNS OF DEVELOPMENTAL READINESS

Infants are developmentally ready to consume complementary food when they can:

- Hold their head up and sit in a chair with support.
- Keep food in their mouth and swallow it.
- Close their lips over a spoon and scrape food off as a spoon is removed from the mouth.

4.5.1 Introducing Complementary Food

Tips for introducing complementary foods include:

- Infant's hands and face should be washed frequently and especially before they eat. An infant's hands can pick up germs, lead paint dust, etc., which could be harmful if ingested.
- Complementary food should be fed using a small spoon and a small unbreakable bowl. Infants who are not ready to eat from a spoon are not ready to eat complementary food.
- Infant cereal or other complementary food should not be fed in a bottle or an "infant feeder."
- During mealtime, infants should be sitting comfortably in a sturdy highchair (or similar chair) that can safely secure them and prevent falls.
- Infants should not be fed while they are crawling or walking—eating while moving could cause choking.
- Infants touch their food and play in it and should be expected to make a mess at mealtimes. Caregivers should be encouraged to be patient and to not scold their infant for spilling food or beverages.

WATCHING FOR REACTIONS TO FOOD

- New food should be introduced gradually, with only one new food given at a time. Caregivers should wait at least 7 days between introducing new foods so that they can watch for any reactions to the food.
- Caregivers should start with a small amount (e.g., about 1 to 2 teaspoons) when first offering a new food (this allows the infant to adapt to a food's flavor and texture).
- Single-ingredient foods should be offered at first to see how the infant reacts to each food (e.g., plain rice infant cereal should be tried before rice infant cereal mixed with fruit).
- If an infant does not like the taste of a new food, encourage the caregiver to offer it again later. It takes up to 10 to 15 exposures to a new food for an infant to readily accept the food.
- Symptoms of a reaction to food may include diarrhea, vomiting, coughing and wheezing, respiratory symptoms, ear infections, shock, abdominal pain, hives, skin rashes (like eczema) and extreme irritability. If an infant has a reaction to a specific food, caregivers should stop feeding that food and consult with a health care provider. If an infant has a severe reaction to food (e.g., difficulty breathing, shock), instruct caregivers to contact 911 or take the infant to the nearest emergency room immediately.

WATER NEEDS WHEN COMPLEMENTARY FOOD IS INTRODUCED

An infant's health care provider may recommend feeding a small amount of sterile water (~ 4 to 8 ounces per day) in a cup when infants start eating a variety of complementary foods, especially protein-rich foods (e.g., home-prepared meats, commercially-prepared plain meats and mixed dinners, egg yolks, cheese).

VITAMIN/MINERAL SUPPLEMENTS

- Refer caregivers to the infant's health care provider for recommendations on vitamin supplementation.
- Remind caregivers to keep all vitamin/mineral pills or drops, and any other pills, medicines, poisons, etc., locked in a secure place out of their infant's reach.

4.5.2 Infant Meal Patterns

HOW MUCH AND HOW OFTEN TO FEED

Caregivers should let their infant be their guide as to how much food to feed. They should start with 1 to 2 teaspoons of each food once a day and gradually increase to 2 to 4 tablespoons of each food. Caregivers may start out offering complementary food at one meal per day and gradually increase this to about 3 meals and 2 to 3 snacks per day.

- Infants should not be forced to finish a serving of food. Infants indicate fullness by:
 - Pulling away from the spoon
 - Turning his or her head away
 - Playing with the food
 - Sealing his or her lips
 - Pushing the food out of his or her mouth



- Throwing the food on the floor.
- Caregivers should follow their infant's lead on how often and fast to feed, food preferences and amount of food.
- Encourage caregivers to be patient and allow their infant time to adapt to the new textures and flavors of complementary foods.

4.5.3 Preparing Infant Foods at Home

CLEANLINESS

Key concepts to convey to caregivers on general cleanliness and reducing contamination of food include:

- Wash hands with soap and hot water and rinse thoroughly. Hands should be washed:
 - Before breastfeeding, bottle feeding or preparing any food or bottles
 - Before handling any food or food utensils
 - After handling raw meat, poultry or fish
 - After changing an infant's diaper and clothing
 - After using the bathroom or assisting a child in the bathroom
 - After sneezing or coughing into tissues or hands
 - After wiping noses, mouths, bottoms, sores or cuts
 - After handling pets or other animals or garbage
- Before preparing food, wash all work surfaces used to prepare food, such as countertops or tables, with soap and hot water and then rinse well with hot water.
- Before preparing food, wash all equipment, such as blender, food mill, food processor, etc. carefully with soap and hot water. Rinse thoroughly with hot water and allow to air dry.

EQUIPMENT

The texture of food can be changed to meet the needs of the infant using a blender, food mill, food grinder or strainer, or by mashing with a fork.

SELECTING FOOD TO USE

Caregivers should start with quality, fresh food, if possible, when making infant food. Plain, frozen foods, with no added sugar, salt or sauces are also a good choice. If canned foods are used, caregivers should select those without added salt or syrups or select foods packed in their own juice (if regular canned foods are used, syrup or salty water should be poured off and the food should be rinsed with clean water).

FOOD PREPARATION

The following instructions should be given to caregivers for preparing infant food:

- Wash, peel and remove the seeds or pits from vegetables and fruits. Cook vegetables and hard fruits, like apples, until tender. Edible skins and peels can be removed either before or after cooking.
- Remove bones, fat, and gristle from meats, poultry and fish. Meats, poultry, fish, dried beans or peas and egg yolks (not egg whites) should be well cooked. Baking, boiling, broiling, poaching and steaming are good cooking methods.
- Blend, grind or mash the food to a texture and consistency appropriate for the infant's stage of development. Food texture should progress from pureed to

mashed to diced. Providing new textures encourages the infant's further development.

- If using the same food the family eats, the infant's portion should be separated before adding salt, sugar, syrup, gravy, sauces, etc.

STORAGE OF FOOD

The following instructions should be given to caregivers for storing infant food:

- If freshly cooked food is not served to the infant, immediately refrigerate or freeze it. Do not allow cooked food to stand at room temperature; harmful germs can grow in the food when left standing at room temperature.
- Throw out foods that are left out of the refrigerator for more than 2 hours. Do not taste the food to see if it is safe. A food can contain harmful bacteria yet taste and smell normal.
- Two easy methods of storing infant food in serving-size amounts (after it has cooled) in the freezer include the ice cube tray method and the cookie sheet method:
 - Pour cooked, pureed food into sections of a clean ice cube tray or place 1 to 2 tablespoons in separate dollops on a clean cookie sheet; cover with plastic wrap or aluminum foil; and place in the freezer.
 - When frozen solid, the frozen food cubes or pieces can be stored in a freezer container or plastic freezer bag in the freezer. Label and date the bags or containers of frozen food. Use within 1 month.
 - When ready to use, the desired number of cubes or pieces can be removed from the freezer and reheated.
 - Thaw food in the refrigerator or under cold running water. Do not thaw frozen infant food at room temperature or in the microwave.



4.5.4 Purchasing, Serving and Storing Store-bought Infant Food

SELECTING COMMERCIALY-PREPARED INFANT FOOD

Not all commercially-prepared infant foods are necessary to include as complementary foods in an infant's diet. Care givers should select foods that will provide nutrients needed for growth and development.

- Instruct caregivers to read the ingredient list on the food label. Ingredients are listed on the label in order of those present in the largest to smallest amount. Labels will tell them which foods contain more water than others, and which contain added sugar or salt.
- Single-ingredient infant foods (like plain fruits, vegetables and meats) provide more nutrition for the money than combination foods or mixed dinners.
- Older infants who are ready for food with a chunkier texture can be transitioned to mashed or finely chopped home-prepared food instead of infant food combination dinners; this helps the infant learn new eating skills.
- Select containers that are clean, have no cracks, have no rust on the lid, and are not sticky or stained. Observe "Use-by" dates for purchase and pantry

storage of unopened containers. If the date has passed, the food should not be used.

OPENING INFANT FOOD CONTAINERS

Instruct caregivers to:

- Wash containers with soap and hot water before opening.
- Make sure the vacuum seal on a new jar or tub of infant food has not been broken before using.
- Running the jar under warm water for a few minutes will make it easier to open. The jar lid should not be tapped with a utensil or banged against a hard surface; this could break glass chips into the food.

TIPS FOR HEATING PREPARED INFANT FOOD

- Food should be removed from the purchase container before heating. Heat food in a pan on the stove, stirring it, and testing its temperature before feeding.
- Never heat infant food containers in a microwave oven. Even though some infant food jars indicate that they can be heated in a microwave, this could be dangerous. A microwave oven may heat the food unevenly, which can seriously burn the infant's mouth.

SERVING INFANT FOOD

When serving commercially prepared infant food:

- Remove the desired amount of food from the infant food container using a clean spoon and place in a bowl for serving. The jar or tub should not be used as a serving dish. Most infants cannot finish a small container of infant food at one feeding.
- Use a separate spoon to dish out any additional food needed. If a spoon used for feeding is placed in a jar of food that will be stored and used for another feeding, the infant's saliva could contaminate and spoil the rest of the food.
- Any leftover food in the bowl should be thrown away. Leftover food should not be put back into the container because it will add germs to the food in the container.



STORING INFANT FOOD

Once a container is opened, it should be stored in the refrigerator. The food should be used within 48 hours, except for infant food meats and egg yolks, which should be used within 24 hours. If food is not used within these time periods, it should be thrown out.

4.5.5 Use of Specific Types of Food

INFANT CEREAL

- Infant cereal should be introduced around 6 months of age, if the infant is developmentally ready. Feed infant cereal using a spoon, not a bottle.
- The first cereal to introduce should be rice infant cereal, followed by oat and barley cereals. Caregivers should wait at least 7 days between trying each new cereal.

- Infant rice cereal should be mixed with expressed breast milk, infant formula, water or pasteurized 100 percent fruit juice (if the infant has already tried it and had no reactions to it) to produce a smooth mixture. The consistency of all cereals can be thickened by adding less liquid as the infant matures.
- Wheat cereals should not be introduced until the infant is 8 months old, because the infant is less likely to have an allergic reaction to wheat at that age. Mixed grain infant cereals and infant cereal-and-fruit combinations may be tried after the infant has been introduced to each food in the mixture separately.
- Infants should not be fed ready-to-eat cereals designed for adults and older children (these cereals do not contain the right amount of vitamins and minerals for an infant and may cause choking).

FRUIT JUICE

- Pasteurized 100 percent fruit juice should only be introduced when the infant is able to drink it from a cup. Feeding fruit juice in a bottle increases the risk of developing early childhood tooth decay.
- Infants should not be fed fruit-flavored drinks, punches or aides, soda pop, gelatin water or other beverages high in sugar and low in nutrients.
- Single varieties of fruit juice should be introduced first. If the infant has no reactions, then mixed juices, containing the single varieties of juice already tried, can be introduced.
- Limit the total amount of juice fed to an infant to about 4 ounces per day. Too much juice can spoil the infant's appetite for other nutritious food or cause diarrhea.
- Caregivers should watch for any reactions in their infants when introducing citrus (orange, tangerine, or grapefruit), pineapple or tomato juices and delay introducing them until the sixth month or later—these juices might cause allergic reactions in some infants.
- Canned juices should be poured into a glass or plastic container for storage after the can is opened. Once the can is opened and air enters the can, the can begins to corrode, which can affect the juice's flavor.
- Imported canned juices should be avoided because the seams of these cans may contain lead.

VEGETABLES AND FRUITS

- Vegetables and fruits can be introduced around 6 months of age, if the infant is developmentally ready. Almost any soft-cooked fruit or vegetable can be fed as long as it is prepared in a consistency that the infant can safely eat. As the infant gets older, the thickness and lumpiness of vegetables and fruits can be gradually increased.
- Caregivers should wait at least 7 days between introducing each vegetable or fruit and observe their infant carefully for reactions to the food.
- Examples of vegetables that can be prepared as infant food: asparagus, broccoli, brussels sprouts, cabbage, carrots, cauliflower, collard greens, green beans, green peas, green peppers, kohlrabi, kale, plantain, potatoes, spinach,

summer or winter squash and sweet potatoes. Fresh vegetables generally need to be cooked until just tender enough to be pureed or mashed.

- Home-prepared spinach, beets, turnips, carrots or collard greens should not be fed to infants less than 6 months old. These vegetables all tend to be high in nitrates (from the soil), which could harm very young infants.
- Fruits that can be mashed (after peeling) without cooking if ripe and soft: apricots, avocado, bananas, cantaloupe, mango, melon, nectarines, papaya, peaches, pears, and plums. Stewed pitted dried fruits can be pureed or mashed. Apples, pears and dried fruits should be cooked before pureeing or mashing. Older infants who are developmentally ready can be given small pieces of ripe, soft fruit, such as ripe peeled peach, nectarine or banana.
- Avoid these vegetables and fruits due to risk of choking: raw vegetables (including green peas, string beans, celery, carrot, etc.), cooked or raw whole corn kernels, whole grape or cherry tomatoes, whole grapes, berries, cherries, or melon balls, uncooked dried fruit (including raisins), fruit pieces with pits, whole pieces of canned fruit and hard pieces of raw fruit.
- If store-bought infant food is used, plain vegetables and fruit provide more nutrition for the money than fruit desserts and mixtures.

PROTEIN-RICH FOODS

- Infants can be introduced to these foods between 6 and 8 months old: cooked strained or pureed lean meat, chicken or fish, cooked egg yolk, cooked dried beans or peas, tofu, mild cheese, cottage cheese or yogurt.
- If using commercially prepared infant meats, single-ingredient containers of meat (like beef, lamb, chicken) contain more nutrients for the money than mixed meat dinners (like chicken noodle, vegetable beef or turkey rice dinner).
- If home-cooked meats are prepared, it is best to bake, broil, poach, stew, or boil the meat, poultry or fish. After cooking, the food should be pureed or finely chopped. There is no need to add gravies or sauces to meats.
- Cottage cheese, hard cheeses and yogurt can be gradually introduced as occasional food. (Infants should not be fed chunks of cheese, which could cause choking.)
- Cooked legumes (dry beans and peas) or tofu (bean curd made from soybeans) can be introduced into an infant's diet as a protein food. It is best to introduce small quantities (1 to 2 teaspoons) of mashed or pureed legumes at first (whole beans or peas could cause choking).

These foods should be avoided for infants:

- Egg white, whole egg (because of the egg white), or shellfish before 1 year old. Infants are often allergic to these foods.
- Hot dogs, sausage, luncheon meats, bacon or other cured meats. These meat products contain high levels of salt and fat.
- Raw or partially cooked egg yolks, meat, poultry or fish or products that contain them. These foods may contain harmful bacteria that could make an infant very sick.
- Shark, swordfish, king mackerel and tilefish (tilapia), due to risk of high mercury levels.

Grain Products

- Around 6 to 8 months of age, infants can try plain crackers, teething biscuits, whole grain or enriched bread, soft tortillas, zwieback, graham crackers, and plain, cooked noodles, macaroni, ground or mashed rice and corn grits. An infant's risk of having a reaction to wheat decreases at this age. These foods can be introduced as snacks, finger food or as additional food at meals.
- Avoid highly seasoned snack crackers and those with seeds; snack potato or corn chips, pretzels, cheese twists and breads with seeds or nut pieces. Infants can choke on these foods.

Finger Food

- Between 6 and 8 months of age, infants begin to feed themselves with their hands. They can start to eat foods that they can pick up and eat easily without choking.
- Good finger foods include dry toast, dry breakfast cereal, small pieces of soft, ripe, peeled fruits (such as banana) or soft cooked vegetables, small slices of mild cheese, crackers, or teething biscuits. Infants should eat biscuits, toast, or crackers (and other food) in an upright position.

SWEETENED FOOD AND SWEETENERS

Infants should not be fed these foods:

- Chocolate, before 1 year old. Some infants are allergic to chocolate.
- Commercially prepared infant food desserts or commercial cakes, cookies, candies, and sweet pastries. These tend to be high in sugar, which can replace nutrient-dense foods needed to meet nutrient needs.
- Added sugar, syrups, molasses, corn syrup, honey, glucose or other syrups.
- Food, beverages or powders containing artificial sweeteners.

Honey should never be fed to an infant in any form—plain, in cooking or baking or as part of processed food. Honey sometimes contains dangerous spores, which can cause a serious illness in an infant, called infant botulism.

4.5.6 Choking Prevention

Choking is a common concern of caregivers. It is important to feed infants in a manner that is developmentally appropriate to reduce the risk of choking.

Tips to prevent episodes of choking include:

- Caregivers should hold their infant while feeding a bottle and never "prop" the bottle. The bottle should not be left in the infant's crib or playpen. (Older infants can hold the bottle while feeding but they should be in a highchair or similar chair and the bottle should be taken away when the feeding is finished).
- The hole in the nipple of the infant's bottle should not be too large, to avoid the liquid from flowing through too rapidly.
- Mealtimes and snacks should be supervised. Infants should not be left alone when eating. Infants should be sitting still and in an upright position during meals and encouraged to eat slowly.

- Infants should be fed small portions.
- Serve food appropriate in texture for the infant's development. Prepare food so that it is soft and does not require much chewing.
- Foods, like cooked carrots, should be cut into short strips rather than round pieces. Raw whole grapes, cherries, berries, melon balls and grape or cherry tomatoes should not be fed to infants; these fruits and vegetables should be cut into quarters, with pits removed.
- Remove all bones from poultry and meat, and especially from fish, before cooking.
- Substitute foods that may cause choking with a safe substitute, such as meat chopped up or mashed ground beef instead of hot dogs or pieces of tough meat.
- Whole grain kernels of wheat, barley, rice, etc. should not be fed to infants. These grains must be cooked and finely ground or mashed before being fed to an infant.
- Nuts or seeds or nut butters, such as peanut butter, should not be fed to infants. Whole nuts and seeds can lodge in the throat or get caught in the windpipe and nut butters can get stuck to the roof of the mouth.

4.6 COMMON GASTROINTESTINAL PROBLEMS

4.6.1 Spitting up

It is normal for young infants to spit up a small amount (about a teaspoon or less) of breast milk or infant formula after feedings.

Methods to reduce excessive spitting up include the following:

- Burp the infant several times during a feeding. Burping is generally done during normal breaks in a feeding or when switching from one breast to another during breastfeeding.
- Hold the infant in an upright position for about 15 to 30 minutes after feeding.
- Avoid excessive movement or play right after feeding.
- Avoid forcing the infant to eat or drink when full and satisfied.

4.6.2 Gastroesophageal Reflux (GER)

Reflux is defined as the spontaneous, effortless regurgitation of material from the stomach into the esophagus. GER may be caused by an immature gastrointestinal tract and seems to be related to a delay in stomach emptying. Although thickening breast milk or infant formula has been prescribed as a treatment for GER, the effectiveness of this therapy is controversial. The addition of infant cereal to breast milk or infant formula or the use of infant formula with added rice cereal should only be done if prescribed by the infant's health care provider.

Infant's with GER who have wheezing, recurrent pneumonia or upper respiratory infections, symptoms of esophagitis (an irritation of the esophagus), irritability during feedings, or failure to thrive are at particular risk and should be referred to a health care provider immediately.

4.6.3 Vomiting

Vomiting refers to the forceful discharge of food through the esophagus and involves a more complete emptying of the stomach's contents. It can occur as a symptom of a reaction to food eaten, a minor or major medical condition, or with use of certain medications. Vomiting can also result from stimulation to the inner ear that occurs from being in a moving vehicle or even from excitement or nervousness. Vomiting can place an infant at risk of dehydration.

Refer an infant to a health care provider for medical evaluation if the caregiver notes that the infant is vomiting or that his or her spitting up is unusual in terms of volume, contents or accompanying symptoms.

4.6.4 Diarrhea

Diarrhea is defined as the frequent passage of loose, watery stools. Diarrhea should not be confused with the normal stools of breastfed infants. Diarrhea in infants can be caused by a reaction to a food, excessive juice consumption, use of certain medications, medical conditions or infections, malabsorption of food or consumption of contaminated food or water. If untreated, diarrhea in an infant can rapidly lead to dehydration, which can be life-threatening; diarrhea is the most common cause of hospitalizations in otherwise healthy infants. Chronic diarrhea may lead to nutrient deficiencies because food passes through the gastrointestinal tract too quickly to be digested and nutrients cannot be absorbed. *Thus, refer an infant to a health care provider for medical evaluation if the caregiver notes that the infant is having diarrhea.*

Use of ordinary beverages to treat diarrhea may actually worsen the condition and lead to further dehydration. In most cases of acute diarrhea, and clearly when dehydration is not present, continued feeding of the infant's usual diet is the most appropriate treatment. This is true whether the infant's usual intake is breast milk, cow's milk-based infant formula, soy-based infant formula, or any of these milks along with complementary food. ***Caregivers should consult the infant's health care provider about the treatment of diarrhea and not self-treat it by feeding ordinary beverages such as carbonated beverages, sport drinks, fruit juice, tea or chicken broth.***

The Centers for Disease Control and Prevention (CDC) and the AAP recommend the following during diarrhea:

- Breastfed infants should continue to breastfeed on demand.
- Formula-fed infants should continue to be fed usual amounts of infant formula immediately following rehydration (if indicated).
- Low lactose or lactose-free infant formula is usually not necessary.
- Infant formula should not be diluted during diarrhea.
- Use of soy-based formulas is not necessary.
- Infants eating complementary food should continue to receive their usual diet during diarrhea.
- Simple sugars (as found in soft drinks, juice and gelatin) should be avoided; solid food intake should emphasize complex carbohydrates.

- Withholding food for > 24 hours or feeding highly specific diets, for example the BRAT diet (bananas, rice, applesauce, tea) is inappropriate.
- Depending on an infant's condition, a health care provider may prescribe an appropriate oral rehydration solution to prevent and treat dehydration resulting from diarrhea. **Oral rehydration solutions should be used only under the supervision of physicians or other trained health professional.**

4.6.5 Constipation

Constipation is generally defined as the condition when bowel movements are hard, dry and difficult to pass. Although some believe constipation is related to the frequency or the passage of stools, this may not be as important as the consistency of the stools. Part of the difficulty in determining if an infant is constipated is that each caregiver may have a different perception of how often an infant should have a bowel movement and whether an infant's stool is "too hard." True constipation is not very common among breastfed infants receiving adequate amounts of breast milk or formula-fed infants consuming adequate diets. Some caregivers believe iron causes their infant to be constipated, but studies have been unable to demonstrate a relationship between iron-fortified infant formula and gastrointestinal distress, including constipation. Formula-fed infants tend to have firmer stools, but this does not indicate constipation.

Constipation can be caused by a variety of factors or conditions, including:

- Inadequate breast milk, infant formula, complementary food or fluid intake
- Improper dilution of infant formula
- Early introduction of complementary food
- Excessive cow's milk in older infants
- Abnormal anatomy or neurological functioning of the digestive tract
- Use of certain medications
- A variety of medical conditions and hormonal abnormalities
- Excessive fluid losses due to vomiting or fever
- Lack of movement or activity or abnormal muscle tone

If a caregiver complains that an infant is constipated, refer the infant to a health care provider for medical evaluation.

If the health care provider determines that the infant's diet is inappropriate and is a factor influencing the constipation, it is appropriate to assess the infant's diet, with particular focus on:

- Adequacy of breast milk or infant formula intake
- Proper infant formula preparation and dilution, if formula-fed
- Appropriate types and amounts of complementary food
- Early introduction of complementary food if the infant is less than 4 months old

4.6.6 Colic

Up to one-fifth of all infants experience colic in the first few months of life. Colic is described as prolonged, inconsolable crying that appears to be related to stomach pain and discomfort (infants may pull their legs up in pain) often occurring in the late afternoon or early evening. It usually develops between 2 to 6 weeks of age and may

continue until the infant is 3 to 4 months old. Formula-fed infants seem to experience colic more often than breastfed infants; the cause of colic is unknown. A systematic review of a variety of therapies used to manage colic indicates no clearly effective treatments.

4.7 ORAL HEALTH

Establishing an oral care routine for infants is important even before teething starts. Keeping the mouth healthy is essential for maintaining a healthy nutrition status.

4.7.1 Oral Care for Infants

- Before teeth erupt, wipe the infant's mouth out gently and massage the gums with a clean damp gauze pad or washcloth after feedings or at least twice a day, including before bedtime.
- Once teeth erupt, they should be cleaned well after each feeding or at least twice a day, including before bedtime. To clean the teeth, a very small, child-size toothbrush with soft, rounded end bristles may be used with extreme care. Use water only, not toothpaste since an infant will swallow it. Continue using a clean damp gauze pad or washcloth to clean those areas in the mouth without teeth.
- A health care provider may recommend cleaning more frequently than twice a day, especially if there are signs of tooth decay.

4.7.2 Teething Tips

- During teething, the infant's gums may be red and swollen and the caregiver may feel or see the new tooth coming through the gums.
- To soothe the infant's gums during teething, a chilled teething ring, washcloth or pacifier may be offered to the infant to chew on.
- If the infant's health care provider prescribes teething pain relief medicine, it should be avoided before mealtime because it may interfere with chewing.

4.7.3 General Prevention of Tooth Decay

- Bottles should be used for feeding only infant formula or expressed breast milk.
- Offer 100% pasteurized fruit juice in a cup, never in a bottle. Drinking from a cup will be messy at first and the caregiver will need to be patient as their infant's skills develop.
- Never give sweetened beverages such as water sweetened with honey, sugar or corn syrup; soda pop; sweetened iced tea; fruit drinks, punches or sweetened gelatin to an infant in a bottle or cup. The infant should instead be fed more nutritious beverages that will help them grow.
- The bottle should not be left in the infant's crib or playpen.
- Infants should not be allowed to walk around or sit alone with a bottle or spill-proof cup for long periods.
- The bottle should only be offered at feeding time, not when going to bed to sleep or for a nap. If the infant falls asleep during a feeding, he should be moved around slightly to stimulate swallowing before putting down to sleep.

- If caregivers are having trouble getting their infant to stop taking a bedtime bottle, they should try showing their infant love in different ways besides the bedtime bottle; for example, offer a security blanket or teddy bear, sing or play music, hold or rock their infant or read a story to their infant.
- Infants should never be given a pacifier dipped in honey, syrup or sugar.
- Infants should not be given any concentrated sweet food such as lollipops, candies, candy bars, cookies or cakes, or sweetened cereals. Infants do not need sugar or sweeteners added to their food.
- Infants should be weaned off the bottle entirely by about 12 months of age.
- Caregivers should follow the advice of their medical or dental health care provider regarding their infant's fluoride needs.

To discover and prevent tooth decay, recommend caregivers take their infants to their health care provider or a pediatric dentist for a dental check by 12 months of age. If there seems to be dental problems or decay prior to 12 months of age, the infant should see a health care provider as soon as possible.

4.8 PREVENTING OBESITY

Factors That Contribute to the Development of Childhood Obesity

Higher rates of obesity have been associated with:

- Late weaning from the bottle
- Rapid weight gain in infancy
- A high degree of caregiver control over the infant's or child's intake
- Overly restrictive diets

Breastfeeding may be linked to lower rates of childhood obesity.

PROMOTING PHYSICAL ACTIVITY

Physical activity is important for infant development and to establish healthy skills and behaviors for later childhood.

Caregivers should:

- Nurture their infant's motor skill development and encourage physical activity
- Participate in parent-infant play groups
- Provide toys and activities that encourage infants to move and do things for themselves in a safe environment
- Gently move their infant to encourage muscle development and connections between the brain and muscles
- Avoid rough activities and pay attention to whether their infant is distressed and cries when played with too vigorously
- Avoid extended periods of inactivity, such as placement in an infant seat or swing
- Assist the infant's development of head and neck control

Infant walkers are associated with thousands of injuries or deaths each year, most often as a result of an infant falling down stairs in a walker. The AAP has recommended a ban on the use and manufacture of infant walkers. The misuse of other infant equipment, including infant seats, highchairs, swings, bouncers,

exersaucers and similar equipment has been associated with significant delays in motor skill development. Caregivers should be encouraged to limit use of infant equipment and encourage their infant's movement in a safe environment.

4.9 SAFE SLEEP GUIDELINES

The following AAP guidelines for sleep should be followed:

- Babies should be placed on their backs during naps and at nighttime. Babies sleeping on their sides are more likely to accidentally roll onto their stomach, so the side position is not as safe as the back and is not recommended.
- The safest place for a baby to sleep is in the same room as the mother or caregiver in a safety-approved crib or bassinet, with a firm mattress and well fitting sheet, placed near the mother's bed (within an arm's reach).
- The crib or bassinet should be free from toys, soft bedding, fluffy blankets, comforters, pillows, stuffed animals and wedges. These items can impair the infant's ability to breathe if they cover their face.
- Remind caregivers to discuss safe sleep practices with their infant's childcare provider.
- Supervised tummy time during play is important for an infant's healthy development.

4.10 SELF-TEST QUESTIONS

1. What is the best indicator that an infant is receiving enough calories?
2. Most healthy infants _____ their birth weight by 6 months of age and _____ it by 12 months of age.
3. What condition are infants, who are breastfed and do not receive supplemental vitamin D or adequate sunlight exposure, at increase risk of developing?
4. What types of complementary foods should be introduced around 6 months of age? Why are these foods important?
5. Fluoride supplementation should not be give to infants less than ____ months old.
6. What condition can occur in an infant that is provided over-diluted formula, force-fed water or fed water in place of breast milk or infant formula?

7. What determines the type and texture of food to feed and which feeding styles to use in feeding an infant?
8. At what age does an infant's feeding pace begin to slow down?
9. Infants are capable of _____ their own food intake to meet their needs for growth.
10. List 3 common barriers to breastfeeding that a woman may experience.
11. _____ is a hormone that causes the alveoli to produce milk, whereas, _____ is a hormone that causes the "Milk Ejection Reflex".
12. What type of milk is produced around 10 to 15 days after birth and consists of foremilk or hind milk?
13. What is the purpose of the hind milk?
14. List three ways an infant may show signs of hunger (feeding cues)?
15. What is the importance of frequent breastfeeding?
16. How many times per day is it recommended that an infant nurse?
17. List 4 ways to know an infant is getting enough breast milk.
18. List 3 causes of sore nipples.
19. What can a woman do to release a plugged duct?

20. Is smoking contraindicating to breastfeeding?
21. List three instances in which soy based formula is indicated.
22. List three reasons why cow's milk is not appropriate to give to an infant.
23. At what age does water no longer need to be boiled and then cooled before mixing with infant powdered or concentrated formula?
24. Refrigerated bottles made with powdered formula must be used within _____ of preparation.
25. List 3 signs that an infant is ready to consume complementary food.
26. List 3 ways an infant shows signs of fullness.
27. How long should caregivers wait between introducing a new food?
28. If an infant does not like a food it should be offered again later, because it can take up to _____ exposures to a new food for an infant to readily accept the food.
29. Due to possible allergic reactions, what food should be avoided for infants before 1 year of age?
30. At what age do infants begin feeding themselves and can start eating finger food?
31. List five foods that should not be given to infants due to the risk of choking.
32. List 3 methods than can reduce excessive spitting up for an infant.

33. What is the AAP recommendation for the treatment of diarrhea?
34. List 5 factors that can cause constipation in an infant.
35. If a caregiver reports their infant has constipation, what should be assessed in regards to the infant's diet?
36. Before teeth appear, how should the infant's mouth be cleaned?
37. List 5 things a caregiver can do to prevent tooth decay in an infant.
38. List 3 factors that may play a part in the development of childhood obesity.
39. List 3 recommendations to give a caregiver to promote physical activity.
40. List 3 recommendations from the AAP in regards to safe sleep for an infant.

4.11 REFERENCES

Infant Nutrition and Feeding: A Guide for Use in the WIC and CSF Programs,
http://www.nal.usda.gov/wicworks/Topics/Infant_Feeding_Guide.html#guide

AAP Committee on Drugs: The transfer of drugs and other chemicals in human milk. Peds 108 (3):776, 2001

AAP Committee on Nutrition: Hypoallergenic infant formulas. Peds 106 (2), 346-349, 2000

AAP Committee on Nutrition: Soy protein-based formulas: recommendations for use in infant feeding. Peds 101 (1): 148, 1998.

AAP Section on Breastfeeding, Breastfeeding and the Use of Human Milk. Peds 115 (2) 496-506, 2005

AAP Task Force on Sudden Infant Death Syndrome: The Changing Concept of Sudden Infant Death Syndrome: Diagnostic Coding Shifts, Controversies Regarding the Sleeping Environment, and New Variables to Consider in Reducing Risk. Peds 116:1245-55, 2005 <http://www.aap.org/healthtopics/Sleep.cfm>

Centers for Disease Control, Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States, August 17, 2001 / Vol. 50 / No. RR-14
<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5014a1.htm>

American Dental Association, Fluoride and Fluoridation, Infant Formula and Fluoridation, November 2006,
<http://www.ada.org/public/topics/fluoride/infantsformula.asp>

Riordan, Jan. Breastfeeding and Human Lactation, Third Edition, 2005