



NCC Pediatrics Continuity Clinic Curriculum: **Nutrition I: Infants & Toddlers** Faculty Guide

Goal:

To understand the pediatric nutrition recommendations for *infants & toddlers* and to be able to translate them into practical, anticipatory guidance for parents.

Pre-Meeting Preparation:

- “Breastfeeding Update 2”
 - *Note: Article contains some dated/controversial viewpoints (e.g. “nipple confusion” and co-sleeping). Please read these in the context of an overall informative clinical guide.*
- Excerpts from “HealthyChildren.org” on Infant & Toddler Nutrition
- “Helping Preschoolers Become Healthy Eaters”
- **Be prepared to provide a case-example or FAQ related to Infant & Toddler Nutrition from your continuity clinic experience.** (Examples: breastfeeding difficulty, concern for food allergies, picky eaters.) Discuss how you approached the case or question.

Conference Agenda:

- Complete Nutrition I Quiz & Case Studies
- Hands-on intro to breastfeeding/pumping “paraphernalia”. Residents will learn how to make a “supplementer” with a syringe and butterfly tubing.
- **Round table discussion of *resident Infant & Toddler* cases (*if time permits*)**

Post-Conference: Board Review Q&A

Extra Credit:

Please review the following enclosures, related to the practical guidelines, above:

- www.aap.org/breastfeeding/curriculum/tools.html
(includes pre/post-tests, case studies, & PowerPoint presentations)
- [AAP Policy Statements & Resources on Vitamin D Supplementation](#)
- [“The Use & Misuse of Fruit Juice in Pediatrics”](#)

Breastfeeding Update 2: Clinical Lactation Management*

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IMPORTANT POINTS

1. Physicians can help limit infants' exposure to medications in human milk without interfering with breastfeeding.
2. Maternal breast problems and conditions may be significantly related to feeding difficulties; to detect most of these, the pediatrician must obtain a thorough maternal history and physically inspect the breasts.
3. Despite the many advantages of human milk and breastfeeding for the preterm infant, required hospitalization imposes barriers to milk production and breastfeeding. These mothers require attention and support.
4. Early identification of the breastfed term infant who has inadequate intake will prevent morbidity while physician and mother work to preserve breastfeeding.
5. Very few maternal infections are a contraindication to breastfeeding.

Clinical lactation management is the science and art of assisting women and infants with breastfeeding. Until recently, lactation and breastfeeding rarely were addressed in medical school or residency training. If breastfeeding was taught, it was by lecture, *not* by clinical example. Because the mother-infant pair is dynamically interrelated for breastfeeding, it is imperative to consider *both* individuals when attempting to assess and "manage" breastfeeding. Multidisciplinary input is desirable and often critical.

Current State of Affairs

During the past 5 years, with the resurgence of professional and lay interest in the promotion of breastfeeding, it has become increasingly common to encounter nurses who are lactation consultants. They may

be working in hospitals, physician offices, or private practice. It also is becoming increasingly common for physicians to use their office nurses as "lactation educators" or "breastfeeding specialists" once these nurses have acquired sufficient knowledge, expertise, and experience. These individuals have an in-depth knowledge of early breastfeeding management and problem solving; they also are clinically competent to assist and support the mother-infant pair. Their particular areas of expertise include (but are not limited to): understanding the anatomy and physiology of lactation (Fig. 1); facilitating immediate breastfeeding postpartum; proper positioning and latch-on of the infant at the breast; preventing postpartum breastfeeding problems by frequent, effective feedings; assisting the mother in learning to recognize and respond to infant cues; and recognizing and managing common problems such as a sleepy baby, a fussy baby, latch-on difficulties, sore nipples, engorgement, and perceived low milk supply. It is imperative that these specialists have enough experience with young infants to recognize illness.

The increasing availability of lactation consultants/breastfeeding specialists does not exempt the physician from responsibility. As with other consultations that involve delegation of care, the physician continues to oversee and coordinate

the management of the infant. If the physician refers patients to the lactation consultant for detailed feeding assessment and assistance and if communication is open, the lactation consultant can feel comfortable in working with the physician on more complex medically related feeding problems.

Anatomy and Physiology

Physicians must understand several essential underlying anatomic and physiologic considerations thoroughly as they assist the breastfeeding dyad (Tables 1 and 2). (See Lawrence and Riordan and Auerbach in Suggested Reading for more detailed information.)

PREPARATION FOR BREASTFEEDING

Pregnancy provides optimal preparation of the breasts for subsequent feeding. The only further preparation required is that of clinicians: obtaining a careful history, examining the breasts, and communicating any concerns to colleagues.

A complete breastfeeding history includes exploration of the feeding decision, previous breastfeeding history, previous postpartum hemorrhage (possible Sheehan syndrome), previous breast surgery (cosmetic or reconstructive surgery, biopsies), cardiac or chest wall surgery, breast trauma (eg, a burn that has caused

ABBREVIATIONS

HIV-1:	Human immunodeficiency virus Type 1
HIV-2:	Human immunodeficiency virus Type 2
HSV-1:	Herpes simplex virus Type 1
HTLV-1:	Human T-lymphotrophic virus type 1
HTLV-2:	Human T-lymphotrophic virus type 2
UNICEF:	United Nations International Emergency Children's Fund
WHO:	World Health Organization

*Part 1 of the Breastfeeding Update appeared in the April 1997 issue of *Pediatrics in Review*.

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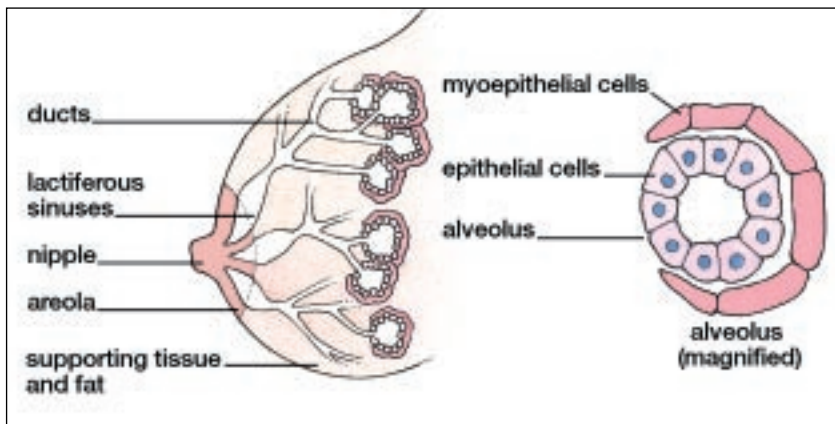


FIGURE 1. Clusters of epithelial cells form the alveolus. During lactation, these cells actively secrete milk into the lumen. When oxytocin, secreted by the posterior pituitary, reaches the mammary gland via the bloodstream, contraction of the myoepithelial cells pushes the milk down the ducts to pool in the lactiferous sinuses. Illustration by Marcia Smith.

scarring), questions regarding breast changes during pregnancy, family history of breast cancer, and any other concerns the mother may have about her breasts or about the feeding process. Table 3 lists some of the major maternal conditions affecting breastfeeding.

BREAST SURGERY

Previous breast surgery has the potential to interfere with lactation. Breast reduction, in particular, usually involves significant cutting of ducts or nerves that could impair the lactation process. Breast augmentation tends to be associated with great anxiety on the part of the pregnant and lactating woman about the possibility of causing illness in her infant. Most breastfeeding experts see no strong evidence to support ill effects in the infants of these women. If breast augmentation was performed to correct a developmental anomaly of the breasts, lactation performance may have been impaired prior to surgery (see section on Insufficient Glandular Development). In all women who have had breast surgery, breastfeeding care should be individualized and the infant followed frequently during the first few weeks for appropriate weight gain.

FLAT, RETRACTILE, OR INVERTED NIPPLES

No specific intervention is required for bilateral inverted or retractile nipples in early pregnancy. (If one

nipple normally is protuberant, the infant can nurse totally from that breast if necessary.) If both nipples remain inverted near term, the woman may require extra attention to intrapartum management, should be cautioned to avoid artificial nipples and pacifiers, or may need extra skilled assistance with early feeding. Most infants can learn to nurse from inverted or retractile nipples if given the opportunity soon after delivery and if they do not receive artificial nipples the first several days. Use of a breast pump just prior to feeding may be beneficial in pulling the nipple and areola out further and helping to initiate let-down.

The prenatal use of breast shells (also called milk cups), although widespread, is controversial. Theoretically, the shell allows the nipple to protrude through the hole in the plastic and gradually stretch the fibers that are “tethering” the inverted nipple. In the only study to date, the use of breast shells prenatally was associated with less successful breastfeeding. The greatest disadvantage was that women randomly assigned to use shells decided not to initiate breastfeeding in greater numbers than those who were not assigned their use. The authors of that study suggested that prenatal use of breast shells be abandoned.

Nipple shields (an artificial nipple placed over the mother’s breast/nipple during the postpartum period) have several drawbacks that may

complicate the original problem. They reduce milk flow to the infant by 40%, causing a rapid decline in milk supply, and the infant tends to become “addicted” to the sensation of a rigid nipple, similar to a bottle nipple preference. The result is that the mother cannot feed without the shield, but she cannot produce sufficient milk while using the shield (unless she also pumps, which becomes complicated). Nipple shields rarely are indicated and should be prescribed only by a qualified licensed practitioner who understands and communicates the potential risks and who will follow the mother and infant closely.

INSUFFICIENT GLANDULAR DEVELOPMENT

“Insufficient glandular development” of the breast (sometimes called “primary lactation failure”) is characterized by immature-appearing breast(s). Striking asymmetry is present in the unilateral form, although bilateral underdevelopment also has been documented. Some women may have had cosmetic surgery to correct the appearance of the anomaly. Other major features include little or no breast growth during pregnancy and lack of physiologic engorgement postpartum. Hormone levels, including prolactin, are normal.

In general, small breasts will produce normal amounts of milk. However, small, immature, or asymmetric breasts that do not respond to pregnancy by enlarging suggest the possibility of anomalous development. The obstetrician should inform the pediatrician of this condition and the pediatrician should incorporate questions about breast changes into the maternal history-taking. Close follow-up of the infant is mandatory, with weight checks every 2 to 3 days, because these babies can develop significant dehydration or hypoglycemia quite rapidly.

Because insufficient glandular development of the breast is a clinical diagnosis and is rare (probably less than 1 per 1,000 women of childbearing age), the breastfeeding experience should be encouraged until signs and symptoms are definite. Infants should receive early supplementation to avoid significant

TABLE 1. Lactation Physiology Glossary of Terms

These are listed in chronologic order as they occur in lactation.

- **Milk ejection reflex = let-down = oxytocin release:** The maternal neuroendocrine response to suckling or other stimuli that release oxytocin from the posterior pituitary into the circulation. The oxytocin then acts upon the mammary myoepithelial cells to contract and force milk from the alveoli into the ducts toward the lactiferous sinuses where it is readily available to the suckling infant.
- **Lactogenesis = “The milk comes in”:** The onset of copious milk production in the first several days postpartum. After delivery of the placenta, systemic levels of progesterone and estrogen drop steadily, while prolactin levels remain high. This sequence of hormonal changes potentiates the target organ (mammary epithelium) to respond to prolactin.
- **Galactopoiesis:** The ongoing maintenance of milk production in sustained lactation. Galactopoiesis requires systemic hormones, but day-to-day regulation of milk volume depends on ongoing milk removal, an “autocrine” function (see below) of the mammary gland. The more the baby nurses, the more milk is produced (if the baby is successful in removing milk from the breast). Ongoing milk production also can be stimulated by hand expression or pumping, as long as milk is removed in sufficient quantities.
- **Autocrine regulation:** Self-regulation of milk production due to local factors produced in the mammary gland. A peptide “inhibitor” produced in the gland slows milk production unless it is “removed” by the frequent suckling. Conversely, if frequent feedings occur, the inhibitor is removed, and milk production is increased.
- **Foremilk:** Milk that is extracted early in a feeding. This milk is lower in fat and, therefore, lower in calories than is hindmilk. Milk fat concentration rises linearly during a feeding, so there is no specific point in time that distinguishes foremilk from hindmilk.
- **Hindmilk:** Milk that is extracted later in a feeding. This milk is higher in fat and calories than foremilk. Milk fat concentration rises linearly during a feeding, so there is no specific point in time that distinguishes foremilk from hindmilk. The longer the interval between feedings, the greater the difference will be in fat concentration between foremilk and hindmilk.
- **Unilateral involution:** One breast ceases milk production while the other continues. Because ongoing milk production is regulated locally, continued milk production is regulated independently in each breast. The side that involutes will be somewhat smaller than the side that is producing milk until complete weaning has occurred on both sides.

dehydration following overzealous attempts to stimulate the milk supply with frequent suckling. Despite frequent and effective milk removal, these breasts cannot be stimulated into full production; partial breastfeeding, using a supplementer, is an option for some women.

Intrapartum Care

Many health professionals are not aware that intrapartum attitudes, events, and procedures affect breast-

feeding; these last well beyond delivery. More research accumulates each year to affirm that a more “natural” birthing process enhances the instinctual and reflexive aspects of breastfeeding.

Because maternal medication during labor affects infant neurobehavioral status, minimizing the use of medications during labor and delivery will optimize infant feeding behavior. Epidural anesthesia is associated with long labors, maternal fever, increased rates of

instrumented delivery and cesarean section as well as altered infant neurobehavior. The ultimate effect of epidural anesthesia on breastfeeding remains an important area for further research.

Gastric suctioning of the newborn should be abandoned when the labor and delivery is uncomplicated. If suctioning is necessary, gentle bulb suctioning of mouth and nares usually is sufficient.

After delivery of the healthy term infant, immediate and sustained contact between mother and infant strongly correlates with longer durations of breastfeeding. The infant can be dried, assigned Apgar scores, and visually inspected as it receives skin-to-skin contact with the mother. Both mother and baby can be covered with warm blankets if the room temperature is cool. Skin-to-skin contact also accelerates infant temperature stability and normalization of blood glucose and improves acid-base status. For the healthy dyad, skin-to-skin contact should occur for at least 1 to 2 hours after delivery. Even short interruptions for bathing, eye prophylaxis, administration of vitamin K, weighing, and other procedures have been documented to reduce breastfeeding success. These first hours following birth, when mother and infant are alert, allow time for maternal-infant bonding, imprinting, oxytocin release, and nutritive feeding with actual intake of colostrum.

It is essential for an experienced health professional to observe and assist with at least one feeding in the hospital to document good latch-on. If the first feeding in the alert period is not optimal, the infant may be sleepy for up to 48 hours postpartum.

Optimal Breastfeeding

NOTHING BUT THE BREAST

Questions frequently arise regarding the adequacy of human milk for the newborn infant; numerous customs for supplementation have arisen throughout the world. However, it is well-documented that for healthy infants, no additional liquids, foods, or vitamins are

necessary during the first 6 months of breastfeeding (See "Breastfeeding Update 1: Immunology, Nutrition, and Advocacy" in April 1997 issue.)

Breastfed infants never need to be bottlefed; even young infants can take expressed human milk from a cup and older infants can graduate directly from breast to cup sometime after 6 months, when other liquids are started. For families who are more comfortable giving human milk in a bottle, it is reasonable to introduce a bottle at 3 to 6 weeks of age (when breastfeeding is usually well established).

HOW OFTEN AND HOW LONG?

After delivery, both mother and infant usually are alert for 1 to 2 hours and then become drowsy. In the hospital, term infants often show little interest in feeding for the next 24 to 48 hours. Infants 37 weeks of gestation or younger require close scrutiny for possible hypoglycemia, but term infants should have adequate energy stores.

Once the baby becomes more wakeful, feedings tend to be very frequent (8 to more than 12 per 24 hours) and clustered during particular portions of the day or night.

It is essential at this early stage to be certain that the infant has good latch-on technique (Fig. 2), which prevents most common breastfeeding problems, such as sore nipples, unsatisfied baby, engorgement, low milk supply, and hyperbilirubinemia.

If the infant is well latched-on and feeding is painless, it should continue on the first breast until the baby is finished. When finished, the infant will detach spontaneously or will fall asleep and not feed in response to gentle stimulation.

Parents and health professionals must learn to use behavioral and physical criteria to judge appropriate intake, in place of weights, measures, and units of time. Table 4 lists the signs of good breastfeeding and warning signs that early breastfeeding is not going well.

TABLE 2. Clinical Lactation Management Glossary of Terms

- **Dyad:** The mother-infant pair.
- **Latch-on = attachment at the breast:** The manner in which the infant's oral structures make contact with the maternal breast to suckle. Proper latch-on requires proper positioning of the infant's body, active rooting reflex with wide opening of the jaw to facilitate grasping of the areola as well as the nipple, lips relaxed and flanged out, tongue cupped around inferior aspect of nipple-areola complex, and deep rhythmic sustained bursts of sucks with audible swallows (indicates that let-down has occurred). See Figure 2.
- **"Nipple confusion":** An imprecise term describing the situation that occurs when newborns receive artificial nipples and subsequently refuse to latch-on at the human breast. Occasionally, the term is used for older breastfed infants who refuse to take a bottle.
- **Sheehan syndrome:** Loss of anterior pituitary function (and subsequent loss of prolactin, thyroid hormone, cortisol, and gonadotropins) following severe postpartum hemorrhage. The hypotension associated with the blood loss decreases perfusion to the pituitary. Lactogenesis does not occur due to absent or deficient prolactin levels. Frequently the diagnosis of this syndrome is delayed for years beyond the initiating event.
- **"Supplementer" = Infant feeding device = Supplemental Nutrition System (proprietary name) = Supplementer tube:** A device that consists of a small flexible feeding tube attached to a milk reservoir in such a way that the infant can receive supplemental human milk or formula while breastfeeding. This helps to maintain maternal milk supply and to prevent nipple confusion. See Figures 3 and 4.

Sleep Issues and Nighttime Parenting

Only a few newborns exhibit regularly spaced feeding times. Anticipatory guidance regarding nighttime fussiness during the first week as well as the expectation of 8 to 12 feedings per 24 hours can be invaluable during this crucial period. Many women find that sleeping with the baby eases the infant's transition to nighttime sleep. Breastfed infants need to be fed at night to maintain growth and to receive consistent responses to hunger cues. In addition, night feedings often are necessary to maintain adequate milk production (Fig. 5). Care should be taken not to frown upon mothers who continue to feed their infants at night or who sleep with them because these are normal physiologic processes for the breastfeeding mother-infant dyad (see McKenna

TABLE 3. Maternal Conditions Directly Associated With Significant Breastfeeding Problems

ACQUIRED PRIOR TO PREGNANCY/LACTATION	ACQUIRED BECAUSE OF BREASTFEEDING PROBLEM	ACQUIRED DURING PREGNANCY/LACTATION AND CAUSES BREASTFEEDING PROBLEM
• Inverted or retractile nipples	• Sore, cracked nipples	• Retained placenta
• Breast surgery	• Engorgement	• Hypothyroidism
• Primary glandular insufficiency of the breasts	• Blocked ducts	• Sheehan syndrome
• Breast trauma	• Mastitis	

in Suggested Reading). Providing strategies on how a mother can minimize awakening when feeding at night is a supportive step for breastfeeding families.

Newborns feed much better according to their own sleep/wake cycles than if parents attempt to

awaken infants by the clock (when the infant may be in a deep sleep). Parents need to awaken sleepy newborns during the first few weeks of life only if the infant is feeding fewer than eight times per 24 hours and only until the baby regains its birthweight.

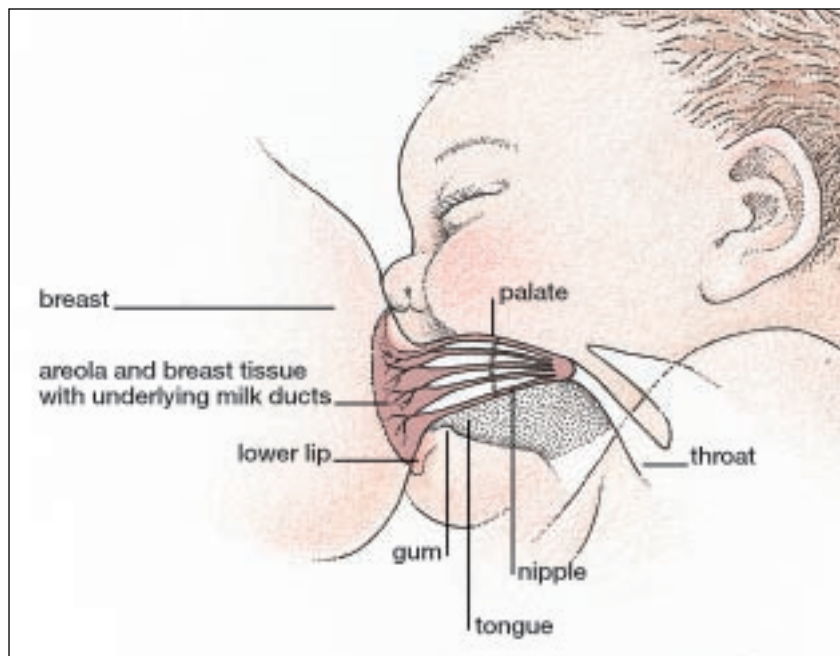


FIGURE 2. Correct attachment (latch-on) at the breast includes: 1) newborn's nose close to or touching the breast while it breathes through the nasolabial folds; 2) rooting by the infant to move in and grasp the areola well behind the nipple, forming a teat; 3) tongue moving forward beyond the lower gum, cupped and forming a trough, then removing milk from the lactiferous sinuses by peristaltic waves; 4) the jaw moving down, creating a negative pressure gradient that facilitates transfer of the milk into the oral cavity. Illustration by Marcia Smith.

Normally, milk production occurs at a continuous rate, like faucet that is running. As the faucet runs, the sink (the breast) fill

FIGURE 3. In addition to breastfeeding, a commercial "supplementer" is used to deliver supplemental nutrients to an infant delivered at 24 weeks' gestation and weighing 745 g. Postconceptional age of the infant in this photo is 36 weeks. Photo courtesy Nancy G. Powers, MD.

Keeping Records of Feedings

Under certain circumstances (especially with patients who are experiencing problems), a breastfeeding log or diary may be useful (Fig. 6). If the parents are comfortable jotting down feeding-related events, a written record can help them keep track of important indicators during the early postpartum period. Sleep deprivation and constant care of the infant make it easy for parents to lose track of time and over- or underestimate actual numbers of feedings and diaper changes. For the infant illustrated in Figure 4, the diary makes it easy to see that the infant received 11 feedings (with a cluster between 4 PM and 8 PM) and had 3 to 5 wet diapers along with 6 stools (transitioning to yellow), all of which are within the normal ranges. The column labeled "other" could reflect expressed milk or formula given by cup or supplementer and the amount the baby received.

When to Supplement

Giving water or formula supplements will sabotage breastfeeding by decreasing the infant's interest at the breast and subsequently reducing milk removal and production. In addition, nipple confusion or "nipple addiction" to an artificial nipple is a risk in selected babies. The healthy



FIGURE 4. A home-made supplementer device uses a red nipple cut to allow passage of a #5 french feeding tube. The tube's "hub" rests in the milk. The rubber band and safety pin around the bottle allow the device to be pinned to the mother's clothing.

TABLE 4. Breastfeeding in the Newborn Period

Signs of Good Breastfeeding

- Frequent feedings of 8 to 12 times every 24 hours (the baby does not have to take both breasts at each feeding)
- The baby is allowed to feed until finished on one side (time will vary greatly with each individual mother-baby dyad)
- Intermittent episodes of rhythmic sucking with audible swallows
- At least 1 to 2 wet diapers per day for the first 2 days (may be difficult to judge with disposable diapers; use cloth diapers or use a liner such as a paper towel)
- Pink urate crystals, if present, disappear after the third day
- Starting the third day, 4 to 6 wet disposable diapers or 6 to 8 wet cloth diapers every 24 hours
- A minimum of 3 to 4 bowel movements every 24 hours
- Stools should be about 1 tablespoon or larger
- After the third day, soft and yellow stools ranging from 4 (if large) to 10 (if small)

Breastfeeding Warning Signs (requires infant evaluation)

- Fewer than 6 wet diapers per 24 hours after the third day
- Dark black, green, or brown stools after the third day
- Fewer than 3 or 4 yellow stools (from the fourth day to the fourth week)
- Fewer than 8 feedings in 24 hours (the baby does not have to take both breasts at each feeding)
- The baby seems to be nursing continuously, always hungry, and never satisfied
- The baby is exceptionally “good,” rarely crying and consistently sleeping more than 4 to 6 hours
- Milk comes in, but swallowing or gulping is not audible
- Milk does not seem to have come in by the fifth day
- Sore and painful nipples throughout most feedings
- Significant engorgement (breasts are very hard and do not soften after feeding)
- Average daily weight gain of less than 15 to 30 g (once the milk comes in)
- The baby has not regained birthweight by 10 days of age

term infant needs nothing more than breastfeeding.

For healthy term infants, situations that *do not* warrant supplementation include:

- A sleepy baby who has few feedings the first 48 hours
- Bilirubin levels between 12 and 20 mg/dL after 72 hours (the infant should be feeding well, having more than four yellow bowel movements per day, and having no hemolysis or other pathology)

- Nighttime fussiness or constant feeding for several hours
- Growth spurts

There are alternative management strategies for these situations (Table 5). The American Academy of Pediatrics (AAP) “discourages the interruption of breastfeeding in healthy term newborns. . . .”

Supplementation *sometimes* is necessary for the term infant in the first weeks of life. According to the World Health Organization (WHO), only mothers and infants who are ill

fall into this category (Table 6), and supplementation indicates anything other than human milk.

In the United States, where there is not a strong breastfeeding culture and limited support, indications for supplementation must be placed in the context of the infant’s overall status and a thorough breastfeeding evaluation. If the infant is stable, skilled assistance with positioning, latch-on, relaxation, and milk ejection may obviate the need for supplements.

If feeding still is not effective after skilled assistance, indications for supplementation might include those listed in Table 7. It may be difficult to pump colostrum (colostrum is obtained most easily by hand expression), but once lactogenesis has occurred, the mother can express her own milk to use as a supplement. Preferably, the supplements would be given at the breast by using a “supplementer.” Cup feeding also is a good option for preterm or ill infants because the cup is noninvasive and will stimulate the rooting reflex and horizontal tongue movements similar to that seen with suckling at the breast (Fig. 2).

Painful Feedings

Persistent pain during breastfeeding is not normal. During the first 2 weeks, brief discomfort can occur for a minute or so when the newborn is latching-on. If pain continues after the initial latch-on, the infant should be removed and reattached to ensure proper latch-on, let-down reflex, and swallowing. If pain arises during the course of feeding, the baby should be removed and switched to the other breast if still hungry.

Another cause of sore nipples during the first few days is infant oral-motor dysfunction (abnormal suck pattern). The pediatrician should examine the infant completely and ensure that positioning and latch-on are optimal. After feeding, the mother’s nipple may appear creased, ridged, flattened, pointed, or otherwise misshapen. The diagnosis and treatment of breastfeeding problems related to oral-motor dysfunction require consultation with

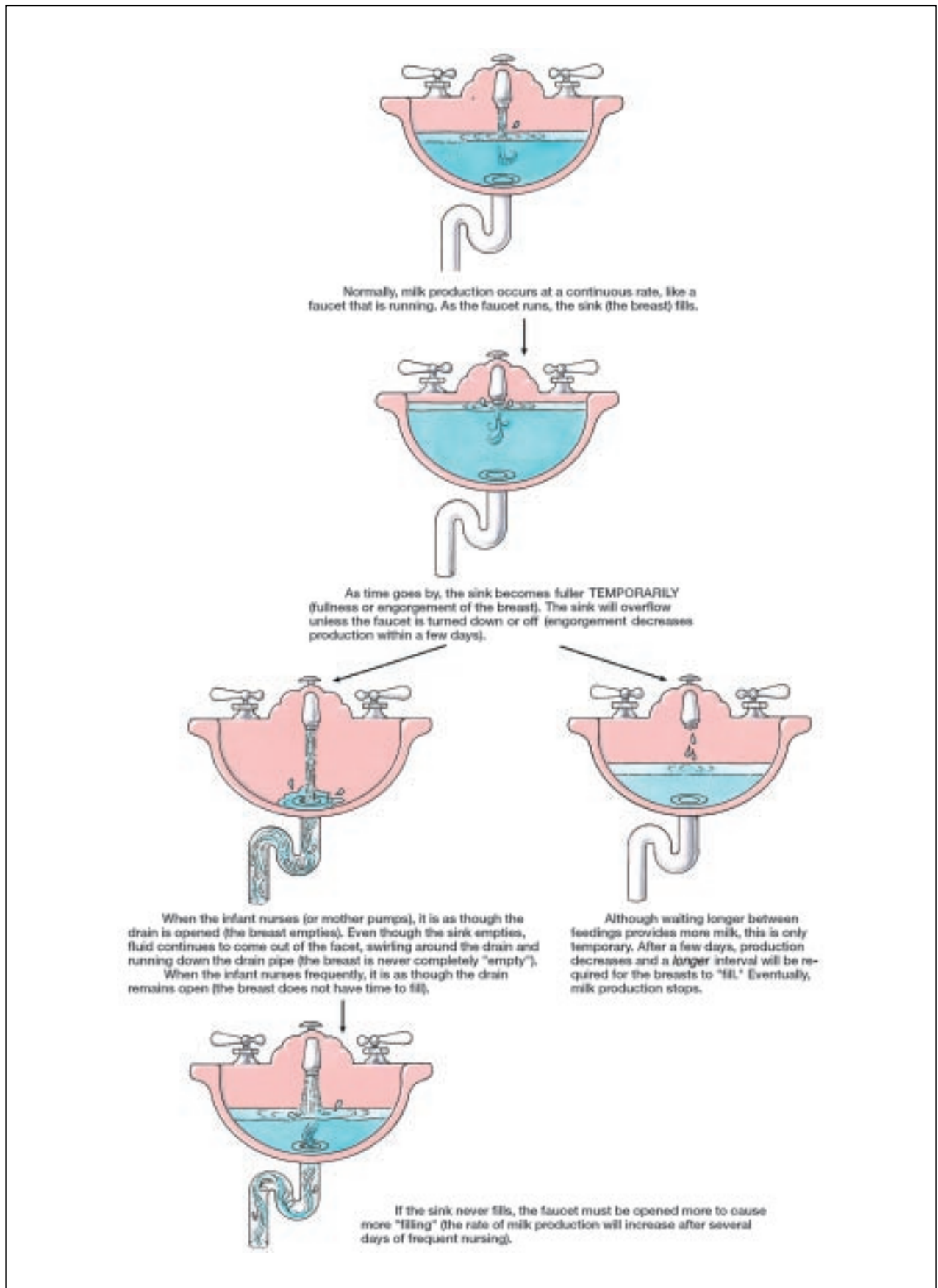


FIGURE 5. Frequent removal of milk from the breast stimulates milk production. This analogy with a sink can help parents understand the importance of frequent milk removal by feeding or pumping. Illustration by Marcia Smith.

NUTRITION Breastfeeding

BABY'S NAME: <u> Marci </u>		DATE: <u> 7/29/96 </u>		BABY'S AGE: <u> 3 days </u>		
TIME	BREAST	(OTHER)	(AMOUNT)	WET DIAPERS	STOOLS* SIZE/COLOR	COMMENTS
06:00 AM						
07:00	√			√		ate well
08:00						
09:00	√				Med/green	
10:00						
11:00						
12:00 NOON						(mom & baby fell asleep!)
1:00 PM	√			?	Med/y-green	
2:00						
3:00						
4:00	√			√		
5:00	√				sml/yellow	
6:00	√				sml/yellow	eating constantly
7:00	√					
8:00	√					finally went to sleep
9:00						
10:00						
11:00						
12:00 MIDNIGHT				√ (soaked)	sml/yellow	
01:00 AM						
02:00	√					
03:00						
04:00	√			?	med/yellow	
05:00						
<p>*KEY TO STOOL DESCRIPTION: <i>Lg</i> = 2 or more tablespoons <i>Sml</i> = 1 teaspoon <i>Dk</i> = very dark <i>Br</i> = brown <i>Med</i> = 1 tablespoon <i>Spt</i> = spot <i>Gr</i> = green <i>Y</i> = yellow</p>						

FIGURE 6. Sample breastfeeding diary.

a knowledgeable and skilled professional (lactation consultant or specialist, often in conjunction with an infant feeding specialist).

Later in lactation, *Candida* infection of the nipple/areola complex may present as new onset of sore nipples or breast pain (the pain often is described as having a burning or stabbing quality). The clinical diagnosis is made when there is a preceding history of antibiotic usage, thrush (infant) or dermatitis (infant), or maternal candidal vaginitis in combination with maternal nipple pain and/or dermatitis. Maternal physical findings can include normal appearance, mild erythema of the nipples, erythematous scaling, or a florid erythematous rash of the nipple/areola complex. Occasionally the mother will have either satellite lesions on the breast or intertrigo.

Candidal dermatitis frequently is complicated by cracking or fissuring of the nipples.

When the pediatrician diagnoses oral thrush (with or without symptoms in the nursing mother), treatment of both mother and infant is essential to prevent the "ping pong" passage of the infection. Conversely, if the mother presents with clinical findings of yeast infection of the breast or nipples, the pediatrician must treat her (or ensure treatment by her physician) as well as the infant (with or without clinical thrush). The infant is treated with oral nystatin ("painted" onto the oral surfaces) after every other feeding for 14 days. The mother should be treated with nystatin or clotrimazole cream rubbed well into the nipple/areola after each feeding for a minimum of 14 days. Other sites of

candidiasis also must be treated (maternal vaginitis or infant diaper dermatitis). Meticulous attention must be given to eradicating *Candida* from any feeding equipment, breast pumps, pacifiers, toys, towels, bed linens, nightclothes, and bras. Longer treatment frequently is necessary if the condition has become well established prior to treatment. Recently some practitioners have started treating chronic yeast of the maternal breasts and nipples with oral fluconazole while the infant continues to breastfeed (personal communication).

Pacifiers

Although many newborns are sleepy, some are wakeful and seem to require substantial sucking. There are several risks to introducing paci-

TABLE 5. Alternatives to Supplementation in the Early Neonatal Period

NEWBORN BEHAVIOR/FINDING	SUGGESTIONS
Immediate breastfeeding after delivery; baby not interested	Minimal/gentle oral suctioning at delivery. Leave infant with mother, skin-to-skin for the first few hours; infant may take up to 1 hour to show interest in actual feeding. Delay procedures such as vitamin K administration and eye prophylaxis.
Infant sleepy during the first 24 to 48 hours	Keep baby skin-to-skin, in diaper only (baby probably will sleep a great deal). Watch for early feeding cues, and when present, awaken infant and put to breast. Gently stimulate infant if sleepy at breast; rub hands, feet, head. Do not force infant to breast if it is uninterested or crying. NO SUPPLEMENTS ARE NECESSARY; REASSURE THE PARENTS. Baby should start waking frequently by the third day or be awakened.
Infant fussy and acts hungry all of the time during the first few days	Evaluate latch-on and position. Facilitate milk ejection reflex: skin-to-skin contact in center of chest before putting baby to breast; warm moist compresses to breasts; relaxation techniques (deep breathing, visual imagery, shoulder massage by family member or nurse). Allow unlimited feeding on one side as long as it is not painful. Instead of pacifier, help baby find its own hand or let baby suck on parent's finger.
Baby jaundiced, bilirubin <25 mg/dL (day 3 or later), and no hemolysis	All above strategies are appropriate. See AAP Practice Parameter (Suggested Reading).
Baby awake and fussy at night	Keep lights low. Let the baby sleep with parent. Skin-to-skin contact.
Baby cries at the breast and will not latch on in the first few days	Examine baby for injury (severe bruising of head, forceps injury over mandible, fractured clavicle, oral injury from suctioning, other). Erect nipple by stimulating it; hand express some colostrum onto the nipple; compress breast to create more surface for infant to grasp. Do not push or force baby onto the breast; console. Last resort: Try using some drops of glucose water on the nipple or use a "supplementer" to get baby started.
Growth spurts: Previously satisfied (and growing) infant is hungry all of the time; mother doubts her milk is sufficient. Infant is not ill.	Feed as often as the baby requests; try to obtain extra household assistance. Do not give other liquids or foods. Condition usually lasts 2 to 7 days.

fiers to term infants during the first few weeks of life: 1) The infant may substitute nonnutritive sucking for milk intake at the breast, resulting in poor weight gain; 2) The pacifier can become a source of nipple confusion; and 3) Use of a pacifier may reinforce abnormal sucking in infants who have oral-motor dysfunction. The infant sometimes can be calmed and soothed, with close body contact, with or without suckling, a natural function of the breasts. Infants often will suck on their own fist, hand, fingers, or thumb to self-soothe.

Pacifier use has strong cultural underpinnings; it may be a marker for breastfeeding problems rather than a cause of the problems. After breastfeeding is well established,

some parents may choose to use a pacifier, even though most studies examining pacifier use for term infants relate a number of potential negative consequences, including shorter duration of breastfeeding, increased incidence of otitis media, increased carriage of oral *Candida* and other pathogens, and orthodontic problems. Preterm infants benefit from nonnutritive sucking during the period of time that they are unable to take oral feedings.

Early Discharge and Breastfeeding

Over the past several years, increasing attention has focused on "failed breastfeeding" ("breastfeeding malnutrition," "breastfeeding morbid-

ity," extreme weight loss with hypernatremic dehydration or hyperbilirubinemia). The increased frequency of this syndrome probably is multifactorial, including shortened hospital stays, economic pressures to minimize costs of extra office visits, and increased initiation of exclusive breastfeeding without the sociocultural and health-care supports that provide a safety net for the dyad. Infants between 35 and 37 weeks' gestation (who probably did not actually fulfill requirements for early discharge) appear to be at particular risk for this complication.

Studies of effects of early discharge are inconclusive. Hospital-based reports of readmission are primarily retrospective, case reports are difficult to put into perspective,

TABLE 6. Acceptable Medical Reasons for Supplementation*†

- Birthweight <1,500 g or gestation <32 weeks
- Small for gestational age with potentially severe hypoglycemia
- Severely ill mother (eg, psychosis, eclampsia, or shock)
- Inborn errors of metabolism (eg, galactosemia, phenylketonuria, maple syrup urine disease)
- Acute water loss
- Mothers taking contraindicated medication when breastfeeding (rare)

*Supplementation indicates liquids or foods other than human milk. In most cases, mother's milk supply should be maintained.

†Adapted from *The Global Criteria for the WHO/UNICEF Baby Friendly Hospital Initiative*.

TABLE 7. Possible Indications for Early Supplementation After Complete Evaluation of Mother and Infant and Breastfeeding Observation*

Infant indications

- Hypoglycemia documented by blood glucose measurement (not Dextrostix[®]) after infant has had opportunity to suckle
- Significant dehydration
- Weight loss of 8% to 10% accompanied by delayed lactogenesis (day 5 or later)
- Delayed bowel movements or dark stools at day 5
- Insufficient intake despite an adequate milk supply
- Hyperbilirubinemia related to poor intake (breastfeeding evaluation and management has occurred and infant is unable to sustain feedings at the breast)
- Prematurity/low birthweight necessitates fluids/calories, and mother is not available or is unable to express sufficient quantities for the baby's immediate needs

Maternal Indications

- Delayed lactogenesis (day 5 or later) and signs of infant problems
- Delayed lactogenesis and inconsolably hungry infant
- Intolerable pain during feedings
- Unavailability of mother due to severe illness or geographic separation
- Primary glandular insufficiency (primary lactation failure), as evidenced by poor breast growth during pregnancy and minimal indications of lactogenesis
- Retained placenta causing delayed lactogenesis (lactogenesis probably will occur after placental fragments are removed).
- Sheehan syndrome (postpartum hemorrhage followed by absence of lactogenesis)

*Supplementation indicates expressed human milk, fortified human milk, or formula, preferably given by "supplementer."

cost/benefit analyses tend to favor overall cost savings above individual episodes of readmission, and every hospital has a different mechanism for follow-up after discharge. Thus, standards do not exist. Two separate sites of a large health maintenance organization (HMO) have documented independently an overall reduction in costs of hospital readmission when breastfeeding promotion, early discharge, and consistent follow-up occurred in the context of a lactation program (personal communication).

For infants discharged prior to 48 hours of age, the AAP now recommends follow-up by a health professional within 48 hours and an office visit within 7 days instead of 2 weeks. Home visits are appropriate, given proper training and supervision of the home visitors. At these first follow-up visits, close attention must be given to both maternal and infant indicators of breastfeeding progress (Table 8); appropriate advice can be given only if the feeding has been observed and assessed by a knowledgeable clinician. Subsequent follow-up within 1 to 3 days is prudent to determine if interventions have been successful.

Complications

IN THE INFANT

Even when complications arise, such as prematurity, multiple gestations, or illness of mother or baby, it often is possible to continue breastfeeding or at least to maintain lactation until the baby can suckle at the breast. The immunologic advantages and nutritional aspects of human milk for the pre-term infant were addressed in "Breast-feeding Update 1: Immunology, Nutrition, and Advocacy" in the April 1997 issue of *Pediatrics in Review*. The following section offers suggestions for clinical assistance for mothers and infants who are hospitalized.

Preterm infants of fewer than 36 weeks' gestation frequently cannot sustain feedings at the breast, either because of significant medical problems that preclude feedings or because of immaturity of suck, swallow, and breathing reflexes. Women who have high-risk preg-

TABLE 8. Indicators of Breastfeeding Progress in the First Week of Life

INFANT	MOTHER
Physical examination: Alert, hydrated with moist tongue, vigorous and coordinated suck, mild-to-moderate icterus	Physical examination of breasts: No scabbed or cracked nipples, no severe engorgement, no erythema. May be tender to palpation due to fullness
Weight: Loss less than 8% of birthweight; gain of 15 to 30 g/d (after the milk comes in)	Temperature: Normal
Feedings: Minimum of 8 per 24 hours	Feedings: Comfortable
Bowel movements: At least 3 to 4 per day; yellow "milk stools" by day 3	Milk "comes in": Within 72 hours after delivery; breasts feel full and warm; milk may leak
Urination: At least 4 to 6 times per day after day 3	
Behavior: Hungry/alert periods alternate with content/sleepy periods	Milk let-down: Evident by infant swallows, milk leaking, softening of breasts after a feed
Breastfeeding observation: Infant is awake, roots eagerly, latches on easily, and quickly settles into feeding with rhythmic sucking and audible swallows	Breastfeeding observation: Mother handles infant confidently, positions him or her well, and appears relaxed during feeding. Milk let-down and audible swallows are noted by an experienced observer

nancies may be too ill to nurse their babies after delivery. Finally, the neonatal intensive care unit can be a daunting environment that presents numerous barriers to breastfeeding. Recognition of these barriers is the first step to helping mothers overcome them (see Table 9).

The primary goal is for the mother to develop and maintain an adequate milk supply until her infant can suckle. Skin-to-skin contact with the infant should begin as soon as possible, and the mother should begin expressing milk, preferably within the first 24 hours. Optimal routines for milk expression include: eight pumpings per 24 hours (seven are acceptable, but not truly physiologic because some longer intervals will elapse); use of a double professional electric pump if the woman is not proficient at hand expression; facilitation of let-down by relaxation techniques such as deep breathing, visual imagery, or relaxation tapes; and provision of a pleasant private place for women to express their milk. Milk collection and storage techniques are important for optimal delivery of nutrients. There is no scientific justification for routine microbiologic cultures of human milk, and the financial costs are exorbitant (a recent inquiry showed a range of \$35.00 to \$95.00 for a single culture).

Bottle feedings are unnecessary for care of the breastfed preterm infant, as validated by WHO/UNICEF in its specific reference in the "Ten Steps to Successful Breastfeeding" (see "Breastfeeding Update 1: Immunology, Nutrition, and Advocacy" in the April 1997 issue of *Pediatrics in Review*). An indwelling nasogastric tube may be left in place while the infant learns to suckle at the breast. Another alternative is to use oral feedings of expressed human milk, given by cup, spoon, or supplementer. The staff of the intensive care unit must be trained to provide practical assistance with feedings under these special circumstances.

IN THE MOTHER

Infections

The complications that generate the most concern and controversy are those associated with infectious diseases or drug use in lactating women. Most infections in the mother pose little risk to the healthy term infant, with the notable exceptions of human immunodeficiency virus (HIV) I and II, human T-lymphotrophic virus (HTLV) I and II, active tuberculosis, and active herpes simplex virus (HSV)-1 lesions *on the breast*. (Little information is available regarding the risk of trans-

mission of hepatitis C via human milk, but there are no reported cases at this time. As of March 1997, the Centers for Disease Control and Prevention states that if a woman has active hepatitis C at the time of delivery, "there is no reason to recommend against breastfeeding." Cracked or bleeding nipples are of theoretical concern.)

For each of these infections, several considerations must be addressed, realizing how rapidly information is changing: 1) What is the precise risk to the infant of acquiring the disease (as opposed to carriage or exposure)? 2) What are the specific benefits of breastfeeding to the infant? (Human milk contains antiviral properties, some of them specific to HIV.) 3) What other risks are posed to the infant by bottle feeding in his or her particular environment? 4) What therapies are available to prevent or treat the infection? 5) Is partial breastfeeding an option (eg, when one breast has an HSV-1 lesion, but the other is completely clear)? 6) Is temporary cessation of breastfeeding an option (eg, expressing and discarding milk until sufficient antituberculous treatment)? Vigilance is required to track new developments in these situations to evaluate reports critically, to weigh the known benefits of breastfeeding with the potential risks of acquiring a serious illness, and to

TABLE 9. Overcoming Barriers to Breastfeeding in the Neonatal Intensive Care Unit

BARRIERS	STRATEGIES
Maternal transport, parents far from home, isolated from support systems	Involve social work, lactation consultant, parent support groups
Mother did not decide about mode of feeding prior to preterm delivery	Provide information to assist in decision-making
Mother-infant separation, no suckling	Begin regular milk expression as soon as possible
Lack of privacy for pumping or feeding inhibits let-down reflex	Find space for women to pump/feed their infants where interruptions are minimized
Maternal fatigue, lack of sleep, frequent trips to NICU, delay in postpartum recovery	Emphasize that maternal recovery and health are important to the entire family; have a comfortable place for parents to rest, wait, or room-in
Preterm or ill infant cannot breastfeed for 2 to 3 months or longer	Initiate skin-to-skin contact as early and frequently as possible. Involve parents in as many other aspects of infant care as possible
Pumping schedule difficult to maintain; milk supply starts to decline	Acknowledge the difficulties; praise mother for her efforts; educate mothers to ask for assistance early if milk supply is declining (don't wait more than 2 to 3 days to ask for assistance)
Ineffective pumps appear to work initially but over an extended period of time do not maintain adequate supply	Counsel mothers about professional pumps; help mothers obtain a professional pump for home use
Invasive procedures may cause infant feeding aversion	Provide developmental support and adequate pain medication during procedures; involve lactation consultant or infant feeding specialist knowledgeable about breastfeeding
NICU environment can overstimulate the preterm infant, causing shutdown for feeding	Provide a comfortable private room for feeding when infant's condition permits
Prominence of bottle-feeding; breastfeeding not promoted	Physician should inform parents of the advantages of human milk, so that an educated decision is possible
Bias of individual care providers that breastfeeding is not really important	Have written hospital/NICU policy to promote breastfeeding. Obtain administrative support for and enforcement of the policy (performance evaluations)
Mixed messages regarding relationship of breastfeeding/human milk to jaundice	Make no mention of this connection unless (which should be rare) heating mother's own expressed milk (56°C for 20 min) is an option for jaundice
Necessity for supplementation (protein, calories, minerals, vitamins) for very low birthweight infants (<1,500 g) can be another source of mixed messages	Emphasize the positive attributes of human milk, particularly the immune and gastrointestinal trophic properties. Use of hindmilk can provide extra caloric density.

help breastfeeding mothers make informed decisions. For an in-depth discussion of these issues, see Lawrence as well as Ruff in Suggested Reading.

Obtaining a mother's milk for her own child should be emphasized for multiple reasons. The mother's exposure to illness triggers the immune response that ultimately is conferred to the infant via the

entero- or bronchomammary pathway (see "Breastfeeding Update 1: Immunology, Nutrition, and Advocacy" in April 1997 Pediatrics in Review). The unique nutritional value of a mother's milk for her own infant also is important. No expensive testing of milk or pasteurization is necessary.

If donor milk is used, donors must be screened carefully, and

milk should be pasteurized to kill microorganisms (usually done by a milk "bank" with well-established procedures). Unfortunately, the pasteurization process will reduce immune properties and alter the nutritional content somewhat. Despite these drawbacks, donor milk is a valuable option under certain circumstances. The issues surrounding donor milk and milk

banking are discussed thoroughly in Lawrence's text (see Suggested Reading).

Drug Use

When physicians prescribe medications to breastfeeding mothers, they are concerned about possible side effects to infants. Drugs of abuse also may be of concern. Therefore, it is crucial for pediatricians, obstetricians, and family physicians to have a rational approach to medication questions, have access to relevant information, and have a telephone resource that is knowledgeable in this area. The AAP publishes a compendium of drug use during breastfeeding (see Suggested Reading). Frequently, a local poison center or drug information center will be able to assist. The following approach by Anderson (Suggested Reading) is encapsulated with his permission.

Drugs given to mothers by various routes pass into the maternal bloodstream in variable amounts and bind to protein at variable percentages. Passage of the drug from the bloodstream into human milk is influenced by molecular size, pH of milk, pKa (drug dissociation constant) of the drug, fat solubility, and possibly transport mechanisms. Plasma pH is fairly constant at 7.4, while milk pH can vary from 6.8 to 7.3; the direction of the gradient, as well as the amount of drug diffused will vary according to the acidity and alkalinity of the drug in relation to the plasma pH and milk pH. Once a drug enters milk, it may back-diffuse, causing levels to fluctuate over time.

The amount of drug ingested by the infant depends on the concentration of drug in the milk, the frequency of nursing, and the volume of milk the infant drinks. Once in the intestinal tract, drug absorption by the infant is influenced by oral bioavailability and age of the infant (gestation, if preterm). The drug then enters the infant's bloodstream, where it is subject to metabolism (active or inactive metabolites may be generated). Because of the multiple steps in drug absorption and metabolism, most drugs reach the infant's bloodstream in only a small percentage (typically, <2%) of the mother's dosage.

With an understanding of this process, it is important for the mother to know that when she must take medication, there usually are options that are safe during lactation and that can help to preserve breastfeeding. The following guidelines can be applied when breastfeeding mothers need advice:

1. If it is not absolutely necessary for the mother to take medication, she could do without, trying instead nonmedicinal measures for symptomatic relief (eg, humidification or saline for nasal congestion, heat and massage for muscle pain).
2. Investigate whether the course of medication can be delayed safely until the child is older, so that the infant is more mature and the length of breastfeeding can be extended (eg, radioactive I-131 for thyroid ablation might be delayed while using propylthiouracil and propranolol; treatment of extensive condyloma acuminata might be delayed to avoid systemic absorption of podophyllin).
3. If medication is necessary, use local or topical preparations that have a minimal chance of entering the bloodstream or use oral preparations that have minimal absorption in the gastrointestinal tract (eg, oxymetazoline nasal spray instead of oral decongestants/antihistamines, topical or inhaled steroids instead of oral steroids, sucralfate instead of cimetidine).
4. If medication is necessary but requires caution in nursing mothers, try to substitute a drug that has less risk of side effects or is known to be tolerated in children (eg, long-acting benzodiazepines such as diazepam and chlor-diazepoxide may cause sedation in the breastfed infant, but short-acting lorazepam and oxazepam are acceptable).
5. Within a particular class of drug, some may enter human milk at substantially lower amounts than others or there may be a larger base of experience or research (for lactating women) on selected drug(s) in a particular class. Either of these factors probably would favor use of the "safer" alternative if the therapeutic effect in the mother is similar (eg, ibuprofen is preferable to other non-steroidal anti-inflammatory drugs; propranolol is preferable to atenolol, which has been reported anecdotally as associated with apnea and cyanosis in the newborn period).
6. Formulation and dosage of required medications may be manipulated to reduce peak drug levels in milk at the time of actual feedings. Generally speaking, shorter half-lives (more frequent dosing) and timing of the dose before the longest sleep period (in older infants, since newborns are feeding around the clock) will minimize the intake and accumulation of drug by the child (eg, tricyclic antidepressants may be given as a single dose at bedtime).
7. If the mother requires a drug that is contraindicated, consider an intensive short course of therapy, during which time she can pump and discard the milk, perhaps interrupting breastfeeding for only 1 or 2 days (eg, metronidazole as a single 2-g dose for trichomoniasis). Many breastfeeding women are motivated to pump for longer periods if really necessary.
8. For some conditions, drugs are required that are contraindicated; this may require complete cessation of breastfeeding. These situations are rare and usually mean that the mother's health is in serious jeopardy from her illness (eg, cancer chemotherapy or radioactive pharmaceuticals).

Table 10 lists some of the medications used most commonly and categorizes them according to their utility and safety in the lactating woman.

Summary

Breastfeeding encompasses the anatomy, physiology, psychology, and social constructs of both mother and infant. It takes time for early breastfeeding to become established while mother and infant are learning the process. When pathology is present, complex situations arise

TABLE 10. Use of Drugs During Lactation*

Contraindicated. These drugs should not be used during lactation. If they are essential to the mother's health, breastfeeding should be discontinued temporarily or permanently.

Amantadine [†]	Dipyron (in Mexican drugs)	Metamizol (same as dipyron)
Amiodarone	Gold salts	Metronidazole [§]
Antineoplastic agents	Indandione anticoagulants	Radiopharmaceuticals (withhold breastfeeding temporarily)
Bromide	(eg, phenindione)	Salicylates (large doses)
Chloramphenicol [§]	Iodide (including topical forms)	
Cocaine		

Potentially Hazardous. Although not generally contraindicated, these agents should be used with caution and avoided if possible, particularly while breastfeeding a newborn.

Acebutolol	Doxepin	Nicotine/Smoking [†]
Alcohol (especially large amounts)	Ergotamine	Nitrofurantoin
Antihistamine/Decongestant combinations [†]	Ethosuximide	Phenobarbital (anticonvulsant dose)
Atenolol	Fluorescein	Piroxicam
Benzodiazepines (lorazepam, oxazepam preferred)	Fluoxetine	Quinolone antibacterials (norfloxacin preferred)
Chlorthalidone [†]	Lindane	Reserpine
Clindamycin	Lithium	Sotalol
Clonidine [†]	Methimazole	Sulfonamides, long-acting
Contraceptives, estrogen-containing [†]	Nadolol	Thiazide diuretics, long-acting or in high doses [†]
	Narcotics (in addicts or with therapeutic doses in first 10 days postpartum)	

Probably Safe in Usual Doses. Data are insufficient to ensure that these agents have no adverse effects in breastfeeding infants; if these effects occur, they probably are infrequent or mild. There is a potential for rare allergic or idiosyncratic reactions.

ACE inhibitors (eg, enalapril)	Decongestants, oral [†]	Salicylates (occasional use)
Aminoglycoside antibiotics	Ergonovine (short courses) [†]	Spironolactone
Anticholinergic agents	Fluconazole	Sulfisoxazole
Anticonvulsants (except ethosuximide and phenobarbital)	Histamine H ₂ -receptor antagonists (famotidine preferred)	Terfenadine
Antihistamines	Metoclopramide (10 to 14 days)	Tetracyclines (2 weeks or less)
Antitubercular agents	Nonsteroidal anti-inflammatory agents (ibuprofen preferred)	Thiazide diuretics, short-acting (low doses)
Azathiopine (immunosuppression following organ transplantation)	Oxazepam	Tricyclic antidepressants (nortriptyline, desipramine preferred; avoid doxepin)
Barbiturates (except phenobarbital)	Phenothiazines	Verapamil
Butyrophenones (eg, haloperidol)	Propylthiouracil	
	Quinidine	

Safe in Usual Doses. Although the potential for rare allergic or idiosyncratic reactions should be kept in mind, usual doses pose little risk for the breastfed infant.

Acetaminophen	Heparin	Methylergonovine (short courses)
Antacids	Inhalers, bronchodilators, corticosteroids	Metoprolol
Caffeine	Insulin	Miconazole
Cephalosporins	Labetalol	Penicillins
Clotrimazole	Laxatives, bulk-forming and stool-softening (eg, psyllium, docusate)	Propranolol
Contraceptives, progestin only	Lidocaine	Theophylline
Corticosteroids	Magnesium sulfate	Thyroid replacement
Decongestant nasal sprays	Methyldopa	Vaccines
Digoxin		Vancomycin
Erythromycin		Warfarin
Flurbiprofen		

*Compiled by Philip Anderson, PharmD, Director, Drug Information Service, University of California, San Diego, CA.

[†]Drug also may inhibit lactation.

[§]In situations where bottle feeding threatens the infant's life, breastfeeding may be undertaken cautiously.

Sources: Knoben JE, Anderson PO. Handbook of Clinical Drug Data. 7th ed. Hamilton Press; 1993; Anderson P. Drug use during breastfeeding. Clin Pharm. 1991;10:596-624; UCSD Drug Information Service.

Note: The information contained in this table is time-limited. It is current and accurate as of 9/95. For use beyond that date, review and updating may be necessary.

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that require significant clinical expertise.

Pediatricians are crucial to the success of early breastfeeding through both advice and clinical care. A confident, positive attitude coupled with knowledgeable, concrete actions can maximize the impact of physicians. Decisions, policies, and patient care that demonstrate knowledge and commitment can help women to achieve breastfeeding goals. This, in turn, will allow children to benefit fully from the numerous advantages that breastfeeding and human milk have been proven to provide.

SUGGESTED READING

- American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics*. 1994;93:137–149
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PIR QUIZ

- Breastfeeding difficulties often can be anticipated and surmounted by obtaining a thorough maternal history and making a direct inspection of breasts. In general, breastfeeding failure is *most* likely to accompany a previous history of:
 - Augmentation surgery.
 - Breast hematoma.
 - Fibroadenoma excision.
 - Mastitis.
 - Reduction surgery.

Successful breastfeeding of the hospitalized very low birth-weight infant requires overcoming a number of significant obstacles. Match each numbered barrier listed below with the most appropriate corresponding lettered strategy.
- Infant unable to feed orally for 2 to 3 months.
- Initial mother/infant separation.
- Nutritional limitations of human milk for very low birthweight infant.
- Overstimulating neonatal intensive care unit environment.
- Weak suck.
 - Regular milk expression at approximately 3-hour intervals.
 - Private room for feeding stable infant.
 - Selective use of hindmilk.
 - Expressed human milk delivered by cup.
 - Early and frequent skin-to-skin contact.
- Early identification of a breastfed infant receiving inadequate intake is critical to limit morbidity and optimize the chance for successful breastfeeding. Given a full-term gestation, an uncomplicated delivery, normal intrauterine growth, and an uneventful nursery stay, same-day clinical evaluation is required for:
 - A 4-day-old infant who has had eight soft yellow stools in the past 24 hours.
 - A 4-day-old infant who rarely cries and has had one large, dark stool since discharge.
 - A 3-day-old infant who is breastfeeding 10 times per day.
 - A 2-day-old infant who has had only one wet diaper the first day at home.
 - A 2-day-old infant who has spent only a total of 4 hours awake on the first full day at home.
- With thoughtful selection and delivery of therapy, maternal medication only rarely should preclude breastfeeding. An example of a drug that is considered *safe* in usual doses is:
 - Amantadine.
 - Azathioprine.
 - Labetalol.
 - Metronidazole.
 - Nicotine.
- Most maternal infections are compatible with continued breastfeeding. However, breastfeeding is *contraindicated* if the mother has:
 - Acute Epstein Barr virus infection.
 - Acute hepatitis A virus infection.
 - Asymptomatic human immunodeficiency virus infection.
 - Chronic hepatitis B virus infection.
 - Labial herpes simplex 1 virus infection.

Infant Nutrition

Material adapted from: <http://www.healthychildren.org/English/ages-stages/>

Breastfeeding: See “Breastfeeding Update 2” (Peds-in-Review) at end of section

Formula Feeding: See “Infant Formula Choice Guide” on next page

After the first few days, your formula-fed newborn will take from **2 to 3 ounces** of formula per feeding and will eat **every three to four hours** on average during her first few weeks. During the first month, if your baby sleeps longer than four to five hours and starts missing feedings, wake her up and offer a bottle.

By the end of her first month, she'll be up to at least **4 ounces per feeding**, with a fairly predictable schedule of feedings about every four hours. By six months, your baby will consume **6 to 8 ounces** at each of four or five feedings in twenty-four hours. On average, your baby should take in about 2.5 oz of formula a day for every pound of body weight.

Initially it is best to feed your formula-fed newborn on demand. As time passes, he'll begin to develop a fairly regular timetable of his own. As you become familiar with his signals and needs, you'll be able to schedule his feedings around his routine. If he becomes fidgety or easily distracted during a feeding, he's probably finished. If he drains the bottle and still continues smacking his lips, he might still be hungry.

There are high and low limits, however. **Your baby should drink no more than 32 oz of formula in 24 hours.** Some babies have higher needs for sucking and may just want to suck on a pacifier after feeding.

Between two and four months of age (or when baby weighs more than 12 lbs), most formula-fed babies no longer need a **middle-of-the night feeding**, because they're consuming more during the day and their sleeping patterns have become more regular. Their stomach capacity has increased, too, which means they may go longer between daytime feedings—occasionally up to four or five hours. If your baby still seems to feed very frequently or consume larger amounts, try distracting him with play or with a pacifier. Sometimes patterns of obesity begin during infancy, so it is **important not to over-feed your baby.**

Vitamin Supplementation:

The current AAP recommendation is that all infants and children should have a minimum intake of **400 IU of vitamin D per day** soon after birth. Breastfed infants need supplemental vitamin D. Prepared formula has vitamin D added to it; so if your baby is drinking at least **32 ounces**, supplementation is not needed. In addition, once your baby is one year old and on vitamin D milk, extra vitamins are no longer needed.

A regular, well-balanced diet should provide all the vitamins necessary for both nursing mothers and their babies. However, pediatricians recommend that mothers continue taking a **daily prenatal vitamin**. If you are on a strict **vegetarian diet**, you need to take an extra **B-complex supplement**, since certain B vitamins are available only from meat, poultry, or fish. If your baby is on infant formula, he generally will receive adequate vitamins.

If your baby is breastfed, there is sufficient, well-absorbed **iron** to give her an adequate supply so that no additional supplement is necessary. When she is between four and six months old, you should be starting baby foods that contain supplemental iron. If you are bottle-feeding your baby, it is now recommended that you use iron-fortified formula (4-12 mg of iron).

Infant Formula Choice Guide (adapted from CHOP Dept of Clinical Nutrition)

Patient	Feeding	Considerations
Premature infants	Breastmilk	- Feeding of choice (except: maternal substance abuse, HIV) - Fortify with HMF when at full volume feeds
	Enfamil Premature Lipil (Mead Johnson)	- Use for ELBW infants; higher in Vitamin A
	Similac Special Care Advance (Ross)	- Use if infant is osteopenic; higher in Ca/Phos
Premature close to discharge	Neosure Advance (Ross)	- Available as ready-to-feed 22 cal/oz or powder - Has 25% MCT
	Enficare (Mead Johnson)	- Available as ready to feed 22 cal/oz or powder - Has 20% MCT - Has slightly more Ca/Phos
Full term	Breastmilk	- Feeding of choice (except: maternal substance abuse, HIV)
	Good Start Supreme (Nestle)	- Whey PRO hydrolysate - Low renal solute load (use if breastmilk not available)
	Enfamil Lipil (Mead Johnson)	- Higher in DHA/ARA than Similac Advance - Whey:Casein ratio 60:40. Ready-to-feed 20 & 24 cal/oz
	Similac Advance (Ross)	- Lower in DHA/ARA than Enfamil Lipil - Whey:Casein ratio 48:52. Ready-to-feed 20 cal/oz only
Chylothorax	Portagen (Mead Johnson)	- Only indication: chylothorax/ chylous ascites - Has 85% MCT
Galactosemia Lactose Intol. Vegetarian	Isomil (Ross)	- Soy formula containing sucrose and corn syrup
	Prosobee (Mead Johnson)	- Sucrose-free soy formula
Full Term w/ 2° Lactose Intolerance	Similac Lactose Free (Ross)	- Lactose-free cow's milk based - Whey:Casein ratio 20:80 - NOT for preterm infants
Cow's Milk Protein Allergy	Alimentum (Ross)	- Protein:Casein hydrolysate - Contains sucrose (sweeter taste) - Lactose free
	Nutramigen (Mead Johnson)	- Protein:Casein hydrolysate - Sucrose & Lactose free
	Neocate (SHS)	- Amino acid based (elemental) - Sucrose, lactose, soy, whey, and casein free (for severe allergy) - Use if patient is having heme-(+) stools on above formulas
	Elecare (Ross)	- Amino acid based (elemental) - Sucrose, lactose, soy, whey, and casein free (for severe allergy) - Use if patient is having heme-(+) stools on above formulas
Malabsorption	Alimentum (Ross)	- Protein:Casein hydrolysate - Contains sucrose; Lactose free - Has 33% MCT - Available ready-to-feed 20 cal/oz only
	Pregestimil (Mead Johnson)	- Protein:Casein hydrolysate - Sucrose & Lactose free - Has 55% MCT - Available ready-to-feed 20 & 24 cal/oz
	Neocate (SHS)	- Amino-acid based (Elemental) - Use if pt has heme(+) stools on above formulas or fails to tolerate - Has 5% MCT (LCT may be trophic for short gut patients).
	Elecare (Ross)	- Amino-acid based (elemental) - Use if pt has heme(+) stools on above formulas or fails to tolerate - Has 33% MCT (LCT may be trophic for shot gut patients) - 10% less CHO than Neocate

Water & Juice:

Until your baby starts eating solid foods, he'll get all the water he needs from breastmilk or formula. **In the first six months, additional water or juice is generally unnecessary.** After a bottle-fed baby is six months old, you may offer him water between feedings, but don't force it on him or worry if he rejects it. Breastfed infants generally do not need extra water if they are permitted adequate access to the breast for feeding.

Once your baby is eating solid foods, his need for liquid will increase. Getting your infant used to the taste of plain water is a healthy habit that will last a lifetime. **Juice is not recommended; although if you do give your infant juice, make sure your child's daily juice intake does not exceed 4 to 6 ounces.** Most fruit juices do not contain any significant amount of protein, fat, minerals, or vitamins other than vitamin C.

Some children who drink too much juice have an increased risk of being overweight. To help regulate the amount of fruit juice your child drinks, offer juice with food to slow down the rate at which it's absorbed, and serve a combination of **one-half juice and one-half water.**

Introducing Solid Foods:

Most babies are ready to eat solid foods at 4 to 6 months of age. Before this age, instead of swallowing the food, babies push their tongues against the spoon or food, a reflex necessary for breast or bottle-feeding. In addition, by 6 months of age, most babies are able to sit independently. Finally, energy needs begin to increase, making this a good time to introduce solids.

Start with simple, basic foods such as rice cereal. You should add breast milk or warm formula to the cereal, mixing about **1 tablespoon of cereal with every 4 to 5 tablespoons of breast milk.** Look for infant cereals that are fortified with iron, which provide about 30-45% of your infant's daily iron needs.

Here are some additional recommendations to keep in mind:

- Introduce your baby to other solid foods gradually. Good initial choices are other simple cereals, such as oatmeal, as well as vegetables and fruits. **Most pediatricians recommend offering vegetables before offering fruits.** However, there is no medical evidence that introducing solid foods in any particular order has an advantage for your baby.
- **Start these new foods one at a time, at intervals of every 2 to 3 days.** This approach will allow your infant to become used to the taste and texture of each new food. It can also help you identify any food sensitivities or allergies that may develop as each new food is started.
- In the beginning, feed your infant small serving sizes—even just **1 to 2 small spoonfuls to start.**
- **Within about 2 to 3 months** after starting solid foods, your infant should be consuming a daily diet that includes not only breast milk or formula, but also cereal, vegetables, fruits, and meats, divided among **3 meals.**
- Some pediatricians advise introducing wheat and mixed cereals last because young babies could have **allergic reactions** to them. Many pediatricians also recommend against giving eggs and fish in the first year of life because of allergic reactions. There is no evidence that introducing these foods after 4 to 6 months of age determines whether your baby will be allergic to them.
- When your infant is about **8 to 9 months old,** give her **finger foods or table foods** that she can pick up and feed to herself. Do not give small infants raisins, nuts, popcorn, or small or hard food pieces that can be easily aspirated.

Sample 8-12 month-old Menu:

See <http://menuplanner.gerber.com/> for interactive menu planner by developmental stage.

Breakfast

- 1/4–1/2 cup cereal or mashed egg
- 1/4–1/2 cup fruit, diced (if your child is self-feeding)
- 4–6 oz. formula/breastmilk

Snack

- 4–6 oz. breastmilk/formula or water
- 1/4 cup diced cheese or cooked vegetables

Lunch

- 1/4–1/2 cup yogurt or cottage cheese or meat
- 1/4–1/2 cup yellow or orange vegetables
- 4–6 oz. formula/breastmilk

Snack

- 1 teething biscuit or cracker
- 1/4 cup yogurt or diced (if child is self-feeding) fruit Water

Dinner

- 1/4 cup diced poultry, meat, or tofu
- 1/4–1/2 cup green vegetables
- 1/4 cup noodles, pasta, rice, or potato
- 1/4 cup fruit
- 4–6 oz. formula/breastmilk

Before Bedtime

- 6–8 oz. formula/ breastmilk or water (If formula or breastmilk, follow with water or brush teeth).

Toddler Nutrition

Material adapted from: <http://www.healthychildren.org/English/ages-stages/>

Feeding Your One-Year Old

You'll probably notice a sharp **drop in your toddler's appetite** after his first birthday. It may seem as if he should be eating more now that he's so active, but there's a good reason for the change. His growth rate has slowed, and he really doesn't require as much food now.

Your toddler needs about **1,000 calories a day** to meet his needs, generally divided among **three small meals and two snacks** a day. Don't count on his always eating it that way, however, because the eating habits of toddlers are erratic and unpredictable from one day to the next. Your child's needs will vary, depending on his activity level, his growth rate, and his metabolism.

Remember that cholesterol and other fats are important for your toddler's growth and development, so they should not be restricted. Babies and young toddlers should get **about half of their calories from fat**. You can gradually decrease the fat consumption once your child has reached the age of two (lowering it to about one-third of daily calories by ages four to five). If you keep your child's caloric intake at about 1,000 calories a day, you shouldn't have to worry about putting him at risk of gaining too much weight.

By his first birthday, your child should be able to handle most of the foods you serve the rest of the family—but with a few **precautions**. First, be sure the food is cool enough so that it won't burn his mouth. Also, don't give foods that are heavily spiced, salted, buttered, or sweetened. These additions prevent your child from experiencing the natural taste of foods and may be harmful to long-term health.

Finally, your little one can still **choke on chunks of food that are large enough to plug his airway**. Keep in mind that children don't learn to chew with a grinding motion until they're about four years old. Make sure anything you give him is mashed or cut into small, easily chewable pieces. Never offer him peanuts, whole grapes, cherry tomatoes (unless they're cut in quarters), carrots, seeds (i.e., processed pumpkin or sunflower seeds), whole or large sections of hot dogs, meat sticks, or hard candies (including jelly beans or gummy bears), or chunks of peanut butter (it's fine to thinly spread peanut butter on a cracker or bread). Hot dogs and carrots in particular should be quartered lengthwise and then sliced into small pieces. Also make sure your toddler eats only while seated and supervised by an adult.

Feeding Your Two-Year Old

By age two, your toddler should be eating **three healthy meals a day plus one or two snacks**. He can eat the same food as the rest of the family. With his improved language and social skills, he'll become an active participant at mealtimes if given the chance to eat with everyone else.

Do not fixate on amounts and do not make mealtimes a battle. Many toddlers resist eating certain foods, or for long periods insist on eating only one or two favorite foods. The more you struggle with your child over his eating preferences, the more determined he'll be to defy you. If he rejects everything, you might try saving the plate for later when he's hungry. However, don't allow him to fill up on cookies or sweets after refusing his meal, since that will just diminish his appetite for nutritious ones.

Offer him a selection of nutritious foods at each sitting, and let him choose what he wants. Vary the tastes and consistencies as much as you can. He may be more interested in healthful foods if he can feed them to himself. So, whenever possible, **offer him finger foods** (i.e., fresh fruits or raw vegetables other than carrots and celery) instead of cooked ones that require a fork or spoon to eat. Hard as it may be to believe, your child's diet will balance out over several days if you make a range of wholesome foods available and don't pressure him to eat a particular one at any given time.

Fortunately, your child's feeding skills have become relatively "civilized" by now. At age two, he **can use a spoon, drink from a cup with just one hand**, and feed himself a wide variety of finger foods. But while he can eat properly, he's still learning to chew and swallow efficiently, and may gulp his food when he's in a hurry to get on with playing. Continue to avoid the "chokable" foods, listed above.

Vitamin supplements are rarely necessary for toddlers who eat a varied diet. However, **supplemental iron** may be needed if your child eats very little meat, iron-fortified cereal, or iron-rich vegetables. Large quantities of milk (more than 32 oz/day) also may interfere with the proper absorption of iron. Your child should drink 16 oz of low-fat or nonfat milk each day. This will provide most of the calcium he needs for bone growth and still not interfere with his appetite for other foods, particularly those that provide iron.

A **vitamin D supplement of 400 IU per day** is important for children who are not regularly exposed to sunlight, are consuming less than 32 ounces per day of vitamin D–fortified milk, or do not take a daily multivitamin containing at least 400 IU of vitamin D.

Feeding Your Three-Year Old

As a preschooler, your child should have a **healthy attitude toward eating**. Ideally, by this age she no longer uses eating—or not—to demonstrate defiance, nor does she confuse food with love or affection.

Despite your preschooler's general enthusiasm for eating, she still may have very **specific preferences**, some of which may vary from day to day. As irritating as it may be to have her turn up her nose at a dish she devoured the day before, it's normal behavior for a preschooler, and best not to make an issue of it. Let her eat the other foods on her plate or select something else to eat.

However, **encourage her to try new foods** by offering her very small amounts to taste, not by insisting that she eat a full portion of an unfamiliar food. Your job is to make sure that your preschooler has nutritious choices at every meal. **Keep giving healthy foods** to her even if she repeatedly turns up her nose at the sight of them. Before long, she may change her mind.

Television advertising can be a serious obstacle to your preschooler's good nutrition. Some studies show that children who watch over twenty-two hours of TV per week (over 3 hrs/day) have a greater tendency to become obese. Children this age are extremely receptive to ads for candy and other sugary sweets, especially after they've visited other homes where these foods are served.

Feeding Your Four-Year Old

Between the ages of 4 and 5 years, you can start to gradually reduce the levels of fat that your child consumes. By serving her lower fat meals, you'll help keep her weight under control and lower her risk of heart disease and other chronic illnesses later in life. At this time, most of your family's calories (about 55% to 60%) should come from carbohydrates, with more modest amounts of fat and protein.

What kind of fat-reducing changes should you be making?

- Switch your preschooler from whole milk to skim or 2% milk. She should be drinking 2 cups a day of fat-free or low-fat milk (or equivalent milk products).
- Select grilled or broiled fish or lean meats.
- Serve cheese only in modest portions.
- Give your child whole fruit to meet her recommended fruit intake, limiting fruit juice consumption to no more than 4 to 6 oz per day (from ages 1 to 6 years). Remember, this is 100% juice, not juice drinks.
- For snacks, rely on low-fat choices like pretzels, fresh fruit, air-popped popcorn, or fat-free yogurt.
- When preparing food, use cooking methods like steaming, broiling, and roasting.

Sample 2-year-old Menu:

Breakfast

1/2 cup nonfat or low-fat milk
1/2 cup iron-fortified cereal or 1 egg
1/3 cup fruit (for example, banana, cantaloupe, or strawberries)
1/2 slice whole wheat toast + 1/2 teaspoon margarine or butter or 1 teaspoon jelly

Snack

4 crackers with cheese or hummus or 1/2 cup cut-up fruit or berries
1/2 cup water

Lunch

1/2 cup low-fat or nonfat milk
1/2 sandwich—1 slice whole wheat bread, 1 oz meat, slice of cheese, veggie (avocado, lettuce, tomato)
2–3 carrot sticks (cut up) or 2 tablespoons other dark-yellow or dark-green vegetable
1/2 cup berries or 1 small (1/2 ounce) low-fat oatmeal cookie

Snack

1/2 cup nonfat or low-fat milk
1/2 apple (sliced), 3 prunes, 1/3 cup grapes (cut up), or 1/2 orange

Dinner

1/2 cup nonfat or low-fat milk
2 ounces meat
1/3 cup pasta, rice, or potato
2 tablespoons vegetable

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Helping Preschoolers Become Healthy Eaters

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INTRODUCTION

Good nutrition is important from birth to fuel healthy growth and development. Feeding and eating experiences early in life also shape dietary preferences and, ultimately, the quality of nutrition throughout childhood (Fox et al., 2004; Lederman et al., 2004). The recent Feeding Infants and Toddlers Study (FITS) found that parents give infants as young as 7 months of age soft drinks and French fries, contributing to development of a lifelong preference for sweet and salty foods (Fox et al., 2004). Parents often look to practitioners for guidance in establishing and reinforcing healthy eating habits throughout childhood that will help children avoid overweight and its comorbidities.

Because children develop food- and nutrition-related attitudes during the preschool years, it is important for practitioners to help parents take advantage of the preschooler's readiness to learn and potential to change (Young, Anderson, Beckstrom, Bellows, & Johnson, 2003). The benefits of healthy eating habits are many, including prevention of chronic under-nutrition and growth retardation as well as iron-deficiency anemia, dental caries, and overweight (American Dietetic Association [ADA], 2004). Parents and other

child caregivers can provide opportunities for children to learn to like a variety of nutritious foods by repeatedly exposing them to these foods, overcoming their tendency to reject unfamiliar foods (ADA, 2004).

WHO ARE THE PICKY EATERS?

Common eating problems among toddlers and preschoolers are picky eating and neophobia. Young children often do not like to try new or unusual foods. Children often go on "food jags," where they tend to eat just one type of food frequently over a period of several days or weeks (Story, Holt, & Sofka, 2002). Carruth, Ziegler, Gordon, and Barr (2004) conducted a large survey of families with young children from 4 months of age to 24 months of age to determine the prevalence of picky eating, based on parental perceptions. As expected, the prevalence of picky eaters increased as the children's age approached 24 months. By 24 months of age, caregivers perceived that 47% of males and 54% of females were picky eaters. Interestingly, the prevalence of picky eaters did not differ with gender, ethnicity, or socio-economic status. A 24-hour diet recall indicated that children in

both the picky and nonpicky eating groups consumed the recommended daily intake of energy and nutrients. However, picky eaters were less likely to consume vegetables and fruits and more likely to eat sugared cereals and French fries (Caruth et al., 2004).

In addition, the survey indicated that caregivers typically offered a food only three to five times before deciding their child disliked it. Other researchers have found that a food must be presented between eight to fifteen times before a child will accept it (Birch, Zimmerman, & Hind, 1980; Loewen & Pliner, 1999; Skinner et al., 2002). This research indicates that picky eating is a common problem for many children and that caregivers must be educated about methods for dealing with picky eating.

Jacobi, Agras, Bryson, and Hammer (2003) conducted a study to determine the characteristics of picky eaters and their parents. Using laboratory-based measures, researchers determined that picky eaters consumed fewer foods with less variety, specifically avoiding vegetables. Parents of picky eaters reported more negative food interactions than did parents of nonpicky eaters. Specifically, parents of picky eaters reported struggling around meal times and more frequently offering food concessions to their children. In addition, pickiness in children was associated with a more negative parent affect. Once again, researchers noted that parents limited exposure to new foods and foods children disliked (Jacobi et al., 2003).

Research by Birch and associates with largely Caucasian samples has consistently found a positive relationship between food controlling strategies by parents and child overeating; that is, the more the parent withholds access to high calorie snacks and foods, the more likely it is that the child will desire them and overeat them when finally allowed access (Birch, McPhee, Shoba, Pirok, & Steinberg, 1987; Fisher & Birch, 1999; Orlet-Fisher, Rolls, & Birch,

2003). This is particularly true for girls. The same effect is seen when foods are used as rewards, removing the association between hunger and eating (Birch, 1981).

WHAT IS HAPPENING AND CAN WE MAKE A DIFFERENCE WITH EDUCATIONAL INTERVENTIONS?

Researchers have found a correlation between child weight problems and the attitudes and knowledge of caregivers about nutrition. Gable and Lutz (2001) observed Head Start teachers during mealtimes. These observations showed that opportunities, such as nutrition teaching and encouraging children to taste different foods during mealtime, were often missed. While all teachers sat with the children and many encouraged the children to classify the food into groups, some teachers also hurried eating or directed students to "clean their plate." Educating teachers, child care providers and parents about ways to model and teach nutrition during natural daily routines can help promote positive nutrition socialization experiences for young children (Gable & Lutz, 2001).

The New Jersey Department of Health developed the Prevention-Oriented System for Child Health (PORSCHE) Project to target high-risk families identified through community screenings (Worobey, Pisuk, & Decker, 2004). A public health nurse would meet with the family to provide the intervention strategy, which included hand washing and hygiene, increasing iron intake, increasing water consumption, eating fewer snacks that are high in fat, and eating healthier snacks such as yogurt or fresh vegetables (Worobey et al., 2004). After these interventions, they found that total caloric intake decreased over time, intakes of calcium, iron and zinc were sustained or increased, and vitamin use increased (Worobey et al., 2004).

Horodyski, Hoerr, and Coleman (2004) developed the NEAT program (Nutritional Education Aimed at Toddlers) to improve the knowl-

edge, attitudes, mealtime practices, and dietary intake of rural, low-income caregivers with toddlers in the home. The intervention consisted of three major learning objectives: increasing knowledge of food and food safety, increasing knowledge of feeding self-regulation and the best management of family meals with toddlers, and toddler-parent interactions, as well as healthy food choices away from home and time-saving tips (Horodyski et al., 2004). The researchers believed that negative attitudes toward nutrition led to poor parental feeding practices, which, in turn, led to picky eaters (Horodyski et al., 2004). Having a picky eater for a child often leads parents to bribing them to eat, spoon-feeding them, catering to their demands, or playing games in order to increase dietary intake. Although these parents initially lacked knowledge regarding toddler eating habits, they all attended the NEAT classes, showing a desire to learn and provide better nutrition for their toddlers. This study showed a positive correlation between community nutrition education programs and healthier eating habits and mealtime practices for toddlers (Horodyski et al., 2004).

ARE PRESCHOOLERS TOO YOUNG TO LEARN ABOUT NUTRITIOUS EATING?

Children learn about food and eating behaviors through their surroundings. Children are socialized to food in the home, school, and other caregiving environments. Matheson, Spranger, and Saxe (2002) examined preschool children's perceptions of food and their interpretation of daily food experiences using open-ended interviews and play observations. Children classified foods based on concrete qualities, such as color, shape, and texture. Preschool children did not group foods based on abstract concepts, such as nutritional food groups. Play interactions indicated that children tend to mimic their daily food experiences, with realistic and detailed play scenarios.

BOX. Tips for parents of picky preschoolers

Many parents find that their toddlers and preschoolers are picky eaters. They do not like to try new foods and will only eat certain favorite foods. Many parents offer new foods only one to five times before deciding that their child doesn't like it and eliminating the food from the child's meals. However, research shows that a child needs to be exposed to a new food eight to fifteen times before they will accept it, turning a new food into a familiar, acceptable food. Here are some tips for getting your picky eater to try new foods.

- **Offer small portions of new foods along with your child's favorite foods.** Do not force your child to eat all of the new food, but require that they take a small taste. Remember, it may take up to fifteen exposures for your child to accept the new food.
- **Make food fun!** Be creative with your food. Presenting new foods in a different manner will create interest from your child. Use fruit to make silly faces on pancakes. Use different vegetables and spreads to create food animals, such as a cauliflower sheep and ants on a log (see recipes below).
- **Encourage your child to use different senses to explore their food.** Teach your child different ways of exploring and describing food, such as texture, color, and shape. Have your child taste different foods and guess whether they will be noisy or quiet, hard or soft.
- **Keep a tasting chart.** Keep a tasting chart for your child. Each time your child tastes a new food, reward them by letting them place a sticker or stamp on the chart. After they have achieved a set number of stickers or stamps, reward your child with a favorite activity.
- **Be a good role model.** Present new foods to your child in a neutral or positive manner. If you express dislike for a food, your child will be less willing to try it.

Noisy Sheep, Quiet Sheep

Ingredients

1. One piece cauliflower
2. Raisins
3. Half of a piece of string cheese cut into 4 equal pieces or 4 baby carrots
4. Cheese spread, cream cheese, or peanut butter

Directions

1. Put the cauliflower on your plate.
2. Put 4 pieces of string cheese or baby carrots on your plate.
3. Cover the bottom of the cauliflower with cheese spread, cream cheese, or peanut butter.
4. Attach the 4 pieces of cheese or baby carrots to the cauliflower to make legs.
5. Dip 2 raisins in the cheese spread, cream cheese, or peanut butter and attach to make eyes.
6. Dip 1 raisin in the cheese spread, cream cheese, or peanut butter and attach it to make a nose.

Ants on a Log With Antennas

Ingredients

1. Celery sticks (Vegetable group)
2. Peanut butter (Meat group)
3. Raisins (Fruit group)
4. Pretzel sticks (Grain group)
5. Low-fat milk (Milk group)

Directions

1. Spread peanut butter on celery stick
2. Put 5 raisins on the peanut butter
3. Put 2 pretzel sticks sticking up in the front of the celery stick to look like antennas
4. Eat and enjoy with a nice glass of low-fat milk

Adapted from <http://www.nutritionexplorations.org>.

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This research suggests that nutrition interventions targeting preschoolers should be play-based and take place in the child's natural environment. Matheson, Spranger, and Saxe (2002) also suggest focusing on the concrete qualities of food, rather than abstract categories such as food groups that preschoolers may not comprehend.

Children develop opinions and concepts of food based on experiences. Byrne and Nitzke (2002) examined the effect of presenting a novel vegetable (kohlrabi) through a storybook. One group was read a storybook with positive messages about kohlrabi, while another group was read a storybook with negative messages. Willingness to taste kohlrabi before and after the intervention was measured. Children who were read the positive-message storybook were significantly more likely to taste kohlrabi and to indicate that they would eat it again. This study indicates that presenting a novel vegetable in a positive, interactive manner increases the willingness of children to taste new foods.

LEARNING ABOUT NEW FOODS IS FUN!

The following suggestions are adapted from Nutrition Explorations, an interactive nutrition education program developed by the National Dairy Council, accessed from www.nutritionexplorations.org and applied in a parent handout in the [Box](#).

Activity 1: Noisy Sheep—Quiet Sheep

In this activity, children learn how to make a sheep out of various foods. A cauliflower floret makes the body of the sheep, with cheese sticks and baby carrots as the legs, and raisins for the eyes and nose. Use cream cheese or cheese spread to attach the eyes, nose, and legs, based on the child's preference. Encourage the child to describe the different foods with all of their senses. After assembling the sheep, ask the child which foods he or she thinks will be

quiet foods and which will be noisy foods. Then have the child conduct a "crunch" test to see which foods are the noisiest and the quietest.

The objective of this activity is to teach the child how to explore different foods with senses other than taste. Using different senses and a fun presentation will help the child to try new foods that otherwise might not be tasted. Adaptations from the original lesson plan include incorporating more foods, such as carrots and peanut butter, into the activity. Adding carrots will give the children another chance to taste a "crunchy" food. Cheese spread is a common childhood favorite food and may be more familiar to children than cream cheese.

Activity 2: Taste Testing—Reinforcing Trying New Foods With a Tasting Chart

Write the child's name on a large poster board. Draw or paste pictures of each new food the parent may offer the child to try. After the child tries a new food, have the child place a gold star or smiley face sticker next to the picture on the Tasting Chart. The Tasting Chart provides positive reinforcement to encourage the child to try new foods. It also provides a visual representation of the child's attempts to try new foods. Other important adults in the child's life can view the child's progress and provide reinforcement for taste-testing new foods. The parent can decide on a nonfood reward after a specific number of stickers are earned (for example, reading an extra favorite story after dinner or playing the child's favorite game). By making the Tasting Chart a more long-term activity, parents can continue to encourage the trying of new foods.

Activity 3: Four Food Group Snack—Ants on a Log With Antennas

Research shows that snacks that combine foods from the different food groups enhance satiety and make snacks nutritious mini-meals, such as ants on a log with antennas

and a cup of milk. The logs are made of celery (fruit and vegetable group) covered in peanut butter (meat/protein group) with raisins on top (fruit and vegetable group). The logs will actually look like ants with antennas made of pretzels (grain group). The snack is complete with a cup of milk (milk group).

WHY EDUCATING PRESCHOOLERS CAN WORK

Preschool children fall into Erikson's (1950) early childhood developmental stage, which encompasses two- to six-year-olds. The primary conflict in the early childhood stage is initiative versus guilt. Young children are developing more skills and independence and becoming more engaged in social interactions. They are learning to balance a greater sense of responsibility with a need to control sudden impulses (Erikson, 1950). Nutrition education and food tasting experiences provide preschool children with a greater sense of initiative in making healthy food choices and tasting new foods. Rewarding and reinforcing children for trying new foods on their own. In addition, children are not forced to eat foods they do not want to eat and are not punished when they do not try a new food. This eliminates feelings of guilt and disappointment for not pleasing the parent or caregiver. In addition, the strategies suggested encourage children to use their imagination to view and describe food from a different point of view. Based on Erikson's model, it is anticipated that encouraging children to try new foods will lead to greater initiative in trying different foods in a variety of settings.

CONCLUSION

Good nutrition and healthy food choices are an important component of child health and development. The nutrition choices that young children learn to make affect them throughout their lifetimes. The optimal time to teach nutrition is in the preschool years before unhealthy habits are established and while chil-

dren are eager to learn. We hope you enjoy sharing these ideas with your young patients and their parents.

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Nutrition Quiz—Part I:

1. Round robin: Go around the table and list items for the following breastfeeding items:

Signs of Good Breastfeeding

8-12 feedings/day
Sucking→audible swallow
* 1-2 wets on Day 2; 4-6 wets on Day 3
* Soft, yellow stools by Day 3; 4-10/day
Urate crystal gone by Day3

Breastfeeding Warning Signs

< 6 wets/day by Day 3
Black/green stool by Day 3
Baby “always hungry”
No audible swallowing
Painful nipples, engorged
Milk not in by Day 5
Wt gain < 15-30g

Causes of Breast-feeding Problems

Inverted nipples
Glandular insufficiency
Breast surgery/trauma
Engorgement
Mastitis
Retained placenta
Hypothyroidism

3. Complete this Feeding Chart:

Age	Foods	Serving Size	Feeding Tips
0-4 mo	Breast milk or Formula	On demand or 4oz x 6 feedings @ 1mo 6-8 oz x 4-5 feedings @ 6mo	-Max milk ~ 32oz/day -Vitamin D suppl if BM-fed
4-6 mo	-BM or Formula -Iron-fortified cereal	- <i>Same as above</i> -1-2 Tbsps x 2/day	- Start cereal + solids at 4-6 mo
6-8 mo	-BM or Formula -Iron-fortified cereal -Baby food (stage 1-2)	- <i>Same as above</i> - 2-4 Tbsps x2/day -2-3 servings/day	- Introduce cup? - Can add water and max 4-6oz juice/day at 6mo.
8-12 mo	-BM or Formula -Iron-fortified cereal - Baby food (stage 2-3) -Finger foods	-On demand or 6-8 oz x 3-4 feedings (amt decreases) -2-4 Tbsps x 2-3/day -2-3 servings/day	-Start finger foods at 8-9 mo -Watch for “chokables” -Drink milk from cup @ 12mo -Switch to whole milk @ 12mo
12-24 mo	-BM or Formula -Finger/Table foods— all food groups	-On demand or ½ cup x 4/day -2-3 servings of each/day	-Start egg whites, fish, citrus, chocolate, nuts, wheat at 12mo? -Diet should be 50% fat

4. According to research, how many times must a food be presented before a child will accept it?

8-15 times. In contrast, surveys have indicated that caregivers typically offer a food only 3-5 times before deciding that their child disliked it.

Nutrition Cases—Part I:

Case 1:

(Case adapted from AAP modules; answers from www.mobimotherhood.org; www.lowmilksupply.org)

PFC Thomas is a 24-year-old first time mother who comes in for evaluation of low milk supply. The 7-week-old baby had gained weight well until the last 2 weeks when the mother noticed less wet diapers and a decrease in the volume she was able to pump.

Prior to this visit with you, she had been evaluated by Cathy Shefka. At a visit 1 week ago, pre- and post-feeding weights showed low transfer of milk, but no nipple trauma. Her son now has a coordinated suck and swallow, asymmetric latch with a wide angle of the jaw. The mother holds the infant in a neutral position with the head slightly extended.

The mother had been healthy prior to the pregnancy, had no pregnancy complications and had an unremarkable labor and delivery. Her breast exam was normal.

Mother's concerns:

- The baby never seems satisfied unless he is breastfeeding, otherwise, he is crying
- Her in-laws, who recently arrived to help with the baby, have encouraged her to stop breastfeeding because he seems so unhappy
- She doesn't think the baby likes her
- She isn't sleeping well
- She feels as if she has already failed as a mother

What factors might contribute to the change in milk supply?

Baby Issues:

- Prematurity
- Congenital malformations such as a cleft lip or palate; other conditions such as short frenulum
- Food sensitivities or allergies; GERD
- Neurological conditions leading to disorganized suck/swallow/breathe reflex; low muscle tone (e.g. Trisomy 21)

Mother's Issues: (Review of Quiz Q#1)

- Engorgement, plugged ducts, mastitis
- Cracked nipples, thrush
- Flat or inverted nipples or a mismatch between the size of the nipple and the size of baby's mouth
- Iron-deficiency (increased likelihood of plugged ducts, mastitis, thrush, and overall exhaustion)
- Anemia, hypothyroidism, hypopituitarism, PCOS; Sheehan's Syndrome
- Insufficient glandular tissue (*may be characterized by irregularly-shaped or asymmetric breasts, breasts that are very widely spaced, or breasts that lack fullness*); breast surgery
- Retained placental fragments

Social/Other Issues:

- Obesity & cigarette smoking (RFs for delayed onset of milk production)
- Stress during birth; loss of blood during birth; overall psychosocial stress
- Hormonal birth control medication (especially estrogen)

- Other medications (diuretics, antihistamines, nasal decongestants—especially if pseudophedrine)
- Supply-reducing foods and herbs (e.g. mint teas and candies; parsley and sage; sour foods)

What are some ways to help this mother increase her milk supply?

Once you have determined that a mother has low milk supply, there are several things that can help boost the supply. Eating a balanced diet that is filled with lactogenic foods and beverages, power pumping (a technique for building milk supply), routine pumping to maintain or build supply, and taking medications or herbs to increase milk supply are all tools that may be helpful for the partial-supply mother.

(1) Foods, beverages, herbs:

- 500 extra calories/day to support lactation; plenty of protein and good fats
- 100+ oz of water per day
- Oatmeal and oat-products; Barley-based drinks
- Dark-green vegetables
- Fenugreek, blessed thistle, alfalfa, red clover, marshmallow root; lactogenic teas

(2) Medications:

- Reglan: 10mg PO QD on Day 1, 10 mg PO BID on Day 2, 10 mg PO TID → 1-3 weeks is common; usually wean after 10-14 days. No evidence supporting long-term use.
- *Maternal Side effects*: GI, anxiety/depression, sedation, rare dystonic reactions
- Benefit shown in small placebo-controlled cross-over study with increase of 50cc/feed with dose of at least 30mg/day (effect is to increase prolactin level)

(3) Pumping & Techniques of Milk expression:

- In order to stimulate milk production, it is necessary to remove milk frequently and completely. A mother can achieve this by pumping frequently with an electric pump, by hand-expressing milk, and by nursing frequently if the baby is able.
- Double-pumping: pumping while breast-feeding
- Power-pumping: 10min ON, 10min OFF, etc. (repeat for 1hr), mimics “cluster” feeding.

If persistent, chronic low milk supply, despite above interventions, consult lactation specialist and/or OB-GYN and consider ordering **blood tests to diagnose potential underlying issues** (e.g. CBC for anemia, TFTs for hypothyroidism, hCG for retained placenta, prolactin for pituitary dz, androgens for PCOS).

How else might you counsel this mother? Her family?

(1) Discuss alternative feeding methods:

The traditional mother and baby dyad, where the baby is exclusively breastfed “straight from the tap”, is not an option during the low milk supply period OR when the baby’s or mother’s condition does not support full breastfeeding. The first rule is always: feed the baby.

There are many alternative feeding methods for a mother to choose from while building her supply:

- **Supplemental feeding devices** (e.g. Medela SNS™ and Lact-Aid®)
 - PROS: most direct way to stimulate a mother’s milk supply and get milk to the baby. Provides the comfort of breast bonding, regardless of a mother’s supply.
 - CONS: more difficult to use with babies with sucking issues, mothers with cracked or painful nipples, or premature/fragile babies. Can be difficult and time-consuming.
- Additional methods- **Haberman feeder, finger-feeding, cup-feeding, and bottle-feeding.**

(2) Provide emotional support:

Mothers experiencing supply issues are frequently grieving the loss of exclusive breastfeeding. These mothers are often frustrated that their family and friends are not sensitive to their “mourning” process. Some mothers even stay at home because they feel ashamed to bottle-feed in public.

Many mothers find that redefining their breastfeeding success and their mothering goals can help with the resolution of breastfeeding grief. They find closure and renewed self-confidence by understanding that they did or are doing the best they can in their circumstances. Life with a newborn affords many opportunities to bond and work on health-enhancing behavior.

Case 2:

A father presents to your clinic with his 2-year old son, Samuel. The family has just moved from Colorado and the chief complaint on your clinic sheet reads “weight concerns”. In your chart review, you note that Sam’s weight has tracked along the 5-10th percentile for weight, height, and HC since his 2 month checkup.

You reassure the father that his weight pattern is normal, but the father insists that Sam is a “picky eater” and THAT’S why his percentiles are less than average. He says that he and his wife struggle to get Sam to eat ANY vegetable; most fruits are also a struggle. As an example, they have introduced green beans “three or four times” in the past 3 months, but Sam continues to refuse to eat them, which often results in disagreements and tantrums at the dinner table. They usually use dessert as a reward for “cleaning his plate”.

What are nutritional “red flags” in this scenario? What further information would you like from this father?

- Age = 2-years-old. Highest prevalence of “picky eaters” (47% males and 54% females in one study).
- Fruit & Veggie intake is low. Studies of picky eaters show that they are less likely to consume vegetables and fruits and more likely to eat sugary cereals and French fries.
- Novel food attempts: In studies of picky eaters, caregivers offered a food only 3-5x before deciding their child disliked it. A food must be presented between 8-15x before a child will accept it.
- Negative food interactions: Reported more commonly by parents of picky eaters. Struggles at mealtimes, leading to frequent food concessions to the children.
- Dessert as a reward: Studies have found a positive relationship between food controlling/ withholding and food rewarding strategies by parents and subsequent child overeating.

Other important information would be the child’s nutritional history (e.g. Breastfed or formula-fed? When were solids introduced? What is the eating schedule—3 meals & 2 snacks vs. grazing throughout the day? What is his fluid intake?), as well as the family’s nutritional history (e.g. are parents overweight? Do parents have eating-disorders or food-controlling behaviors? What is the family’s eating schedule—meals vs. grazing?). Any other past-medical history? Allergies?

You and Sam's father decide to undertake a plan to increase Sam's vegetable consumption.

What would you recommend in order to get Sam to eat his veggies?

See BOX on p.180 of 2nd article. Here are some tips for getting picky eaters to try new foods:

- Offer small portions of new foods along with your child's favorite foods.
- Make food fun (e.g. Cauliflower Sheep and Ants on a Log)
- Encourage your child to use different senses to explore their food
- Keep a tasting chart
- Be a good role model

Studies show that presenting a novel vegetable in a positive, interactive manner increases the willingness of children to taste new foods (e.g. kohlrabi study- p.181). In additional play-based interventions were more successful than those that focused on nutritional qualities of food.

A more "controversial" approach is presented in the book [Deceptively Delicious, Simple Secrets to Get Your Kids Eating Good Food](#) by Jessica Seinfeld (Jerry's wife!), which promotes hiding vegetable purees in otherwise appealing food (e.g. brownies).

What is the maximum amount of juice that Sam should drink in one day?

See [The Use & Misuse of Juice in Pediatrics](#): "Fruit juice offers no nutritional advantage over whole fruit. In fact, fruit juice lacks the fiber of whole fruit. Kilocalorie for kilocalorie, fruit juice can be consumed more quickly than whole fruit."

Age-group	Juice Servings	Overall Fruit Servings
< 6mo	NONE	Baby food ad lib
1-6 yrs	4-6 oz/day	2 fruit servings (1/2 juice)
7-18 yrs	8-12 oz/day	4 fruit servings (1/2 juice)

Nutrition Board Review—Part I:
(Residents can complete independently)

1. You are meeting with a pregnant woman who has received a liver transplant and is taking chronic immunosuppression therapy. She asks you if the drugs she takes will preclude breastfeeding her infant.

Of the following, the immunosuppressive drug that has the BEST safety profile for lactating women:

- A. cyclophosphamide
- B. cyclosporin A
- C. methotrexate
- D. prednisone**
- E. tacrolimus

Many medications prescribed to lactating mothers pose no risk for the newborn. Among those for which there are concerns, antineoplastic agents and immunosuppressant drugs are best known. The woman in the vignette, who has a history of solid organ transplantation, is receiving immunosuppressant therapies. One of the safest immunosuppressive drugs is prednisone.

When a physician or other health-care professional is uncertain of the potential contraindication of a medication in a breastfeeding mother, he or she should contact the pharmacist because many resources available to clinicians may, in fact, be out of date.

Cyclophosphamide and cyclosporin A both enter human milk and are transferred to the nursing infant, but they have unknown effects on infant growth. Methotrexate is known to cause neutropenia. Tacrolimus may enter the milk, and data are insufficient to declare it safe in all instances.

2. You are addressing a group of expectant mothers who are due to deliver their infants in the next few weeks. You discuss the benefits of breastfeeding and explain that it is the best nutrition for most babies. One woman asks you if it is acceptable to breastfeed if she has had hepatitis in the past. You explain that there are only a few infections that would prevent a mother from being able to breastfeed her baby.

Of the following, breastfeeding is MOST likely to be contraindicated if a mother

- A. has active untreated pulmonary tuberculosis**
- B. has genital herpes without breast lesions
- C. is a cytomegalovirus carrier
- D. is hepatitis B surface antigen-positive
- E. is hepatitis C antibody-positive

Human milk is the optimal nutrition for infants. Benefits include transference of protective maternal antibodies, improved bonding between mother and child, and probable improvement in cognitive and developmental function of the infant. Most mothers can breastfeed successfully, although there are contraindicated conditions for both infants and mothers. Infants who have galactosemia should not receive human milk, and infants who have other forms of metabolic disease, such as urea cycle defects or phenylketonuria, may receive only a limited amount.

Mothers infected with human immunodeficiency virus (in the United States) or human T-cell lymphotropic virus-1 or -2 and those who have active untreated tuberculosis or active herpes lesions on the breast should not breastfeed their infants. However, mothers who are hepatitis B surface antigen-positive or hepatitis C antibody-positive, are cytomegalovirus carriers, or have genital herpes without breast lesions can breastfeed safely. Maternal medications that preclude breastfeeding include antineoplastic agents, immunosuppressants, lithium, and radiopharmaceutical agents.

Several disorders of the breast may make breastfeeding difficult, but they are not contraindications to breastfeeding. Previous breast surgery may cause ineffective lactation, but this varies among mothers. Women who have inverted or flat nipples may experience difficulties with latch-on, but this can be improved with early feedings, use of nipple shields, and lactation consultation. Use of a breast pump also may help. Women who have breast cancer may be able to breastfeed if they are not taking antineoplastic medications. Mastitis,

inflammation of the breast usually caused by obstruction of ducts, may make breastfeeding painful, but more frequent nursing is the best recommendation to help resolve this condition. Sore or cracked nipples may develop, especially if the infant has oral-motor dysfunction, and adjusting the infant's latch-on may improve these symptoms. A mother who has *Candida* infection of the breast may continue to breastfeed, but both she and her infant should be treated for the infection to avoid a cycle of reinfection.

3. A 3-month-old infant who has a history of renal dysplasia associated with obstructive uropathy has marked polyuria. He is breastfeeding and receiving supplemental cow milk-based formula. In an effort to reduce the high urine output, you consider reducing the renal solute load by changing feedings from the milk-based formula currently being used.

Of the following, the MOST appropriate change is to

- A. a hydrolyzed formula containing medium-chain triglycerides
- B. a more concentrated (24-kcal) milk-based formula
- C. human milk exclusively**
- D. soy milk-based formula
- E. whole cow milk

The infant described in the vignette has polyuria caused by a urinary concentrating defect. The concentrating defect is the result of tubular damage due to the obstructive uropathy. The inability to concentrate the urine causes the kidneys to create an "excessive" volume of urine to excrete the solute load presented to them.

One strategy to reduce polyuria is to reduce the solute burden placed on the kidneys. Potential renal solute load is affected by intake of protein, sodium, potassium, chloride, and phosphorus. The protein and phosphorus content are the most important variables when comparing infant feeding regimens.

Human milk possesses a lower potential renal solute load than cow milk or cow milk-based formulas. Accordingly, the most appropriate change in feeding for the infant in the vignette is to recommend that the mother stop cow milk formula supplementation and exclusively breastfeed.

If human milk is not available, a "low-solute" cow milk-based formula can be used. A low calcium-phosphorus formula has the next lowest potential renal solute load compared with human milk. Cow milk, soy milk-based formula, hydrolyzed formula with medium-chain triglycerides, and 24-kcal milk-based formula all have greater renal solute loads than human milk. Renal solute load should also be considered in nephrogenic DI.

4. You are counseling the mother of a 3-month-old breastfed infant whose family has been urging her to introduce cereals to her baby's diet. She asks your advice.

Of the following, the MOST likely outcome of introducing solid foods at this age is to

- A. accelerate the development of oral-motor skills
- B. help the infant sleep through the night
- C. increase the risk of food allergies
- D. increase the risk of gastroesophageal reflux
- E. increase the risk of gastrointestinal infections**

The most likely consequence of early (before 6 months of age) feeding of complementary foods such as cereals to breastfed infants is an increased likelihood of gastrointestinal infection. The direct relationship between early complementary feedings and the incidence of diarrheal illness is based on several case-control studies. In one investigation from Belarus, a large group of infants who were exclusively breastfed for more than 6 months was compared with a group receiving a mixed diet of human milk plus solids, with solids introduced between 3 and 6 months of age. Exclusively breastfed infants had a significantly reduced risk of one or more gastrointestinal illnesses. Furthermore, other observations suggest that this effect may be enhanced with greater duration and exclusivity of breastfeeding. However, prior studies have failed to show any clear risk reduction in the prevalence of upper and lower respiratory tract illnesses, asthma, and otitis

media among exclusively breastfed infants compared with infants who received a mixed diet of human milk and solids.

No available evidence supports the hypothesis that the introduction of solid foods either accelerates the development of oral-motor skills or helps infants to sleep through the night. Data concerning the effect of early introduction of solids on the development of allergies are conflicting. The Belarus study found no reduction in risk for atopic eczema in exclusively breastfed infants; a Finnish investigation showed a reduced eczema risk at 1 year but not at 5 years in a similar group. Although the Finnish study demonstrated a small reduction in any atopic condition for exclusively breastfed infants, the results were not statistically significant. Evidence also failed to demonstrate that early solid food introduction was associated with an increased incidence of positive skin prick tests.

Results of obesity studies also are inconclusive. In exclusively breastfed infants, solid food introduction prior to 6 months of age generally is associated with reduced human milk intake without accelerated weight gain. However, formula-fed infants may be encouraged to consume the same amount of formula, even after complementary feedings are introduced. This may lead to increased calorie consumption and excessive weight gain.

Gastroesophageal reflux (GER) is the result of transient relaxations of the lower esophageal sphincter. Studies using intraesophageal pH probe monitoring data have shown that the reflux index (RI) (percent time that esophageal pH is less than 4) is significantly greater in infants (RI mean upper limit of normal: ~12) than in older individuals (mean: ~6). The addition of solids to the diet does not influence the time to resolution of clinical GER during infancy, although the frequency and severity of symptomatic reflux episodes may be reduced, at least in part, by thickening feedings or increasing solid consumption in appropriately aged infants.

The appropriate timing for introducing solid foods to the infant diet depends on development of both neuromuscular function and gastrointestinal maturation. The American Academy of Pediatrics supports exclusive breastfeeding for the first 6 postnatal months. However, from a developmental perspective, term infants often are capable of accepting solids (complementary foods) between 4 and 6 months of age. Maturation readiness to tolerate complementary feedings is indicated by loss of the extrusion reflex (usually by 4 months) and by the ability to swallow non-liquid foods. The most obvious risk posed by solid food consumption prior to reaching these developmental milestones is that failure to achieve oropharyngeal coordination may lead to aspiration.

5. During a routine health supervision visit, the mother of a 2½ month-old male infant tells you that the baby has been experiencing bloating and flatulence. His diet consists of 5 to 6 oz of a cow milk-based formula given five times per 24 hours. Because of frequent spitting-up, his mother recently added rice cereal to each bottle. He has two to three seedy stools per day. On physical examination, the baby is alert and vigorous. His length and weight are tracking between the 50th and 75th percentiles. The infant's mother asks you whether switching to a soy protein-based formula will help her baby's "gassiness."

Of the following, the MOST likely the cause of this infant's symptoms is

- A. cow milk protein allergy
- B. excessive energy intake
- C. incomplete starch digestion**
- D. lactose malabsorption
- E. sucrase-isomaltase deficiency

The infant described in the vignette has been given formula thickened with rice cereal to ameliorate spitting-up. Following the introduction of cereal, his mother has noted increased "gassiness." The most likely cause of this symptom is incomplete starch digestion.

Development of the digestive-absorptive function of the gastrointestinal tract is not complete at birth. The newborn can assimilate considerable amounts of complex carbohydrates through hydrolysis by salivary gland amylase until pancreatic function and small intestinal intraluminal pancreatic amylase activity mature. Nevertheless, until pancreatic maturity is achieved, and certainly in infants younger than 4 months of age, dietary starches may be hydrolyzed incompletely. As a result, increased amounts of undigested carbohydrate

pass into the colon, where bacterial fermentation results in gas production that may cause the symptoms described for the infant in the vignette.

A diagnosis of cow milk protein allergy frequently is considered in the differential diagnosis of a variety of diverse gastrointestinal complaints. Symptoms that may be associated with cow milk protein intolerance include diarrhea, failure to thrive, hypoproteinemia, hematochezia, anemia, and vomiting as well as other cutaneous and systemic manifestations of atopy. The relationship between infantile colic and cow milk protein allergy remains highly controversial, particularly when fussiness or irritability is the sole complaint. For a thriving infant who develops vague gastrointestinal symptoms after the type of dietary changes described in the vignette cow milk protein allergy should be considered only after ruling out other, more likely causes, such as incomplete digestion of complex carbohydrates.

It is unlikely that the infant described in the vignette has excessive energy intake because his weight gain is not excessive, and thickening of the formula does not appreciably add to energy intake in an infant who is consuming 25 to 30 oz of formula per day. Lactase concentrations reach mature values in the small intestine by the 36th week of gestation in all healthy infants. Congenital or early-onset primary lactose intolerance is an extremely rare condition that is associated with severe diarrhea and inanition. It typically presents with voluminous diarrhea soon after the first feedings of human milk or cow milk-based formula. During infancy and childhood, secondary lactase deficiency may occur as a consequence of intestinal mucosal damage following a prolonged diarrheal illness, as a result of other intestinal disorders (eg, celiac disease), or in association with malnutrition.

Sucrase-isomaltase (SI) deficiency is the most common congenital disaccharidase deficiency. Diarrhea is a virtually universal symptom of SI deficiency and may be associated with poor weight gain. Symptoms usually appear in older infants following the introduction of sucrose containing foods, particularly fruits and juices. Infants who have SI deficiency also do not tolerate soy or protein hydrolysate formulas because both sucrose and glucose polymers are maldigested and malabsorbed.

6. You are addressing a group of new mothers regarding infant feeding. One asks you when an infant can be switched from formula to whole cow milk.

Of the following, you are MOST likely to respond that whole cow milk

- A. can be introduced at 6 months of age if an infant has significant gastroesophageal reflux
- B. can be given at 9 months of age if the infant is also taking a wide variety of supplemental foods
- C. may be given as a supplement at any age as long as the infant also receives human milk
- D. should be avoided until 12 months of age because its iron content is absorbed poorly**
- E. should be avoided until 2 years of age because its caloric content is inadequate for optimal growth

Iron-fortified formulas are the preferred nutrition for infants up to 12 months of age if a mother is unable or chooses not to breastfeed. These formulas contain 10 to 12 mg/L of iron, approximately 4% of which is absorbed by the infant. This amount of iron is sufficient to prevent iron deficiency in most term infants until 4 to 6 months. At this age, iron stores become depleted and supplemental foods, such as iron-fortified cereals, should be added.

The iron content of cow milk is approximately 0.5 mg/L, and although up to 10% of the iron is absorbed, it is inadequate to prevent iron deficiency, even if iron-fortified foods are added. In addition, cow milk may cause increased fecal blood loss in some infants, further exacerbating iron deficiency. Cow milk also has a higher content of protein and electrolytes, such as sodium and potassium, which results in a renal solute load that is too high for the infant kidney. For these reasons, cow milk is not recommended until 12 months of age. It is appropriate to switch to whole cow milk at this time because the caloric content (19 kcal/oz) is adequate for growth at this age, and the child's diet generally includes more iron-containing foods.

The introduction of cow milk does not prevent or treat gastroesophageal reflux and should not be recommended for this condition. Breastfeeding mothers wishing to provide additional nutrition because of inadequate milk supply or other reasons should be advised to use iron-fortified formulas for supplementation.