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## **Problem-Solving Formula for Failure to Thrive in Breast-fed Infants**

### **SUMMARY**

Failure to thrive and insufficient milk are common reasons given for terminating breast-feeding early. Mothers often doubt their natural ability to successfully suckle a young infant. This perceived inadequacy may be reinforced by health professionals who advise supplemental formula feeds to ensure rapid weight gain before an accurate diagnosis has been made. The growth of healthy infants depends on maternal milk production, milk transfer at the breasts, and the quantity and quality of milk intake by the baby. Problems with any one of these areas can present as failure to thrive. The author focuses on a diagnostic approach to failure to thrive in a breast-fed infant and outlines ways to assess maternal lactation ability, milk production, milk transfer, and milk intake. The diagnosis of failure to thrive is often simple and follows sound physiological and anatomical principles. (*Can Fam Physician 1990; 36:1541-1545*)

### **RÉSUMÉ**

Un retard de croissance et une carence en lait sont des raisons couramment invoquées pour cesser précocément l'alimentation au sein. Les mères doutent souvent de leur capacité naturelle à

allaiter leur nourrisson. Cette perception d'incompétence peut se trouver renforcée par les professionnels de la santé qui conseillent d'ajouter un lait maternisé à la diète afin d'assurer un gain pondéral rapide, avant même d'avoir établi un diagnostic précis. La croissance des nourrissons en bonne santé dépend de la production de lait maternel, du passage du lait au niveau des seins et de la quantité et de la qualité de consommation du lait par le bébé. Un problème dans l'une ou l'autre de ces étapes peut causer un retard de croissance ou de développement. L'auteur s'attarde à une approche diagnostique face au retard de croissance chez le bébé nourri au sein et donne un aperçu des moyens permettant d'évaluer la capacité de la mère à allaiter, la production de lait, le passage du lait et la quantité de lait consommée. Le diagnostic de retard de croissance est souvent simple et repose sur des principes physiologiques et anatomiques solides.

**Key words:** breast-feeding, failure to thrive and breast-feeding, family medicine, lactation insufficiency, neonatal care, nutrition, obstetrics, pediatrics

ONE OF THE MOST COMMON reasons given by mothers for stopping breast-feeding is a belief that they do not have enough milk to satisfy their babies.<sup>1</sup> This belief is often supported by their physician, family, and friends, who readily recommend formula feeds as an appropriate remedy, implying that it is an equal alternative; breast-feeding is abandoned without concern. This advice is not always accepted by discerning mothers; they look for alternative solutions to their breast-feeding difficulties. They know that breast milk is species-specific, has unique, special properties, and is the optimal nutrition for their infants and that formulas are inferior products with many known and unknown hazards.<sup>2,3</sup>

Over the centuries, medical practitioners have always been willing to offer remedies for the ailment of insufficient milk, whether they be herbal, naturopathic, lifestyle changes (such as prolonged bed rest or avoidance of stressful situations), or local applications of poultices to the breast as ways to increase

the milk supply. Different substances were preferred in different periods. Aniseed, fennel, lettuce, and powdered crystals were popular in the 17th century; powdered earthworms and dill were used more in the 18th century. Fennel and aniseed throughout this period were thought to be particularly good galactagogues. Folk beliefs and sympathetic lore explain that the effects were related to the moisture in plants, which could influence the moisture (milk) in the body “by sympathy.” Others comment:

Some prescribe the hoofs of a cow’s forefeet dried and powdered, and a dram taken every morning in ale: I think it should be the hoofs of the hinderfeet, for they stand nearest the udder, where milk is bred.<sup>4</sup>

*Jane Sharp 1671*

If the mother was unable or unwilling to suckle her infant, wet-nursing was the traditional treatment of choice. Historical medical texts clearly outline the criteria by which to choose a suitable wet-nurse and offer advice concerning her deportment and responsibilities. Since antiquity, feeding vessels and breast milk substitutes have been advocated as alternatives for breast-feeding, but it was not until the mid-15th century that pap or panada was in common use. These foods consisted of cow’s milk or broth mixed with a cereal, such as bread, and additives, including honey.<sup>4</sup> Since then there has been a never-ending struggle to develop a safe alternative to breast milk, and the recipes or formulas have been innumerable. Even at the end of the 20th century we are still struggling to concoct appropriate solutions.<sup>5</sup>

Early medical practitioners were observers and offered advice based on common practices of the times; their understanding of the pathological processes was limited. Often they did not appreciate the delicate symbiotic relationship of the breast-feeding dyad and failed to identify the underlying causes of poor lactation and failure to thrive. Based on their observations, some of the practices were sound, but many interfered with the ongoing production of milk, and the prophecy of failure was fulfilled. The situation concerning accurate diagnosis of failure to thrive in breast-fed babies has not changed dramatically since then. The use of patent remedies today is as profitable as ever.

Unfortunately, medical school still has not equipped most physicians with a problem-solving formula; hence, they do not apply basic knowledge of lactation and principles of breast-feeding to evaluate and manage the problems appropriately.

The growth of healthy breast-fed infants depends on maternal milk production, milk transfer at the breasts, and the quantity and quality of milk intake by the baby. Each of these play an important role, and problems with any one may present as failure to thrive (Figure 1).

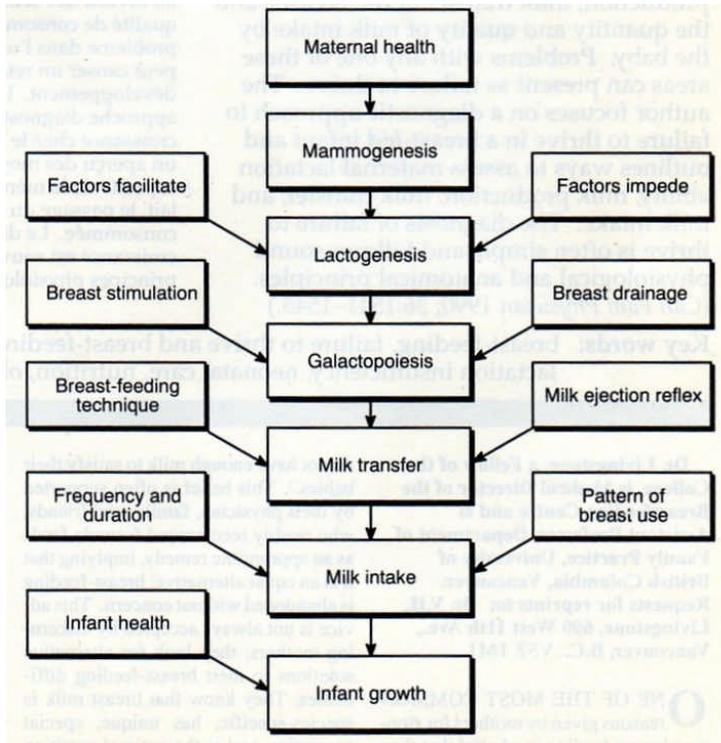


Figure 1 Breast-feeding Kinetics

## Milk Production

Milk production depends on normal lactation ability, adequate breast stimulation, and regular, complete breast drainage. Assessing maternal lactation ability involves an understanding of the normal processes of lactation. Before puberty, the breasts are immature and small. Under the influence of estrogen and progesterone the ducts and gland buds begin to develop, but it is not until pregnancy that the ductile proliferation and lobular-alveolar development occurs. The placental lactogens, in association with high levels of estrogen and progesterone, and prolactin stimulate this growth but inhibit the production of milk. Objective evidence of mammogenesis is breast enlargement and secretion of early colostrum at the end of pregnancy.

Factors that impede successful mammogenesis may include genetic predetermined phenomena, inadequate hormonal milieu. This area has not been studied in detail and many questions remain unanswered. Maternal health factors that interfere with lactational ability include breast surgery, such as reduction mammoplasty and, occasionally, augmentation and endocrine abnormalities.<sup>6,7</sup>

During prenatal visits women should be screened for potential breast-feeding difficulties. Lack of breast enlargement; unusual looking breasts, areolae or nipples; and previous breast-feeding difficulties should be considered “high-risk” indicators for lactational insufficiency. Other compounding factors include lack of maternal motivation associated with lack of support or knowledge.<sup>8</sup>

## Lactogenesis

Lactation begins around parturition. The secretion of milk is triggered by the delivery of the placenta and withdrawal of the hormones. Frequent suckling on the breasts causes surges of prolactin from the anterior pituitary, resulting in the production of colostrum. Placental remnants may interfere with milk production, and it is important to ensure complete removal of placental tissue.<sup>9</sup>

Early initiation of effective breast stimulation is critical to ongoing production of milk. Studies show that the duration of lactation correlates inversely with the time of first breast-feeding; lactogenesis, and hence successful breast-feeding, is impaired by its delay.<sup>10</sup> This delay commonly occurs when mothers and infants are separated because of existing or anticipated infant health problems or maternal illness, such as Caesarean section. These babies are usually cared for in nurseries where rooming-in is unavailable.

Excellent studies in Kenya show that infants with low birth weight can successfully breast-feed and survive if the mother and child are not separated and early access to the breasts is encouraged, enabling lactogenesis to occur.<sup>11</sup>

Clinically, women notice the presence of colostrum for two or three days and then a transition to mature milk over the next several days; they may experience fullness or engorgement during this time. Infants ingest 7 to 20 mL colostrum per feed and do not require supplemental fluids. Prelacteal and complementary feeds may upset the process of lactogenesis by removing the infant's hunger drive and decreasing the frequency of breast stimulation and drainage.<sup>12,13</sup>

Many hospital practices in Canada interfere with the physiological processes of establishing milk production by separating mother and baby. In the United States some current practices, such as mandatory separation with the baby in a nursery, not allowing rooming in, and advising prelacteal feeds of glucose water, are being questioned from a medico-legal standpoint. The current belief is that hospital practices should not impede the natural process of successful milk production. Any factor that interferes with this process is potentially liable for prosecution.

Hospital policies should promote, protect, and support breast-feeding. Across Canada, many hospital policies and practices concerning breast-feeding and the use of formula contravene the World Health Organization and United Nations International Children's Fund recommendations.<sup>14</sup> Family physicians are in a unique position to advise their local hospitals to support the recommendations and to ensure that the practices and policies of the hospital adhere to the guidelines. In this way they can help establish the successful initiation of lactation.

### *Galactopoiesis*

Galactopoiesis is the ongoing production of milk; it is dependent on frequent, effective breast stimulation; complete drainage or emptying of the breast; and an intact pituitary-breast axis. Between feeds, milk passes by passive diffusion across the glands into the ductules. This milk is low in fat, low in protein, high in lactose, and collects in the lactiferous ducts. Some women seem to pool large quantities of this foremilk, and their breasts become full and taut before the next feed.

The active process of lactation is controlled by prolactin, oxytocin, and other poorly defined mechanisms. When the nipple and lactiferous sinuses are directly stimulated, afferent nerve pathways to the anterior pituitary trigger surges of prolactin, which result in hind milk production. This has a higher fat and protein content: the quantity of milk decreases, but the quality and fat concentration increases throughout the feed.<sup>16</sup> If the breasts are not drained adequately, the pressure in the ducts builds up and slowly reduces the amount of milk formed. Complete drainage is a major stimulus to ongoing milk production.

### **Milk Transfer**

The rate of milk transfer to the infant is dependent on milk production and amount of pooled milk, breast-feeding technique, infant suckle, and ejection reflex.<sup>17</sup> A problem in any one or more of these areas may lead to decreased milk intake and failure to thrive. Breast-feeding must be observed in order to access milk transfer. Efficient breast-feeding depends on careful positioning of the mother and infant, appropriate latching on to the breast, and intact suckling ability of the baby.<sup>18</sup>

Correct positioning may include sitting in a comfortable chair with arm rests for support and feet raised on a stool to form a level lap. A pillow helps to raise the baby to the level of the nipple. Breast-feeding is easier if two hands are used. The mother cups the breast with one hand, supports the baby's body

with her forearm, and holds the shoulders and neck with the other hand (Figure 2). The baby's arms should be free to embrace the breast and the body held very closely against the mother.

Figure 2 Modified Cradle Position

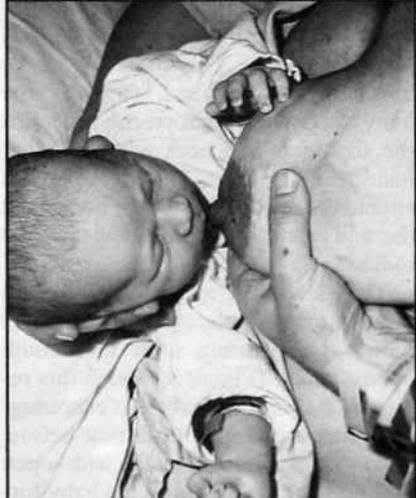


Figure 3 Side Position



Figure 4 Football Position



The latching technique involves brushing the nipple against the baby's mouth and waiting until the mouth opens widely (Figure 3). Often this requires "teasing" the baby and encouraging the mouth to open wider than before. When the mother can see the wide-open mouth, she quickly draws the baby forward over the nipple and areolar tissue and then maintains this two-handed hold throughout the feed (Figure 4). Older infants are able to maintain the latch themselves more easily and nurse comfortably in an elbow crook.

Improper positioning and latching result in decreased breast stimulation, decreased milk production, and decreased milk intake. Simple correction of the position and latch is often the only remedy needed to improve the quality of the feed.

When a baby is correctly latched, he or she forms a teat out of the mouthful of breast tissue. The more elastic and extensible the breast tissue, the easier it is for the young infant. A thick, retracted, or engorged nipple or areolar tissue makes it harder for this to occur. Manual manipulations, including gentle

pulling and stretching out of areolar tissue and manual expression of milk before feeds, and the use of hard plastic nipple shells can help improve the protuberance and elasticity of the tissue.

The strength and frequency of the ejection reflex is related to hypophyseal stimulation of the posterior pituitary and the suckling pressure on the lactiferous sinuses, causing oxytocin release. The more milk that has pooled between a feed, the more milk is ejected with the initial “let downs.” The character of this reflex varies between women and, over time, some have a well-developed let down; others have a slow, irregular reflex. Confidence facilitates the ejection reflex, while anxiety may impede it. Some infants have a strong, vigorous suckle that initiates an ejection reflex quickly and have long bursts of nutritive suckling with few pauses; other infants, including babies with low birth weights, have weak suckles that do not easily evoke a let down. These babies do considerably more non-nutritive suckling and have shorter bursts of swallowing.

Ultrasound studies show how the pressure from the gums and jaws over the sensitive receptors in the lactiferous ducts triggers the milk ejection and the tongue undulates in a co-ordinated manner and strips milk from the teat.<sup>19</sup> Some infants have weak or unco-ordinated sucks. Ankyloglossia (tongue tie) is an important cause of suckling difficulty. The tethered tongue is unable to protrude over the gums and cannot move upward; the teat is not stripped correctly, and less milk is transferred. The nipple often becomes traumatized and sore; the baby may not thrive; and the milk production decreases because of inadequate drainage. A simple “snip” of the frenulum is required and should be done as soon as possible; after a few weeks it is often difficult to alter the way these infants suckle.

The infant’s suck should be evaluated carefully. Visual and digital examinations of the mouth are necessary. The little finger is inserted slowly into the baby’s mouth, and the tongue should move gently around it and protrude over the gum. The suck should be rhythmic, co-ordinated, and equal. An unco-ordinated, weak, flutter, or bunched-up tongue may indicate a sucking defect.<sup>20</sup>

## **Milk Intake**

The quantity and quality of milk drunk is directly related to the frequency and duration of feeds, the rate of milk transfer during a feed, and the pattern of breast use. Most textbooks discussing breast-feeding stipulate rules about duration of feeding: initial short feeds of few minutes on both sides are encouraged because it is said that short feeds prevent sore nipples, there is not very much milk for the baby, and it is too tiring for a new mother and child to breast-feed longer.

Other commonly adhered to rules state that babies should be taken off the first breast after a designated time and switched to the second breast for another specified length of time and that this should be done by inserting a finger into the baby’s mouth and releasing the suction. It is said that by using both breasts, engorgement will be prevented and the milk supply will increase.

Many well-designed studies have repeatedly shown that any restriction on the frequency and duration of feeds interferes with the natural process of “supply and demand.”<sup>21</sup> If the baby does not place sufficient demand on the breast, either by infrequent or inadequate stimulation or by infrequent or inadequate drainage, the milk production decreases or fails to increase to meet the growing demand. Infants can regulate their own milk intake if they are allowed to feed for as long as they like whenever they like.

The milk composition changes throughout a feed; the foremilk has less fat than the milk toward the end of a feed. If an infant is switched from the first breast to the second breast before the high-fat content has been ingested, he or she will have a higher quantity of low-fat milk and more lactose-rich milk. The cream is left behind. The total daily caloric intake is uniform, but the volume of milk taken can vary depending on the pattern of breasts used. The first breast should be finished before switching to the second.

An accurate test weight using electronic scales will readily measure milk intake at a feed, but the 24-hour intake may be harder to evaluate unless test weights are done at each feed, which is impractical. Test weights are a guide to milk intake; the volume ingested at any one feed will vary considerably, but they do help to complete the assessment. Our clinical experience at the Breastfeeding Centre suggests that most small infants drink between 80 and 100 mL of milk per feed, which is considerably less than formula feeds.

## Infant Growth

Infant growth is a result of milk intake and normal infant health. The growth pattern of exclusively breast-fed infants has not been well documented; it could be different from the pattern of formula-fed babies, and standard growth curves might not accurately reflect the slower growth in some breast-fed infants. A rule of thumb is breast-fed infants regain birth weight by two or even three weeks; weight loss of more than 10% of birth weight indicates a problem, and babies gain approximately 20 to 30 g/day during the first three months. If breast-feeding is established without delay, many babies never lose weight. Perhaps this is the ideal growth pattern.

Failure to thrive in breast-fed infants is a common problem; it requires a careful history, physical examinations of the breast-feeding dyad, and a detective's analytical skills to gather clues and interpret the findings. Assuming the infant is healthy, the solutions are usually simple, and formula supplementation is rarely necessary. A tincture of time and patience are also needed to help teach new mothers the art of breast-feeding and the skills to recognize cues and, hence, enable their infants to feed whenever hungry, for as long as desired, and to finish the first breast before offering the second.

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