

Examining the Evidence
for
Cue feeding of Breastfed Infants

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Introduction

It is now commonly accepted that infants, most especially breastfed infants, thrive best when allowed to feed as they indicate their needs. Breastfeeding is, after all, a dynamic process between every unique mother-baby dyad, for which man cannot possibly do a better job than God in designing how infant feeding should work.

This has not been the general consensus throughout the twentieth century, however. Even in the late nineteenth century, there were those, mostly male physicians, who began to believe that infant feeding should be regulated by the clock. As artificial baby milk became all the rage in the twentieth century, both formulations of this milk and schedules to feed babies came into popularity. These schedules often stretched feedings to 3 or 4 hour intervals, and though they apparently worked for bottle fed infants, they did not work so well for breastfed infants.

During the seventies and eighties, as breastfeeding again resurged through a grass roots movement first sparked by La Leche League, many mothers have returned to demand feeding, finding the most breastfeeding success when following baby's cues rather than the clock. The medical establishment lagged behind, and has followed suit only after its own research was undertaken to prove the wisdom of cue feeding—for breastfed babies.

The Evidence

Production and storage capacity.

Until recently, it was believed that the majority of the milk was made at the time the mother sat down to nurse and/or pump, as a result of the prolactin surge that occurs during feeding. We also knew that some milk was made between feedings, as some of the nonfatty constituents collect passively in the sinuses behind the areola to form foremilk. Knowledge of this process has been changed by the work of Peter Hartmann.

Dr. Hartmann is a researcher in Perth, Australia, specializing in human milk production. In his laboratories, Dr. Hartmann has studied mothers before and after nursing sessions by making topographical-type maps of lactating breasts using video cameras and computer equipment in order to analyze changes. Their accuracy has been assessed at +/- 5%, an excellent percentage for this type of work. Dr. Hartmann has discovered, through this work, that the breast does not make all of the milk at nursing time, but rather is making milk around the clock. The rate of milk production between feedings varies according to the degree of fullness of the breast; the fuller the breast, the slower the milk production rate, and conversely the emptier the breast, the faster the rate of production for replacement.

Even more fascinating, Dr. Hartmann has also quantified differences in the maximum storage capacity of women's breasts, identifying at least a 300% difference between the most one woman could store versus the most another could store in his study. Further, Dr. Hartmann noted that the women who had larger storage

capacities often nursed at longer intervals, whereas women with smaller storage capacities nursed naturally at more frequent intervals [Comment: breast size appearance is not always a good predictor of production or storage capacity]. Most importantly, it was noted that all of these women had the *ability* to produce plenty of milk over 24 hours; what varied was the maximum amount that they could deliver at one sitting.

The implication for scheduled feeding is quite evident, as noted in one of Daly and Hartmann's papers:

“At an historical level the typical four hourly breastfeeding schedule that was once widely favoured in the western world [citations removed] may not have caused problems for women with larger storage capacities but might have had disastrous consequences for women with smaller storage capacities. Such women, who needed to breastfeed more frequently, would have been aware that their provision of milk was inadequate on a four hourly breastfeeding schedule. However, rather than dispensing with the schedule, it is clear that such mothers more often doubted their ability to provide milk for their infants and instead introduced artificial milks.”

Endocrine vs. Autocrine control theory.

There is also a second level of potential problems with scheduled feedings. It was well known that prolactin, the milk-producing hormone, was very important in the early months for good milk production. Yet, research also shows that prolactin levels decline to a lower plateau over the first few months postpartum, less important later than early on. This apparent contradiction has been explained in part by the theory of endocrine versus autocrine control. Endocrine control refers to the idea that hormones- namely prolactin and oxytocin-- are the major drivers of milk production. This appears to be established shortly after parturition, and can be inhibited by retained placental fragments or other hormonally related health problems that mother may have. Endocrine control seems to be primary for approximately the first three months or so, until prolactin levels diminish.

It is now believed, partly due again to Dr. Hartmann's work, that another process referred to as autocrine (local) control takes over at about this time. Under the theory of autocrine control, the body continues milk production at a more local level that has been set during the early period. What appears to affect successful long term lactation is the proper development of adequate prolactin receptors during the endocrine control period, which in turn appears to be correlated with frequency of feedings: the more frequent the feeds, the greater the stimulation of receptor development (DeCarvalho, et al; Perry WA & Jacobs, LS).

In studies of women who are relactating after a period of non-lactation with a naturally born child, it has been noted that it is far easier to bring a milk supply back during the first three months postpartum than further down the line. The body produces many milk-making cells during pregnancy, then seems to pare these down over some months after delivery, efficiently keeping only the number necessary plus a few extra “off-line” cells that can be called back into production in a pinch; this natural process is called involution.

Many women claim success in schedule-feeding their breastfed babies during the first couple of months. However, they also have an unusually high rate of milk supply failure around 3-4 months, as evidenced by babies slowing down in growth below acceptable standards, requiring supplementation, and/or involuntary weaning as baby rejects the slower flowing lower volume breast for a more copious bottle.

In light of Dr. Hartmann's work, it becomes clear as to just why some babies never thrive on 3-4 hour schedules, some thrive for the first few months before falling out, and why some succeed the whole duration of lactation. It has everything to do with individual physiology plus breastfeeding management (schedule vs. cue), and nothing to do with proper following of an arbitrary or even “average” routine/schedule. Mothers who have not succeeded in combining breastfeeding with schedules have been told that they lacked the physical ability to produce enough milk, or else that they were not implementing the curriculum correctly, and are bearing a far too heavy burden of guilt and inadequacy!

Crying and satiety.

Katherine Dettwyler, an anthropologist specializing in infant feeding, has recently co-edited a book called *Breastfeeding: Biocultural Perspectives*. In the chapter entitled “Baby Controlled Breastfeeding: Biocultural Implications”, noted and respected lactation researcher Michael Woolridge writes about baby’s crying, and how cultural beliefs often affect interpretation of a baby’s cry. Most notable of Woolridge’s comments was on satiety, the feeling of fullness and contentedness that is felt when the body is properly nourished:

“I still feel that we have yet to appreciate the “currency” of this appetite control—this is likely to be calories, but may, more particularly, be fat. I suspect that in the public perception *volume intake* is regarded as the critical factor, so invariably it is assumed that any woman whose baby remains unsettled after feeding has inadequate milk volume to satisfy her baby’s needs. Much more specifically there may be a small but critical shortfall in her baby’s fat or caloric intake with the result that satiety is not reached..... In this context, a critical difference between breastfeeding and bottle-feeding is that a bottle of formula is of uniform caloric density, so that nutrient intake bears a linear relationship to volume intake. In contrast, breastmilk increases in caloric density during the feed as the volume available diminishes, so that calorie intake shows a curvilinear relationship to volume intake, with the later stages of the feed making a disproportionate contribution to the baby’s intake of calories. Concomitantly, restriction of milk volume removal from the breast results in disproportionate caloric restriction. Though there are likely to be many explanations, including those operating at an emotional level, this is a potential physiological explanation for why unsettled behavior is perceived more commonly for the breastfed than for the bottle-fed infant [additional citations in original].”

These comments are very telling. Proponents of schedule/routine feeds often also place time restrictions upon babies as to how long they should feed, and while unusually long feedings can indicate other difficulties, Woolridge’s analysis serves as a warning against the practice of applying arbitrary limits on feeds, lest we also in the process limit fat/caloric intake at the end of feeds.

Further in his chapter, Woolridge pinpoints the two items he considers most important for good breastfeeding management:

“To prevent any potential calorie restriction two critical facets of breastfeeding must be correctly managed: the quality of mouth to breast apposition throughout the feed, and the absence of time restrictions on feeding”..... “I do not feel we can afford to ignore the most direct physical cause of genuine symptoms of undernutrition--caloric restriction--nor blame the mother for interpreting these symptoms *by a culturally prescribed set of criteria* [emphasis mine]. “

Much attention has rightly been paid to the first facet, good latch, but the second facet has still not been completely settled. Of special importance is Woolridge’s observation that time restrictions on feeding may be connected to inadequate fat intake, and yet parents may interpret baby’s resulting cry of insatiety via their culture, which would blame the mother’s body but not the feeding management which was also culturally proscribed.

Fat and feeding intervals

Supporters of schedule/routine feedings believe that longer intervals make for hungrier babies who will demand more aggressively and who will obtain the necessary higher fat available at the end of a feeding. Woolridge, however, has yet another interesting observation that contradicts at least in part this belief:

“Prefeed fat is inversely related to the length of the interfeed interval, which means that *feed frequency influences milk fat concentration*. Thus feed frequency, one of the key parameters of feed patterning, shows a direct relationship to milk fat concentration and so would appear capable of exerting a direct influence on milk quality.”

“Overall, the fat concentration of milk taken at feeds would appear to be maximized both by increasing feed frequency and milk volume removal (which itself is a combination of unrestricted feed duration and optimal positioning), yet in Western hospitals it has been common in the past to impose restrictions on both feed frequency and feed duration to the likely detriment of the baby’s fat intake. Such restrictions may well have resulted in iatrogenic problems of breastfeeding, which would include fat restriction (resulting in unsettled behavior), symptoms of breast milk insufficiency, and underfeeding.”

One notable problem with feeding schedules and routines is that they often consist of what is considered “longer” intervals of 3 or 4 hours, rather than 2 to 3 hours or even more often, as young babies especially need. The standard definition of a feeding interval *is from the beginning of one feeding to the beginning of the next*, and not from the *end* of one feeding to the beginning of the next, as in *On Becoming Babywise*.

Babywise

Authors Gary Ezzo and Robert Bucknam have misleadingly redefined the term and thus smoke-screened the issue. Babies need to eat or drink when they need to, and that is as individual in intervals and duration as the infinite variety of humankind. Yes, there are averages that may fit into a bell-shaped curve model, but by definition there will also be babies who fall on either side, requiring very short or needing only longer nursing intervals. Temperature, activity, teething or health may also affect these needs and patterns. No schedule, not even a “flexible routine”, allows for this variation, because the base premise is that parents, by virtue of being adults, know better than baby what the baby’s needs are at every point in time. A baby’s cries, his most dramatic expression of need, are instead routinely interpreted through an artificial **filter** that precludes the possibility that many babies are not going to behave like THE average baby and may actually have needs that we have not anticipated. Thus, we lose our ability to understand what is truly “good” for our baby because we are no longer open to learning from him, but only to “teaching” him—imposing upon him—how to be a culturally model baby.

Feeding cues and delayed feeds.

A baby readying to feed displays cues even before he may awaken (Anderson, GC). At first, baby may wiggle, toss and turn, or be restless in his sleep. If his hand is near his face, he may begin to root towards it, and even attempt to suckle it or anything else near his mouth. If these early cues are ignored, the baby may begin to “squeak” and fuss lightly; and if this is also ignored, he will eventually work up to a full cry to express that he is now overdue for his needed nourishment. An experienced breastfeeding mother with baby nearby usually quickly discerns baby’s needs and puts him to breast early in this sequence of cues, avoiding the fretting and crying entirely. For the mother who is scheduling her baby and/or sleeping apart from him, however, it is much different.

A newborn who is left to cry for even a few minutes can become very disorganized and have a more difficult time latching on and suckling correctly (Anderson, GC). This has often been observed by mothers in the hospital; the nurse will rush the baby in, saying “He’s really ready to eat, he’s been crying for the last 10 minutes!” but then as soon as mom attempts to put him to breast, he falls asleep and does **not** breastfeed well. As a result, he often does not take as much as he needs, and if this scenario is repeated, mother’s milk production will decrease over time. This stands in opposition to the belief that a baby who is made to wait for his feeding based on a clock is going to ‘signal the breast to produce more milk’ by sucking more strongly out of his hunger. Rather, the opposite quite often occurs. Circumventing the natural cues of a baby by attempting to breastfeed earlier or by waiting past those “golden moments” simply doesn’t work well. While a good

nursery nurse can “make” a baby take a bottle on a schedule by forcing the rigid nipple into his mouth to elicit a sucking reflex, it is virtually impossible for even the best lactation consultant to “make” a baby breastfeed.

Furthermore, crying has been found to be physiologically detrimental to the new infant. Large fluctuations in blood flow occur during extended crying periods, decreasing cerebral oxygenation and causing an increase in cerebral blood volume. As a result, rising blood pressure increases intracranial pressure, putting baby at risk for an intracranial hemorrhage. Meanwhile, oxygen-depleted blood flows back into the systemic circulation rather than into the lungs (Anderson, GC). Overall, crying in the newborn resembles the adult valsalva maneuver (straining with stooling) by obstructing venous return in the inferior vena cava, which temporarily reestablishes fetal circulation within the heart of the newborn.

In an attempt to prevent excessive crying and also keep baby on track, some proponents of infant schedules promote the use of pacifiers to delay feedings and/or eliminate non-nutritive sucking at breast. Such interventions are not without risk, however. Barros and Victora, et al, have documented that pacifier use is associated with a shorter duration of breastfeeding, while Victora et al note that mothers who utilize pacifiers for their infants frequently exercise a higher degree of behavioral control while breastfeeding, often leading again to shorter duration of breastfeeding overall. This should be of concern to both parents and health professionals as the duration of breastfeeding in the United States currently falls well below the recommendations of the World Health Organization (Baby-Friendly Hospital Initiative) and the Surgeon General.

Eating patterns

Physicians and dietitians have long decried the American way of eating three big meals a day. They have often said that six smaller meals would be more beneficial for our digestive systems, growth and development. Given this, then, why should anyone try to cut back a baby’s feeding frequency to only four a day by twelve weeks, as the Ezzos promote? Unlike adults, who need only to keep their weight stable, babies need to *double* their birthweight in 5-6 months and *triple* it in a year.

Taking that into consideration, observe adult patterns of eating. Most adults have something in their mouths (unless they are actively dieting) on average every 90 minutes during waking hours-- breakfast, coffee breaks, lunch, snacks, dinner, gum, candy (Linda Smith, IBCLC; unpublished study). We nibble; we get thirsty; we get a drink of water; our hunger and thirst changes from day to day according to the weather and our activity level. We are not trying to gain weight, let alone double or triple it; why would babies need fewer feeds a day than we take, given their circumstance? The average need of a baby is to feed 8 - 10 times a day, and up to 12 - 14 times a day during growth spurts (Mohrbacher and Stock); schedules simply do not adequately allow for such unpredictable variations.

The immune factor

Nutrition is often the focus of breastfeeding, but there are other reasons that babies ask for the breast as well. Most people are aware that breastfeeding confers immunological advantages upon the baby, but few understand the dynamics of this process.

A normal baby is born with an underdeveloped immune system that takes from two to six years to completely mature (Goldman, AS). One of the lesser-understood roles of human milk is to supplement the young child’s immune system until he fully matures. For the newborn, colostrum is densely packed with antibodies and immunoglobulins to give baby a “booster shot” right after birth. As baby grows older, human milk continues to pass on antibodies for all those organisms to which the mother has developed her own immunity. Even more amazing, if a baby contracts an illness that mom has *not* been exposed to previously, he will transfer this organism through his saliva to the breast, where antibodies are manufactured on site and then sent back to baby via the milk to help him cope. Science does not come even close to duplicating this feat! Babies who are sick will often increase their nursing frequency, and researchers now believe that they do so not only for the comfort

that it brings to a miserable little being, but also to increase the baby's intake of antibodies and immune factors available through mother's breast (Dettwyler, website). Babies seem to "know" when they have been exposed to a virus or bacteria, and know when they need to breastfeed more frequently to help them fight it off; most importantly, they sense it before parents realize that an illness is developing. There is no system in existence that is as sensitive and accurate as this one, and it is not under parental control. Mothers who wean their babies from the breast during the first and even second and third years of life often notice that their child becomes sick more than before, or for the first time; the immunological advantage of human milk does not disappear after a set period of time and also cannot be scheduled.

Conclusion

The evidence is very strong that arbitrary (defined as set by external influences, such as averages) scheduling of breastfed infant feedings is inadvisable for any mother who desires to breastfeed successfully, most especially for the recommended longer periods of up to a year or more. Individual storage capacities of mother's breast is one major factor in the determination of which babies can be fed at long versus shorter intervals, and the proper development of adequate prolactin receptors is another major factor that favors more frequent feedings. Coupled with the evidence that suggests that frequency of feeds-- unrestricted-- may influence the fat content of milk in a positive correlation, it appears as overwhelmingly good sense to allow baby to feed whenever he signals the need to, ala "on demand" or "on cue."

Moreover, it would appear that this is nature's design, and for those who acknowledge a Creator, really *God's* design, for breastfed infants and their mothers. When parents ignore the natural, God-created system of cues between baby and mother, it can result in disorganization of baby's suckling and resulting low intake and milk supply. In addition, the unnecessary extra crying that results from putting a baby off can actually cause unhealthy stress to his body. Immunologically, limiting a baby's feeds to a particular schedule may thwart a baby's attempt to fight a developing illness, reducing his intake of vitally important antibodies and immunoglobulins.

It can be argued that bottle-fed babies should be exempt from the need for demand feeding, but even though the composition and availability of their milk is relatively stable and without the immunity factors of human milk, they, too, may benefit from being allowed to eat when hungry, rather than being forced to take in possibly larger amounts on less frequent intervals in order to meet their daily caloric needs, stretching their stomachs unnecessarily in the process.

Empirical and theoretical evidence combined continue to support current recommendations of the American Academy of Pediatrics that babies, most especially breastfed babies, need to be fed on cue and should be allowed to set their own routine, rather than placed into a predetermined schedule. It is our further conclusion that practices which interfere with respecting babies' cuings have been responsible for low weight gains, failure to thrive, milk supply failure, involuntary early weaning, and possibly even some cases of colic, not to mention infant regression and depression due to lack of parental responsiveness to baby's frantic cues.

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