



June 2008: VOLUME 5, NUMBER 10

Breastfeeding of Preterms in the NICU



In this Issue...

Breastmilk is the ideal food for the preterm infant because it provides nutrients and bioactive components that promote optimal growth.¹ The nutrients support weight gain as well as development of the nervous system and other developing body systems while offering less challenge to the immature gut.^{1,2} The bioactive components provide protection against infection to which the preterm is so profoundly vulnerable.^{1,3}

In this issue, we review recent reports that affect breastfeeding in this high-risk group. These reports include: perinatal and socioeconomic determinants of breastfeeding, the effects of antenatal corticosteroid treatment on breast milk supply and quality, how the odor of mother's milk influences breastfeeding behavior, and the implementation of peer counselors as a strategy to increase breastfeeding success.

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Length of Activity

1.0 hours Physicians
1 contact hour Nurses

Release Date

June 12, 2008

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June 11, 2010

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GUEST AUTHOR OF THE MONTH



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Guest Faculty Disclosure

Ms. Silbert-Flagg has no relevant financial relationships to disclose.

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At the conclusion of this activity, participants should be able to:

- Identify for colleagues the perinatal and socioeconomic factors that influence breastfeeding of preterm infants in the NICU
- Discuss with colleagues the factors that may affect breast milk production among NICU mothers
- Describe to colleagues the factors that may affect breastfeeding behaviors among preterm infants in the NICU

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COMMENTARY

Breastmilk and breastfeeding offer significant, immediate and sustained short-term and sustained benefits to preterm infants, contributing to growth and development in the neonate as the species is intended to grow and develop.⁴ Breastmilk offers support to multiple systems including the immune system, the developing neurologic system, the gut, and all other developing systems; it also helps in both pain and stress management.^{1,2,3} Despite compelling data that support the benefits of breastfeeding, mothers of preterm infants are less likely to breastfeed as compared to mothers of term infants.¹ Mothers and infants face intimidating challenges and barriers to breastfeeding in the NICU. The barriers these mothers and infants face are significant in the intimidating physical environment of the Neonatal Intensive Care Unit (NICU): infant factors include a multitude of physiologic and medical conditions; maternal factors include illness, stress, and medications; family factors include inexperience with breastfeeding and financial constraints; socioeconomic factors include health insurance exclusions and the lack of available affordable breast pumps for purchase or rental.¹

In a 2004 report,⁵ 10 steps were identified as contributing to both promoting and protecting breastfeeding in vulnerable populations. These include:

1. providing the parents with information necessary to make an informed decision to breastfeed
2. assisting the mother with the establishment and maintenance of a milk supply
3. ensuring correct breast milk management (storage and handling) techniques
4. developing procedures and approaches to feeding the infant breast milk
5. providing skin-to-skin (kangaroo) care opportunities
6. non-nutritive sucking at the breast
7. managing the transition to the breast
8. measuring milk transfer
9. preparing the infant and the family for infant hospital discharge
10. providing the appropriate follow up care

The American Academy of Pediatrics (AAP) recommends having a lactation consultant on staff, peer support for breastfeeding, and a hospital breastfeeding policy. Implementation of these guidelines is increasing breastfeeding rates and milk production.

The 4 research studies reviewed herein — managing perinatal and socioeconomic risk factors associated with early weaning, understanding the effects of antenatal corticosteroids on lactogenesis II, utilizing the effects of maternal odor on breastfeeding behaviors in the premature infant, and the use of peer counselors in the NICU — identify strategies to promote successful breastfeeding which can be applied by clinicians working with preterm infants, mothers, and families to help achieve more favorable outcomes.

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1. Gartner LM, Morton J, Lawrence RA, et al., American Academy of Pediatrics Section on Breastfeeding. [Breastfeeding and the use of human milk](#). *Pediatrics*. 2005;115(2):496-506.
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4. United States Department of Health and Human Services (2008) *The Benefits of Breastfeeding*. [Available online](#). Accessed May 23, 2008
5. Spatz DL. [Ten steps for promoting and protecting breastfeeding for vulnerable infants](#). *J Perinat Neonatal Nurs*. 2004;18(4):385-396.

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PERINATAL AND SOCIOECONOMIC DETERMINANTS OF BREASTFEEDING IN THE PREMATURE INFANT

Flacking R, Wallin L, Ewald U, Heyns L. **Perinatal and socioeconomic determinants of breastfeeding duration in very preterm infants.** *Acta Paediatr.* 2007;96:1126-1130.

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This report is the first published prospective population-based cohort study on breastfeeding duration up to 1 year in preterm infants. The researchers sought to describe the impact of prematurity, size at birth, neonatal disorders, and the family's socioeconomic status (SES) on breastfeeding duration in mothers of infants born <32 weeks gestation. Conducted in Sweden on infants born between 1993 and 2001, 225 very preterm (<32 weeks) singleton infants with Apgar scores of 7 or higher at 5 minutes were identified; infants with diagnoses that included respiratory disorders, neonatal sepsis, and neonatal sequelae diagnosed at discharge were also included in the study.

In comparing mothers who were breastfeeding (defined as the infant being fed with breastmilk, either exclusively or partially, without regard to the method used for intake) with mothers who were not, data were obtained from scheduled visits at 2, 4, 6, 9 and 12 months at Child Health Centers where 99% of all newborns were enrolled. Socioeconomic status included maternal education, maternal unemployment benefits, and two income measures (social welfare and equivalent disposable income of the household). Data were adjusted for confounders of maternal smoking at first antenatal visit, cohabitation, maternal age, paternal education and county. Among the key findings reported:

- breastfeeding frequency among all mothers of infants born <32 weeks was 79% at 2 months, 62% at 4 months, 45% at 6 months, 22% at 9 months, and 12% at 12 months
- the breastfeeding rate did not differ significantly between infants born at 22-27 weeks and infants born at 28-31 weeks
- no association was found between prematurity, size at birth, or neonatal disorders before 6 months.

The authors further report that adverse exposure to each of the SES factors was associated with weaning before 6 months, with similar associations identified at 2 and 4 months. Lower maternal educational level was associated with significantly higher risk of weaning at age 9 and 12 months. At 6 months, when all SES factors were entered into the analysis simultaneously and adjustments were made for confounding variables, social welfare remained significant while the other factors did not.

Sweden is a nation with low income inequality and high rates of social expenditure, including parental leave benefit for 480 days, guaranteed temporary parental benefit when an infant is sick, and cost-free access to child health care. These benefits may affect external validity. The relationship between SES and health behaviors, such as breastfeeding, might be mediated by cognitive-emotional factors and fewer personal resources. However, these insights into identifying those individuals at risk for unsuccessful breastfeeding may allow the NICU staff to offer more effective support to this particular group.

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THE EFFECTS OF ANTENATAL CORTICOSTEROID TREATMENT ON LACTOGENESIS II

Henderson JJ, Hartmann PE, Newnham JP, Simmer K. **Effect of Preterm Birth and Antenatal Corticosteroid Treatment on Lactogenesis II in Women.** *Pediatrics*. 2008;121(1):e92-100.

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Antenatal corticosteroids are routinely given to enhance fetal maturation in an anticipated preterm birth. Henderson et al investigated the effect of both antenatal corticosteroids and preterm birth on the timing of lactogenesis II. Fifty women who had received betamethasone treatment and were expressing breast milk for a preterm infant <34 weeks were included in the study. Exclusion criteria included maternal age younger than 18, no intention to breastfeed, likely poor perinatal outcome, and multiple pregnancy of triplets or greater. All women received a single course of 2 intramuscular injections of 11.4 mg of betamethasone, 24 hours apart (a standard practice).

Women were encouraged to express a minimum of 6 times per day, including once overnight, by using a commercial electric pump. Digital scales accurate to 0.1g were used to weigh the milk. The primary end points were 24-hour expressed milk on days 1 to 10 postpartum, and levels of lactose and citrate in the milk. Independent variables were gestational age at delivery and time interval between antenatal betamethasone treatment and delivery. Mothers were divided into 2 groups based on the gestational age of their infants: <28 weeks (n=13) and 28–33 weeks (n=37). The median gestational age at delivery was 31 weeks (24.2 to 33.7 weeks) and the median birth weight was 1465g (640g to 2580g). Seventy percent of the infants were male. More than 56% of participants intended to breastfeed for over 6 months and 40% were primiparous.

The investigators found overall milk volume increased from day 1 to day 7 postpartum, with daily milk production rising to a median of 323 ml on day 5 and 530 ml by day 10. Volumes also increased significantly with advancing gestational age at delivery (p=.017), and were significantly associated with frequency of expression (p<.001). There was no effect of gestational age on frequency of expressing (p=.650). The mother's intended duration of breastfeeding was significantly associated with 24 hour milk volume (p=.002), also unrelated to gestational age. There was no relationship between intended duration of breastfeeding and frequency of expressing (p=.780). Expressed milk volume was not associated with any other maternal, antenatal, intrapartum, or neonatal factor, including maternal age, smoking, parity, obstetric complication, cesarean section delivery, or birth weight.

When delivery occurred before 28 week's gestation, there was no difference in milk volume at the different intervals between betamethasone treatment and delivery. In contrast, when delivery occurred at more advanced gestational ages (between 28 and 33 weeks), there were differences found between the treatment interval groups. Women who delivered 3 to 9 days after treatment obtained significantly reduced volumes of milk compared with the women who delivered 0 to 2 days after treatment. Regarding lactose and citrate levels in the milk, after adjustment for postpartum day, the interval between antenatal betamethasone treatment and delivery was not associated with either milk lactose (p=.857) or citrate (p=.312) levels. Based on this study, lactose and citrate levels are not markers of lactogenesis II in determining the association with antenatal corticosteroid treatment.

This study is the first to investigate the relationship between preterm birth, betamethasone administration, and lactogenesis II. Based on these findings, the NICU staff can advise the mother of the potential benefit of increased pumping frequency to reduce risk of delayed lactogenesis II. Alternatively, explaining the possible physiologic reasons for initial decreased milk production may lessen the anxiety and encourage continued pumping to establish an increased volume of milk production. Such counseling would be most effective for mothers of infants 28 to 33 weeks gestation delivered 3 to 9 days after antenatal corticosteroid treatment. Further, the NICU staff may find it helpful to know the median milk production as identified in this study as a basis for evaluating the preterm mother's milk production. Finally, these data do support previous findings that frequency of expression strongly predicts both the volume of milk production and concentration of lactose and citrate in milk, so the NICU staff can with confidence continue to encourage regular pumping as an effective strategy for breastfeeding success.

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EFFECT OF EXPOSURE TO THE ODOR OF MOTHER'S MILK ON BREASTFEEDING BEHAVIORS

Raimbault C, Saliba E, Porter RH. **The effect of the odour of mother's milk on breastfeeding behaviour of premature neonates.** *Acta Paediatrica*. 2007;96(3):368-371.

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Overt behavioral responses to olfactory cues have been documented in preterm newborns; this 2007 paper by Raimbault et al (2007) reported on the effects of exposure to the odor of mother's milk on breastfeeding behavior of the preterm infant. Thirteen preterm infants born at 30 to 33 weeks gestational age were included in the study. Inclusion criteria included gestational age 29 to 34 weeks, stable condition, spontaneous ventilation, no evidence of asphyxia, congenital malformations or grade III/IV intraventricular hemorrhage, and mother's intention to breastfeed. Infants were randomly assigned to milk odor or a control group of water.

During week 35 post-conceptual age, each infant was exposed to the appropriate stimulus for 120 seconds on 5 consecutive days immediately prior to a breastfeeding attempt. During the exposure session the infant was in the mother's arms, and a cotton-tipped applicator moistened with the stimulus liquid was held 1cm from the infant's nostril. The sample of fresh milk was manually expressed by the mother within 3 hours of exposure. Milk and water were warmed to body temperature. All infants were fed pasteurized donor milk for the first 8-10 days (via an orogastric tube); after this period they received their own mother's milk. Analysis was done on the final odor exposure session and a second session prior to discharge. Pre- and post-test weights were obtained for each of these feeding sessions. The breastfeeding session was recorded and viewed by an individual blinded to the treatment, to obtain the following behavioral measures: 1) latency to grasp the nipple(s); 2) duration of the longest bout of repetitive sucking movements; 3) number of long sucking bouts (≥ 7 sucks); and 4) duration of the session. Sessions were ended when the mother decided to terminate.

The investigators found that infants exposed to the odor of their mother's milk displayed longer sucking bouts, a significantly greater number of long sucking bouts, and consumed more milk than infants in the water-control condition. When released from the hospital, the median postnatal age of the infants in the milk exposure condition was significantly less: 43 days compared to 55.5 days for the water control group ($p < .025$). The mean weight gain did not differ significantly between the two groups, at 33.3g for the milk group and 27.6g for the water group.

Patterns of nutritive sucking improve with age and experience. Lengthening of sucking bursts indicate a transition to a more mature pattern of feeding. Exposing preterms to the odor of mothers' breast milk has the potential to influence the duration of feeding, as evidenced by the sucking behavior in the milk control group continuing even after the stimulus was no longer used. The authors note that this olfactory cue procedure is a simple intervention with no apparent risks, entails no additional cost, and could easily be incorporated into routine nursing care.

PEER COUNSELORS INCREASE NICU BREASTFEEDING RATES

Merewood A, Chamberlain LB, Cook JT, Philipp BL, Malone K, Bauchner H. **The Effect of Peer Counselors on Breastfeeding Rates in the Neonatal Intensive Care Unit.** *Arch Pediatr Adolesc Med*. 2006;160(7):681-685.

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Merewood's 2006 report sought to determine whether peer counselors impacted duration of breastfeeding among premature infants in an urban population. Secondary objectives were to determine whether peer counselors increased the number of women providing mostly breast milk, and whether peer counselors increased the rates of exclusive

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breastfeeding. One hundred and eight mother-infant pairs of similar sociodemographic variables were enrolled. The study included mothers who intended and were eligible to breastfeed and their infants who ranged from 26 to 37 weeks in gestational age and were otherwise healthy. Limits to the study included that the majority of the infants were 32 to 37 weeks gestational age, and infants with congenital anomalies or with life-threatening complications in the immediate postpartum period were excluded.

Subjects were randomly assigned to either a peer counselor who saw the mother weekly for 6 weeks or to standard care. The main outcome measure was any breastmilk feeding at 12 weeks. Infant feeding status was assessed by a research assistant unaware of the mother's group assignment at 2, 4, 8 and 12 weeks postpartum. The 3 breastfeeding categories included only breast milk, mostly breast milk (equal to or greater than 50% breast milk), and mostly formula; the methods for breast milk ingestion included gavage feeding, bottle feeding, or feeding at the breast. (For the final analysis, these 3 breastfeeding categories were combined and reported as any breast milk.)

Because race is a factor in breastfeeding duration among term infants (39% of white US infants are breastfeeding at 6 months compared with 24% of African American infants) and because of the high incidence of premature births among African American women. A subgroup analysis was performed on the African American subjects. At 12 weeks, all women with peer counselors had odds of providing any amount of breast milk 181% greater than those without peer counselors. In the subgroup analysis of African American mothers with peer counselors, the odds of providing any amount of breast milk was 249% greater than those for African American mothers without peer counselors. The elements of face-to-face contact between the mother and peer counselor, a checklist of goals for the peer counselor at the initial meeting with the mother, carefully maintained field records, and close supervision of, and support for, the peer counselors was thought to be beneficial in contributing to the success of the intervention. Peer counselors had access to a lactation consultant working on the unit and to the project manager and the project managers' presence helped to ensure peer counselor consistency, accuracy of knowledge and reliability.

While the benefit of breast milk on the health of the premature infant in the NICU is widely accepted, the demands on the NICU nurse providing intensive care to the preterm may inhibit opportunities to assist mothers with breastfeeding. As a result, the support required to establish a successful milk supply and subsequent breastfeeding success may not be provided by NICU nurses on a consistent basis – a job that may be undertaken by the peer counselor. Further, mothers may respond positively to support from a person of similar cultural background and experience. However, all peer counselors must be adequately trained and receive the professional support of a person who is knowledgeable about breastfeeding. With these conditions, peer counselors have the potential to affect breastfeeding and thus neonatal outcomes in a significant and positive way.

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- **Lawrence M. Nogee, MD** has received grant support from the NIH.
- **Mary Terhaar, DNSc, RN** has indicated no financial relationship with commercial supporters.

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