Controversial Breastfeeding Issues During the First 24 Hours

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How Long Do We Go Before the First Feeding? 6, 12, 18, 24 hours?

1956 survey of >2 million infants and 1900 hospitals

<table>
<thead>
<tr>
<th>Time (hr)</th>
<th>Breast Fed</th>
<th>Not Breast Fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53.46</td>
<td>52</td>
</tr>
<tr>
<td>3</td>
<td>59.14</td>
<td>54</td>
</tr>
<tr>
<td>6</td>
<td>52</td>
<td>54</td>
</tr>
</tbody>
</table>

Plasma glucose levels

Diwakar. Arch Dis Child Fetal Neonatal Ed 2002; 87:F46-F48

- Remaining unfed following birth did not significantly influence plasma glucose levels at 3 and 6 hours of age in healthy term infants

<table>
<thead>
<tr>
<th>Feed Status</th>
<th>Mean glucose (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3h unfed</td>
<td>53.46</td>
</tr>
<tr>
<td>Recently fed</td>
<td>59.14</td>
</tr>
<tr>
<td>6h unfed</td>
<td>52</td>
</tr>
<tr>
<td>Recently fed</td>
<td>54</td>
</tr>
</tbody>
</table>
How Long Do We Go Between Feedings?

- Intervals of up to 8 hours between feeds were not associated with excessively low blood glucose concentrations in newborns (Hawdon et al, 1992)

Suckling Ketogenesis

(Williams, 1997)

- After normal blood glucose decline in first 3 hours, brisk ketogenic response in breastfed infants
- Ketone bodies provide alternative energy source for neonatal brain
- Breastfed babies tolerate lower blood glucose levels because their ketone body levels are elevated
- LGA infants of non-diabetic mothers will mount a sufficient ketogenic response to low blood sugar levels

Fig 2: K3 concentration (mmol/L) versus postnatal age, SGA and LGA infants

- = formula-fed
- = breastfed
- = supplemented
- = AGA infants

Formula Blunts Ketone Response

• Exclusive ff does not necessarily protect against low blood glucose values, especially with small infants
• Formula blunts ketone response in breastfed babies, making ketogenesis more difficult

How low do we go? What’s the magic number?

• There is none
• Production of glucose by glycogenolysis & gluconeogenesis is apparent at 3-4 hours of age
• Healthy full term babies who have no clinical signs do not require monitoring of glucose concentrations

Use of Operational Thresholds (Cornblath et al 2000, ABM Clinical Protocol #1)

• Infants with clinical signs of hypoglycemia should have glucose measured. If <45mg/dL clinical interventions should be started
• At risk infants monitored within 2-3 hours of birth. If <36mg/dL interventions should be started
• Symptomatic infants started on IV glucose
Diabetic mothers may wish to express colostrum, freeze it, and bring to hospital in case supplementation is needed for hypoglycemia (Cox, 2006)
Enhancing glycemic stability
(Chertok et al, 2009)

- Infants of gestational diabetic mothers
  - Who were fed immediately following birth had lower rates of borderline hypoglycemia than those who had delayed first feeds
  - Who were fed immediately had higher mean blood glucose levels compared to those not fed immediately
  - Who were breastfed had higher mean blood glucose levels than infants fed formula for their first feed

What Else Drops Blood Glucose

- Cold stress
- Separation immediately after birth increases crying
- Crying depletes glycogen stores in the liver

<table>
<thead>
<tr>
<th>90 m of age</th>
<th>Skin to Skin</th>
<th>Bassinet</th>
</tr>
</thead>
<tbody>
<tr>
<td>glucose</td>
<td>57mg/dL</td>
<td>46mg/dL</td>
</tr>
<tr>
<td>crying</td>
<td>70 seconds</td>
<td>47 minutes</td>
</tr>
</tbody>
</table>

Caution

- Maternity units should not utilize glucose measurements adapted for sick infants such as in the S.T.A.B.L.E. program, a program that is for post-resuscitation/pre-transport stabilization care of sick infants.

What do we know?

- Healthy term newborns do not develop symptomatic hypoglycemia simply as a result of underfeeding
- Glucose levels increase after feedings, so frequent breastfeeding with DOCUMENTED swallowing ensure that plasma glucose levels do not remain low for prolonged periods of time
- Unnecessary supplementation with formula interferes with normal metabolic compensatory mechanisms

How much milk does a 0-24 hour old baby take at breast?

- Amount of milk in first hours = 37ml-80ml (Casey, 1986)
- 9.6ml-19.9ml/kg/day (a 3kg or 6.6lb baby took in 28.8-59.7ml) (Dollberg et al 2001)
- 6-7.4ml/kg/day vaginal delivery
  - 4-6.6ml/kg/day cesarean delivery (Evans et al, 2003)
- Average number of feeds = 7
- Volume per feed = 5.2ml-11.42ml (Casey)
- Volume per feed = 4.2-14.8ml (Chapman 2001)
- Amount of colostrum available in the first 24 hours = 7ml-123ml

What is the volume of the newborn stomach? Scammon & Doyle, 1920

- Correlated with size and gestational age of the infant
- Anatomic capacity as determined post mortem averaged 33ml
- Physiologic capacity by pre and post feed weights averaged 7ml
- Maximum capacity on day one was 9ml
- Approximate each other by day 4 as stomach becomes more compliant
### Gastric Volume at Term

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Gastric volume at term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widstrom et al, 1988</td>
<td>Gastric aspirates</td>
<td>10ml (fetus drinks amniotic fluid in portions this size)</td>
</tr>
<tr>
<td>Sase et al, 2005</td>
<td>Ultrasound</td>
<td>10ml</td>
</tr>
<tr>
<td>Nagata et al, 1994</td>
<td>Ultrasound</td>
<td>9.9ml</td>
</tr>
</tbody>
</table>

### Gastric Relaxation and Emptying
- Newborn stomach is noncompliant and does not easily relax to accommodate a feeding during the early hours postbirth
- Maturation and increasing number of feeds reduce gastric tone and increase compliance
- The more feeds a baby receives the more compliant the stomach becomes
- Gastric half-emptying time for human milk meals is $48 \pm 15$ minutes
- Gastric half-emptying time for formula meals is $78 \pm 14$ minutes

### Visual Aids for Stomach Volume
- Marble = 2.1ml
- Shooter marble = 8.2ml (day 1 volume)
- Ping pong ball = 26.5ml (day 2 volume)
- Walnut = 9-11ml (day 1 volume)
How many times should a baby be breastfed in first 24 hours?

- 7-11x
  - meconium passage
  - milk intake
  - weight loss
  - bilirubin levels
  >8 times ↓ bil levels
  ↑ feedings up to 13
  hastens perception of let down reflex & reduce breastfeeding problems

When should a baby be fed?

- Not every 2-3 hours
- Crying is a sign of over-hunger
- When behaviorally ready to feed
  - Rapid eye movements
  - Sucking motions
  - Hand-to-mouth
  - Body movements
  - Small sounds

Renal Function in Newborns

How many diapers?

- Normal neonate has 6-44 ml of urine in the bladder at birth
- 17% void at birth, 92% by 24 h, 99% by 48h
- Time to first void 7.3 h (Mataj et al, 2003)
- Urine output <1mL/kg/h during first 12-18h
- Oliguric for 1st day due to high circulating levels of antidiuretic hormone after birth
- Voiding during the first 2-3 days reflects depletion of extravascular and extracellular fluid reserve and is reflected in diaper counts of 1-2 with amounts increasing following lactogenesis II
- Not an indication for supplementation unless other feeding parameters are unacceptable
Dehydration
Rodriguez et al. Changes in body composition during the initial hours of life in breastfed healthy term newborns. Biol Neonate 2000; 77:12-16

- Percentage of body water ↑ in 1st 3 days indicating adequate hydration
- Weight of baby ↓ from loss of body solids (stool)
- Passage of several large meconium stools in the first 24-48 hours gives the appearance of inadequate feeding or hydration but requires no intervention unless other feeding parameters are unacceptable
- May see diuresis from excess maternal IV fluids

Weight Loss from Supplementation

- Feeding of DHA-containing formula can cause runny, frequent, and/or very large amounts of stooling
- May be a false indicator of sufficient intake in a breastfed baby
- Can lead to supplementation if deemed as an excessive amount of weight loss

First Day Weight Loss

- Weight loss of ≥ 4.5% of birth weight at <24 hours shows ↑ risk of eventual in-hospital weight loss of ≥10%
- May indicate increased need to breastfeeding observation and follow-up

Why don’t these babies breastfeed?

- Too sleepy or too neurologically depressed?
- Too sleepy or shut down?
- Flat nipples, edematous areola, oral anomalies

Perinatal Influences on Latch

- Labor medications
  - Epidural (depressed sucking especially if combined with IV medications)
  - Long clearance time of fentanyl (half life of 3-13 hours in newborn)
  - Reduced spontaneous breast seeking behaviors
  - Blunted early discreet breastfeeding movements
  - Decreased maternal plasma oxytocin levels
  - Intrapartum fever
Dose-Response Relationship Between Fentanyl & Bottle Feeding (Jordan et al, 2005)

- Susceptibility to bottle-feeding was found to be influenced by dose of fentanyl
  - Impact of fentanyl on breastfeeding varied according to determinants of infant feeding
  - Mothers most likely to breastfeed receiving a mean dose of 129ug fentanyl increased the probability of bottle-feeding by 63%
  - Concentration of fentanyl ↑ as infant pH ↓
    - Cesarean delivered infant
    - Infant crying

Nubain (nalbuphine) FDA revised labeling to warn of respiratory depression, apnea, cyanosis, hypotonia
(www.fda.gov/medwatch/SAFETY/2003/apr03.htm)

Vacuum extraction - intracranial hemorrhage can occur in 1/860 infants delivered by vacuum extraction

Drug Exposure in Utero

- Prenatally drug exposed infants
  - Drugs of abuse (hypersensitivity, poor state control)
  - Tobacco (hypertonia, signs of withdrawal or abstinence)
  - Selective serotonin reuptake inhibitors (Paxil, Prozac, Celexa, Zoloft) can cause neurobehavioral alterations
Latch Compromised by Gestational Age

- <37 weeks: poor initiation of sucking, lack of graded jaw movements, weak suck
- 34 to 37 weeks (late preterm): respiratory instability in some breastfeeding positions, reduced stamina, immature state regulation, low tone
- >41 weeks (post term): lethargic, unsustained sucking, depressed suck, birth injury, hypoglycemia

Importance of Non-depressed Neurobehaviors

- Awake state
- Possess enough muscle tone to latch to the breast
- Maintain breast in the mouth with effective seal by the lips
- Generate enough intraoral pressure to form a teat
- Maintain enough tone in the tongue to engage in peristaltic movements
- Coordinate tongue, facial muscles, and muscles of swallowing to achieve a rhythmic suck-swallow-breathe pattern
- Dependent on adequate functioning of cranial nerves

Multiple Interventions Can Have Cumulative Effect on Breastfeeding

- Prenatal SSRIs
- High total amounts of epidural fentanyl
- Crying or c-section that increases fentanyl concentration
- Vacuum extraction
- IV fluids & areolar edema
- Nubain that contributes to hypotonia
- First feeding delayed past 1 hour
- Separation for transport or admission into the nursery
What to do about a sleepy baby?
Sleeping vs Closed Down
- **Sleeping**
  - Relaxed muscle tone
  - Peaceful facial expression
  - Normal skin color
  - Eyelids fluttering in light sleep
- **Closed down**
  - Tense muscle tone
  - Furrowed eyebrows (may reflect internal tension)
  - Skin color flushed or pale
  - Eyes tightly shut

Modulating Infant Arousal Levels
- Infants who appear to be sleeping may be shut down in an attempt to block stimuli that have raised their arousal levels beyond that which they can manage
- Increasing stimulation to a closed down infant exacerbates the problem
- Encourage self regulation by skin-to-skin contact right from birth
- Place an underaroused, overaroused, or shut down infant skin-to-skin as a therapeutic intervention

How to help the sleepy baby
- Skin-to-skin
- Behavioral feeding cues
- Incentives at the breast
- Alternate massage to sustain sucking
- Nipple tug
- Nipple shield
- Hand express colostrum into a spoon and spoon feed baby
- Finger feeding
1st Hour Post Birth

- Infant placed on mother's chest for 1st hour post birth
  - Self-attachment
  - Does not disrupt predictable sequence of pre-feeding events
  - Increases maternal oxytocin levels
  - Less problems with latch
  - Better feeding organization

Why do we supplement?

- Most common time to supplement 7PM to 9AM
- Sleepy baby, breast refusal, latch difficulty, sore nipples
- Fussy, unsettled baby
- Belief of insufficient colostrum
- Cultural bias
- Maternal anxiety
- Overworked staff, lack of teaching time, lack of knowledge

Interventions Prior to Supplementation

- Baby to breast within 60-80 minutes post birth
- Skin to skin
  - State modulation for overaroused and underaroused infant
  - Immediate recognition of subtle feeding cues and readiness to feed
- Positioning recommendations or changes
- Latch and sucking incentives at the breast
  - Hand express colostrum and spoon feed
Swallowing

- Deep jaw excursion
- Audible sound
- Visualization of throat
- Vibration on occiput
- Movement of throat felt by finger
- Small puff of air from the nose
- "ca" sound from the throat
- Placement of small stethoscope adjacent to the side of the larynx
- Pre and post feed weights if necessary
Interventions Prior to Supplementation (con’t)

• Use of alternate massage
  – Observation of swallowing to assure intake at each feeding
• Limit visitors
  – Decreased feeding opportunities
  – Cause the infant to shut down from overstimulation
  – Tire out mother
  – Structure rest periods during the day
    • Napping can add 2 extra hours of sleep

Interruptions
Morrison et al. JOGNN 2006; 35:709-716

• Averaged 54 interruptions over a 12 hour period
• Interruptions were frequent, erratic
• Mothers reported feeling rushed when breastfeeding because they were unsure when the next person would enter the room
• Interruptions took precedence over breastfeeding
• Mothers would cease breastfeeding immediately when interruptions occurred
• Mothers had little time to rest, take care of themselves, or feed the infant

Managing Interruptions

• Inform friends and family of how to help other than visiting the hospital
• Set aside time to nap each afternoon, using a do not disturb sign
• Have phone calls held and visitors and hospital staff check with nurse before entering
• Rest during the day improves ability to breastfeed babies at night
Undesired Outcomes of Supplementation

Infants given non-medically indicated supplements in the first 48 hours of life or offered pacifiers are 2-3 times more likely to have suboptimal breastfeeding behaviors on days 3 and 7

Babies given 2 or more bottles within the first 24 hours are at significant risk for breastfeeding cessation at 7-10 days
  » Hall et al. J Pediatrics 2002; 141:659-664

Dear Nurse,

• If I am a healthy full-term baby, please don’t give me any water bottles, formula, or pacifiers.
  • I eat “on cue” or every 1 - 3 hours, whichever comes first, daytime and nighttime.
  • I may be allowed to sleep one 4 - 5 hour period at night if I have already had 8 feedings that day.
  • My mom allows bunching (frequent feedings) whenever I want.
  • My mom feeds me from both breasts at each feeding for as long as I want. If my latch-on and positioning are correct, my mom won’t become sore.
  • My mom understands that I need to eat 8 - 12 times in 24 hours.
  • Please don’t separate me from my mom for long periods of time unless it is medically necessary. I have been with my mom a long time and want to stay with her.

When do we supplement?

• It’s not 18 hours after birth!
• When infant is unable to latch or transfer milk
• When hypoglycemia is not remedied by feeding at breast
• If mother is unable to breastfeed
What do we supplement

- Fresh mother’s own milk/colostrum
- Refrigerated mother’s own milk
- Frozen and thawed mother’s own milk
- Fortified (if necessary) preterm mother’s own milk
- Pasteurized donor banked human milk
- Hypoallergenic formula
- Elemental infant formula
- Cow’s milk based infant formula
- Soy infant formula
- Water or glucose water

How much do we supplement in first 24 hour timeframe?

- By weight: 3-5ml/kg/feeding (Wight, 2006)
- By physiologic parameters: (Stellwagen, 2007)
  - 5-10mL on day 1
  - 10-20ml on day 2
  - 20-30ml on day 3

How do we supplement?
Artificial Nipples

- Less elastic, minimal elongation, varying flow rates
- May deliver milk using only vacuum or only compression, rather than both
- Can eliminate central grooving of the tongue
- Can extinguish extrusion reflex
- Can interrupt respiratory and ventilation patterns
- Muscles involved with breastfeeding can be:
  - Weakened or immobilized (masseter, obicularis oris)
  - Overactive (chin)
  - Malpositioned (tongue pushed backwards)

Supplementation Protocols

- Kaiser Permanente, Riverside, CA
- Academy of Breastfeeding Medicine
- Model Hospital Policy Recommendations, Inland Empire Breastfeeding Coalition

The importance of exclusive breastfeeding in hospital

- Feeding pattern in hospital is congruent with feeding pattern at 4 weeks
- 50.9% of mothers who exclusively breastfed in hospital were exclusively breastfeeding at 4 weeks compared with 20.3% who partially breastfed in hospital (Petrova et al, 2007)
Joint Commission and Exclusive Breastfeeding

- 11 Core Measures; hospitals must choose 4 out of the 11
- Perinatal Core Measure Set
  - Elective delivery
  - Cesarean section
  - Antenatal steroids
  - Health care–associated bloodstream infections in newborns
  - Exclusive breast milk feeding