Human Milk & Breastfeeding in the NICU

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San Jose, CA

2013 California WIC Association Annual Conference

There is a reason behind everything in nature.
Aristotle (384-322 BC)

Relative Births in 2011

<table>
<thead>
<tr>
<th>“Countries”</th>
<th>2011 Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>3,953,593</td>
</tr>
<tr>
<td>France</td>
<td>827,900</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>807,778</td>
</tr>
<tr>
<td>Germany</td>
<td>662,685</td>
</tr>
<tr>
<td>Italy</td>
<td>546,607</td>
</tr>
<tr>
<td>California</td>
<td>502,118</td>
</tr>
<tr>
<td>Spain</td>
<td>469,178</td>
</tr>
<tr>
<td>Texas</td>
<td>377,449</td>
</tr>
</tbody>
</table>

Objectives

At the conclusion of the presentation the participant will be able to:
- Identify the major goals of nutrition for preterm and sick NICU infants.
- Discuss relative risks and benefits of mothers’ milk (including donor milk) for preterm and ill infants.
- Review evidence-based methods of establishing & maintaining mothers’ milk supply.
- Identify research-based strategies to facilitate successful breastfeeding for preterm mother/infant dyads.
- Discuss NICU policies & procedures which can support or undermine breastfeeding.

Sharp Mary Birch Hospital For Women & Newborns
San Diego, California, USA
Deliveries (2012): 8608
Births (2011): 8833
NICU: Total 84 beds
NICU Admissions: 1377
VLBW Admissions (<1500g): 206
7 Perinatologists
10 Neonatologists (cover 4 hosp)
1.5 Lactation Consultant
1.5 Perinatal Dietician
1 Occupational therapist
1 Physical therapist

No financial conflicts to declare.

Introduction
- Human Milk in the NICU
- Donor Milk in the NICU & Beyond
- Establishing & Maintaining Maternal Milk Supply
- Strategies to Facilitate Breastfeeding in the NICU
- The Breastfeeding-Supportive NICU
- Conclusions/ Q & A
Improved Survival:
Weight at 50% Survival (in USA)

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight (g)</th>
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</thead>
<tbody>
<tr>
<td>1970</td>
<td>1500</td>
</tr>
<tr>
<td>1980</td>
<td>1000</td>
</tr>
<tr>
<td>1990</td>
<td>750</td>
</tr>
<tr>
<td>1995</td>
<td>600</td>
</tr>
<tr>
<td>2000</td>
<td>500</td>
</tr>
<tr>
<td>2005</td>
<td>500</td>
</tr>
<tr>
<td>2010</td>
<td>500</td>
</tr>
</tbody>
</table>


Growth and Neurologic/Developmental Outcome

Postnatal growth failure
Exhaust E, Ziegler MD, Univ of Iowa, VON, NICU

- Poor growth = inadequate nutrition
- Inadequate nutrition = impaired neurocognitive development
- Poor growth is a marker of poor neurocognitive outcome
- Improved growth means improved neurocognitive outcome

GOAL

GOALS OF NUTRITION
- Defining and achieving a standard of short-term growth
- Meeting the unique nutritional needs of prematurity
- Preventing feeding-related morbidities
- Optimizing long term outcome

Should Extrauterine Growth = Intrauterine Growth?

The "Privileged" Intrauterine Environment:
- The FETUS bears no responsibility for:
  - Temperature maintenance
  - Working against gravity
  - Digesting and absorbing food
  - Doing the work of breathing on a regular basis
- Theoretically infants ex-utero need MORE nutrients than in utero
Unique Aspects of Nutrition for the VLBW Infant

- Higher organ: muscle mass ratio
- Higher rate of protein synthesis and turnover
- Greater oxygen consumption during growth
- Higher energy cost due to transepidermal water loss
- Higher rate of fat deposition
- Prone to hyperglycemia
- Higher total body water content

Preventing Feeding-Related Morbidities

- NEC
- Osteoporosis
- Vitamin and mineral deficiencies
- Feeding intolerance
- Prolonged TPN
- Prolonged hospitalization
- Lack of full physical and intellectual potential

Optimizing Long Term Outcome

Nutritional Programming: (The Barker Hypothesis)

Nutrition during critical periods in early life may permanently affect the structure and/or function of organs or tissues.

Alan Lucas, 1990
David Barker 1992

Epigenetics: promote normal intestinal ecosystem for normal gene expression and immune system development.

Opportunities for Improving Nutritional Care & Outcomes

- "Early" TPN
  - Prevent protein deficit
  - Prevent EFA deficiency
- GI priming/HEN/Trophic feeds
  - Prevent GI atrophy effects
  - Faster realization of full enteral feeds
- Fortification/Supplementation
  - Starting earlier
  - Continuing longer
- **HUMAN MILK**: a complex fluid that simultaneously provides nutrients and bioactive components that facilitate the adaptive, functional changes required for the optimal transition from intrauterine to extrauterine life.

Evidence for Human Milk in the NICU

- Human Milk is:
  - Food for nutritional management
  - A therapeutic agent that protects from, and reduces incidence and severity of various morbidities
  - A programming agent for genetic and biologic pathways
  - A mechanism to involve mothers and families in NICU care

Human Milk & Breastfeeding in the NICU

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- Strategies to Facilitate Breastfeeding in the NICU
- The Breastfeeding-Supportive NICU
- Conclusions/ Q & A

Donovan, J Ped 2006; 149(5):S49-S61

Adapted from Paula P. Meier, RN, DNSc
Benefits of Human Milk for the Preterm Infant

- Host defense
- Immunological development
- Gastrointestinal development
- Special nutrition
- Neurodevelopmental outcome
- Physically & psychologically healthier mother
- Decreased healthcare costs
- Decreased societal costs

Some breastmilk is good – MORE is better

Host Defense: (Each element has multiple functions)

- Cellular elements
  - Lymphocytes, PMN & Macrophages
  - Immunoglobulins & other direct anti-infective factors
    - IgA, Secretory IgA
    - Lactoferrin
    - Lysozyme
    - Casein
    - Mucin
  - Anti-inflammatory factors
    - Vitamin A, C, E
    - Catalase
    - Glutathione peroxidase
    - PAF acetylhydrolase
    - Prostaglandins
  - Immunomodulators
    - Prolactin
    - Cytokines
    - Cortisol, thyroxine, insulin & growth factors
    - Interleukins
    - Interferon
    - TNF & TGF
- Other bioactive factors
  - Oligosaccharides
  - FFA
  - Nucleotides
  - Glutamine, Taurine
  - EGF

Gut Colonization: Less Pathogenic Flora
The Original "Probiotic"

Human Milk
BIFIDOBACTERIA

Artificial Milks
Clostridia
Enterococcus
Enterobacter
Bacteroides

The Original "Prebiotic":
> 150 different oligosaccharides not found in artificial milks

The Gut & Inflammatory Processes

- Gut microbiota
  - Commercial bacteria – anti-inflammatory
  - Pathogenic bacteria – pro-inflammatory
- Bacteria and their toxins stimulate inflammatory processes
  - Local: NEC, feeding intolerance
  - Systemic (SIRS): lung, brain
- Systemic Inflammatory Response Syndrome (SIRS)
  - GI tract is the earliest interface between infant and environment
  - Early bacterial colonization of GI tract may “program” long-term responses and development
- Compensatory anti-inflammatory response syndrome (CARS)
  - Primarily mediated by interleukin-10 (IL-10) & transforming growth factor-β (TGF-β)
  - Immature in preterm and all newborns

Gut Colonization: Less Pathogenic Flora
The Original “Probiotic”

Enteral Feedings in First 14 Days of Life

<table>
<thead>
<tr>
<th></th>
<th>Low HM (&lt;50%) N=46</th>
<th>High HM (&gt;50%) N=156</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necrotizing enterocolitis</td>
<td>5 (10.9%)</td>
<td>5 (3.2%) *</td>
</tr>
<tr>
<td>Age at onset (d)</td>
<td>21.8 ± 6.7</td>
<td>24.2 ± 5.6</td>
</tr>
<tr>
<td>Enteral feeding volume prior to NEC (mL/kg/d)</td>
<td>46.5 ± 14.8</td>
<td>32.3 ± 4.1</td>
</tr>
<tr>
<td>Surgical NEC</td>
<td>1 (2.1%)</td>
<td>2 (1.3%)</td>
</tr>
<tr>
<td>Death</td>
<td>1 (2.1%)</td>
<td>2 (1.3%)</td>
</tr>
<tr>
<td>Suspected cases</td>
<td>6 (13%)</td>
<td>22 (14.1%)</td>
</tr>
<tr>
<td>Birth Weight (g)</td>
<td>1184 ± 30</td>
<td>1113 ± 18*</td>
</tr>
<tr>
<td>Gestational age (weeks)</td>
<td>29.2 ± 0.3</td>
<td>28.1 ± 0.2*</td>
</tr>
<tr>
<td>RDS</td>
<td>30 (65.2%)</td>
<td>136 (87.1%)*</td>
</tr>
</tbody>
</table>

* P < 0.05

**Human Milk and Late-Onset Sepsis (LOS) in Infants 401-1000g: A Secondary Analysis**


Data from NICHD Glutamine Trial (15 centers, 1326 infants): Late-Onset Sepsis (LOS) in first 35 days of life

<table>
<thead>
<tr>
<th>Component</th>
<th>Preterm Milk</th>
<th>Term Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories (kcal/100 ml)</td>
<td>67.4</td>
<td>60.6</td>
</tr>
<tr>
<td>Protein (gm/100 ml)</td>
<td>2.44</td>
<td>1.87</td>
</tr>
<tr>
<td>Fat (gm/100 ml)</td>
<td>3.81</td>
<td>3.06</td>
</tr>
<tr>
<td>Sodium (mEq/l)</td>
<td>21.8</td>
<td>16.9</td>
</tr>
<tr>
<td>Chloride (mEq/l)</td>
<td>25.3</td>
<td>21.3</td>
</tr>
<tr>
<td>Lactose (gm/100 ml)</td>
<td>6.05</td>
<td>6.52</td>
</tr>
<tr>
<td>Phosphorus (mg/100 ml)</td>
<td>14.2</td>
<td>15.1</td>
</tr>
<tr>
<td>Calcium (mg/100 ml)</td>
<td>24.7</td>
<td>25.4</td>
</tr>
</tbody>
</table>

**Morbidity: Fortified Human Milk (MOM) vs Preterm Formula**


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<tr>
<td>Calcium (mg/100 ml)</td>
<td>24.7</td>
<td>25.4</td>
</tr>
</tbody>
</table>

**Gastrointestinal Development**

**Human Milk:**
- Reduces intestinal permeability faster (1, 6)
- Induces lactase activity (2)
- Multiple factors to stimulate growth, motility and maturation of the intestine (3)
- Human milk empties from the stomach faster than artificial milks (4)
- Less residuals and faster realization of full enteral feedings (5)

5. Wight et al. Breast Medicine..., 2008; pg 45 with refs X4

**Benefits of Human Milk for the Preterm Infant**

- Special Nutrition
  - Different quantity and quality of proteins
  - Lipid profile: Cholesterol, DHA, ARA
  - Carbohydrates designed for human infants
  - Antioxidants
  - Lower Osmolality/Renal solute load
  - Other factors: eg. Erythropoietin, EGF

**Morbidity: Fortified Human Milk (MOM) vs Preterm Formula**


<table>
<thead>
<tr>
<th>Component</th>
<th>FHM</th>
<th>PTF</th>
<th>Diff.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Stay (days)</td>
<td>73</td>
<td>88</td>
<td>15</td>
<td>0.03</td>
</tr>
<tr>
<td>Duration of TPN (days)</td>
<td>25</td>
<td>35</td>
<td>10</td>
<td>0.01</td>
</tr>
</tbody>
</table>

FHM = fortified human milk
PTF = preterm formula

**Benefits of Human Milk for the Preterm Infant**

- Neurodevelopmental Outcome
  - Higher IQ scores (especially for males)
  - Improved visual development
  - Less, and less severe ROP
  - Development of taste and smell

Mean Bayley Scores by Human Milk Feeds/kg/day - Percentiles

<table>
<thead>
<tr>
<th>Score</th>
<th>N</th>
<th>≤ 20%</th>
<th>20-40%</th>
<th>40-60%</th>
<th>60-80%</th>
<th>&gt;80%</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDI</td>
<td>535</td>
<td>78.8</td>
<td>84.2</td>
<td>87.6</td>
<td>88.8</td>
<td>90.2</td>
<td>.0001</td>
</tr>
<tr>
<td>PDI</td>
<td>511</td>
<td>83.2</td>
<td>87.2</td>
<td>92.0</td>
<td>93.2</td>
<td>95.8</td>
<td>.0076</td>
</tr>
</tbody>
</table>

Breastmilk and Subsequent Intellectual Performance in Premature Infants at 8 yr

**Factor Affecting IQ**  **IQ Points**
- Breastmilk: + 8.3
- Social Class: - 3.5/class
- Mother’s Education: + 2.0/group
- Female Gender: + 4.2
- Mechanical Ventilation: - 2.6/week


Benefits of Human Milk for the Preterm Infant

- Physically Healthier Mother
  - (Weight loss ↑)
  - Breast cancer/ovarian cancer ↓
  - Osteoporosis ↓
  - Child spacing via Lactational Amenorrhea
- Psychologically Healthier Mother
  - Alternate focus
  - Sense of control & Claim on infant
  - Guilt issue

Benefits of Human Milk for the Preterm Infant & Society

- Decreased Healthcare Costs
  - Less acute illness
  - Less chronic illness
- Decreased Societal Costs
  - Loss of time and income from work
  - Less waste
  - Less use of resources

The Breast Supplies What the Baby Lacks

**Lactose**  **Nutrients**
- Energy requirements
- Immature pancreatic function

**Lipase**  **Digestive Enzymes**
- Immature barrier function
- Mucosal differentiation
- Immunomodulation
- Support normal anti-inflammatory bacteria

**sIgA**  **Protective Factors**

**EGF**  **Trophic Factors**

**Lactobacillus**  **Probiotics**

**Oligosaccharides**  **Prebiotics**

Possible Concerns re Human Milk for Preterm Infants

- **Infectious**
  - Bacterial contamination during expression, storage and feeding
  - Viral transmission: CMV, HIV
- **Nutritional**
  - Insufficient Pro, Ca, Phos, Na, vitamins
  - Variability of composition
  - Loss of nutrients during storage/feeding
Collection of milk from the birth mother of a preterm infant does not require processing if fed to her infant, but proper collection and storage procedures should be followed. Milk from other than biologic mother should be treated according to HMBANA guidelines. Routine culture of milk that a birth mother provides to her own infant is not warranted. CMV shed intermittently in human milk. No sequellae noted. Risk of CMV v. lack of human milk.

Preterm vs Term Milk over Time

<table>
<thead>
<tr>
<th>Milk Component</th>
<th>Preterm Mother’s Milk</th>
<th>Term</th>
<th>Mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Pro, g/dL</td>
<td>30</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>IgA, mg/g protein</td>
<td>109</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>NPN, % total N</td>
<td>15</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Na, mmol/L</td>
<td>22.2</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>Ca, mmol/L</td>
<td>6.8</td>
<td>6.5</td>
<td></td>
</tr>
</tbody>
</table>

Higher Protein Intake Improves Growth in VLBW Infants Fed Fortified Breastmilk
Carlson Abstr 1638, SPR 5/1/00

<table>
<thead>
<tr>
<th>Fortified HM</th>
<th>Cal intake (kcal/kg/d)</th>
<th>Wt gain (g/d)</th>
<th>Wt gain (g/kg/d)</th>
<th>Wt gain (g/100 kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactose</td>
<td>120.7</td>
<td>22.7</td>
<td>14.9</td>
<td>13.0</td>
</tr>
<tr>
<td>Protein</td>
<td>113.7</td>
<td>28.7</td>
<td>17.3</td>
<td>16.9</td>
</tr>
<tr>
<td>Lactose</td>
<td>117.0</td>
<td>28.5</td>
<td>18.4</td>
<td>16.4</td>
</tr>
<tr>
<td>Protein</td>
<td>114.4</td>
<td>29.4</td>
<td>19.1</td>
<td>16.9</td>
</tr>
</tbody>
</table>

66 Infants <1250 gm. Suppl started when enteral feeds reached 50 ml/kg/d

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>PreT HM</th>
<th>SNC 1:1</th>
<th>EHMF</th>
<th>SHMF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>71</td>
<td>76</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>3.6</td>
<td>4.0</td>
<td>3.6*</td>
<td>4.0</td>
</tr>
<tr>
<td>CHO (g)</td>
<td>7.0</td>
<td>7.8</td>
<td>9.7</td>
<td>8.8</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>1.8</td>
<td>2.0</td>
<td>2.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>22</td>
<td>97</td>
<td>112</td>
<td>139</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>14</td>
<td>50</td>
<td>59</td>
<td>81</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>2.5</td>
<td>6.3</td>
<td>3.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Sodium (mEq)</td>
<td>0.7</td>
<td>1.1</td>
<td>1.0</td>
<td>1.35</td>
</tr>
<tr>
<td>Zinc (µg)</td>
<td>320</td>
<td>760</td>
<td>1030</td>
<td>1320</td>
</tr>
<tr>
<td>Copper (µg)</td>
<td>60</td>
<td>1045</td>
<td>122</td>
<td>230</td>
</tr>
<tr>
<td>Vitamins</td>
<td>Yes</td>
<td>Multi</td>
<td>Multi</td>
<td>Multi</td>
</tr>
</tbody>
</table>
Fortification of Human Milk

- **Primary reasons:**
  - Increase protein content
  - Increase mineral and vitamin content
  - (Increase caloric density)
- **How to increase protein**
  - Fortifiers have too little protein for mature milk
  - Adjustable fortification with Beneprotein (keep BUN 9-14)

Possible Drawbacks of Fortification

- Partial compromise of immune function of fresh or frozen human milk
  - Chan GM. J Perinatol 2003; 23:620-623
- Delayed emptying from the stomach
- Harder stools
  - Lucas, Am J Clin Nutr 1996; 64:142
- **Hyperosmolality**
  - DeCurtis et al. Arch Dis Child Fetal Neonatal Ed 1999 Sep; 81(2):F141-143
- Excessive growth

Hindmilk Fortification

- Valentine, JPGN 1994; 18(4):474

<table>
<thead>
<tr>
<th>(unit/L)</th>
<th>Foremilk</th>
<th>Hindmilk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>629</td>
<td>825</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>28.6</td>
<td>47.8</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>13.1</td>
<td>13.1</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>272</td>
<td>273</td>
</tr>
<tr>
<td>Sodium (mEq)</td>
<td>3.3</td>
<td>3.1</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>2.9</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Early Diet Influences Long-term Health and Disease

Adverse effects of growth acceleration in humans include:

- Obesity
- Elevated blood pressure
- Insulin resistance and diabetes
- IGF-1 concentrations
- Cardiovascular mortality

Clinical Indications (I deal)

- For human milk:
  - Being born
- For pasteurized donor human milk
  - Being born
- No mother’s own milk (MOM) available

Human Milk & Breastfeeding in the NICU

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If Mother’s Milk is not Available: PDHM = Pasteurized Donor Human Milk

WHO/UNICEF Joint Statement:

“Where it is not possible for the biologic mother to breastfeed, the first alternative, if available, should be the use of human milk from other sources. Human milk banks should be made available in appropriate situations.”

WHO / UNICEF 1980

Supporting Donor Human Milk

• “If mother’s own milk is unavailable despite significant lactation support, pasteurized donor human milk should be used.”
  
  American Academy of Pediatrics, Section on Breastfeeding. Breastfeeding and the Use of Human Milk. Pediatrics 2012; 129(3); e827-e841

• Actions for Health Care: 12. Identify and address obstacles to greater availability of safe banked donor milk for fragile infants.
  

• “Growing evidence supports the role of donated human milk in assisting infants with special needs, such as infants in newborn intensive care units who are unable to receive their own mothers’ milk, to achieve the best possible health outcome……” Surgeon General’s Call to Action, 2011

• “In situations where a mother’s own milk is not available to meet her baby’s needs, pasteurized donor human milk is the ideal replacement. The use of donor human milk has saved infant lives and positively impacted the health outcomes of countless premature and sick infants through therapy and prevention of disease.” USBC Statement on the Safe Use of Donor Human Milk, 2008

VON iNICQ Potentially Better Practices (PBP) 2009

1. Monitor nutritional intake & outcomes
2. Begin TPN within first 2 hours of life
3. Promote human milk as the preferred nutritional substrate
4. Begin trophic feeds within the first 3 days of life
5. Manage residuals appropriately
6. Fortify human milk adequately
7. Facilitate post-discharge feeding of breastmilk, including fortification

General Considerations (2006 iNICQ):

• Breastmilk is the feeding of choice, including donor milk when mom’s own is not available.
• ELBW infants (<1000g) deserve our special attention as they have lesser reserves and tend to receive less nutrition than larger infants.
• Protein is almost always the limiting nutrient.

Use of Donor Human Milk for Medically Fragile Infants

• “When communities do not value breastfeeding it is inherently difficult to value donor milk banking.”
  

• “Collective experience confirms that any method of feeding these (preterm) babies other than using breast milk as the base ingredient is risky until shown otherwise. The burden of proof continues to rest on those who would suggest otherwise.”
  
  James Akre, BMJ (2 Dec 2006), Geneva, Switzerland
Enteral feeding for the VLBW infants: reducing the risk of NEC
Chauhan, Henderson, McGuire, Arch Dis Child Fetal Neonatal Ed 2008; 93:F162-F166

Concerns re Donor Human Milk for Preterm Infants
- Nutritional
  - Insufficient Pro, Ca, Phos, Na., Vitamins
  - Variability of composition - donors usually term+
  - Alteration of nutrients with processing
  - Loss of nutrients during storage/feeding
- Infectious
  - Bacterial contamination during storage and feeding
  - Bacterial contamination with processing
  - (Viral transmission: CMV, HIV)

Effects of Heat Treatment on Human Milk Components (% Retention)

<table>
<thead>
<tr>
<th>Component</th>
<th>56°C 30min</th>
<th>62.5°C 30min</th>
<th>72°C 15sec</th>
<th>Preterm formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. aureus</td>
<td>100% killed</td>
<td>100% killed</td>
<td>100% killed</td>
<td>?</td>
</tr>
<tr>
<td>E. coli</td>
<td>100% killed</td>
<td>100% killed</td>
<td>100% killed</td>
<td>?</td>
</tr>
<tr>
<td>S. agalactiae</td>
<td>100% killed</td>
<td>100% killed</td>
<td>100% killed</td>
<td>?</td>
</tr>
<tr>
<td>CMV</td>
<td>No infectivity</td>
<td>No infectivity</td>
<td>No infectivity</td>
<td>0</td>
</tr>
<tr>
<td>Lactoferrin</td>
<td>72%</td>
<td>22%</td>
<td>No change</td>
<td>0</td>
</tr>
<tr>
<td>IgA</td>
<td>84%</td>
<td>51%</td>
<td>No change</td>
<td>0</td>
</tr>
<tr>
<td>Lysozyme</td>
<td>123%</td>
<td>100%</td>
<td>293%</td>
<td>0</td>
</tr>
<tr>
<td>Phosphatase</td>
<td>25%</td>
<td>1.4%</td>
<td>No change</td>
<td>Adequate</td>
</tr>
<tr>
<td>Vits B, B6, B12, Folic acid, C</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>Adequate</td>
</tr>
</tbody>
</table>


Infection Rates in High Risk Infants
Narayanan et al. Lancet 1984;II:1111-1113

- 243 infants 23-29 wks (BWT 964± 259g)
- 3 groups:
  - Fortified mother's milk only (MM) 70
  - FMM + Donor Milk (DM) 81
  - FMM + Preterm formula (PF) 92
- B/O poor weight gain, 21% infants in MM+DM received PF
- Hospital stay similar MM+DM vs MM+PF, but 1 week less in MM
- LOS and NEC no different MM+DM vs MM+PF, but significantly less with MM
- Dose-response relationship with MM
- Less CLD with MM and DM
- Less ROP with MM
- Long-term benefits not investigated (eg slower growth vs. leaner, IQ, BP)

Pooled Pasteurized Breast Milk and Untreated Own Mother's Milk in the Feeding of VLBW Babies: A RCT
Stein et al. JPGN 1986; 5:242

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Formula</th>
<th>DBM</th>
<th>Relative risk (G5% CB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloss (1983)</td>
<td>3/25</td>
<td>1/41</td>
<td></td>
</tr>
<tr>
<td>Lucas (1984a)</td>
<td>6/70</td>
<td>1/83</td>
<td></td>
</tr>
<tr>
<td>Lucas (1984b)</td>
<td>5/172</td>
<td>3/170</td>
<td></td>
</tr>
<tr>
<td>Schanler (2005)</td>
<td>10/SS</td>
<td>5/78</td>
<td></td>
</tr>
<tr>
<td>Tyson (1983)</td>
<td>1/44</td>
<td>0/27</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2 Meta-analysis of trials comparing feeding with formula versus donor breast milk—effect on risk of necrotising enterocolitis (adapted from Langley et al). DBM, donor breast milk.

Pooled Pasteurized Breast Milk and Preterm Formula as Substitutes for Mothers' Own Milk in the Feeding of Extremely Premature Infants
Schanler, Lau, Hurst, Smith, Peds Aug 2005; 116(2):400-406

- 243 infants 23-29 wks (BWT 964± 259g)
- 3 groups:
  - Fortified mother's milk only (MM) 70
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- Less CLD with MM and DM
- Less ROP with MM
- Long-term benefits not investigated (eg slower growth vs. leaner, IQ, BP)
Randomized Trial of Donor Human Milk vs. Preterm Formula as Substitutes for Mothers' Own Milk in the Feeding of Extremely Premature Infants

Nutrition support protocol
- Trophic feeds (~20 mL/kg/day) in the first week of life and continued for 3-5 days before advancement
- Human milk fortifier added at 100 mL/kg enteral feeds
- Advanced to 20 mL/kg/d until 160 mL/kg/d
- After "full feedings" achieved, increased to 160-200 mL/kg/d to ensure average weekly weight gain of ≥ 15 g/kg/d

Data Analysis
- Only cases of LOS & NEC after attainment of ≥ 50 mL/kg milk intake achieved were counted
- 7 never fed, but remained in assigned study group
- 17 infants (21%), all in DM group were switched to PF b/o poor weight gain

Cumulative amounts of mothers' own milk received
- MM Group: 5.6 ± 3.1 L/kg
- DM Group: 2.4 ± 2.7 L/kg
- PF Group: 2.8 ± 2.9 L/kg

LOS, NEC and LOS + NEC correlated negatively with amount of MM received.
- "Need greater dose of MM to protect"

Only 27% of mothers had enough milk to meet all their infant's needs.

Overall incidence of NEC 50% less than prior study
- Sample size calculations based upon higher incidence
- Sample size too small to detect difference
- Incidence < half of predicted
- Both mothers' own and donor milk groups had a significant reduction in CLD
- Giving ALL groups ~ 50% of enteral intake as mothers' own milk may not be the best way to see an effect of donor milk
- Kangaroo care is highly correlated with mothers ability to produce milk
- And NOT correlated with any increase in infection
- Rapid catch-up growth may not be the ideal for VLBW infants
- Long term outcomes not studied

Conclusions:
- Mother's own milk is best and should be supported in the NICU
- Less NEC, Late-onset sepsis, length of stay, ROP
- Through no fault of the authors, the sample size was inadequate to detect a difference in NEC or LOS
- Incidence < half of predicted
- Both mothers' own and donor milk groups had a significant reduction in CLD
- Giving ALL groups ~ 50% of enteral intake as mothers' own milk may not be the best way to see an effect of donor milk
- Kangaroo care is highly correlated with mothers ability to produce milk
- And NOT correlated with any increase in infection
- Rapid catch-up growth may not be the ideal for VLBW infants
- Long term outcomes not studied

Prolacta PDHM/ HM Fortifier Study
Sullivan et al. J Peds 2010

Reduction of 50% in NEC
(NNT to prevent 1 = 10)

Reduction of 90% in surgical NEC or death
(NNT to prevent 1 = 8)

Reduction due to:
- Not using non-human protein?
- 70-82% of all intake was mothers' own milk?

Fig. 3. NEC and NEC surgery in study infants. There were significant differences in NEC among the 3 groups (P < .05). *P = .04 vs BOV, **P = .08 vs BOV, ***P = .05 vs BOV. There were significant differences in NEC requiring surgical intervention among the 3 groups (P < .05). *P = .03 vs BOV, **P = .001 vs BOV; *P refers to number of infants.

Obtaining PDHM for NICU Patients
- Pauline.................................

Uses of Donor Human Milk in NICU (USA, 2013)

Categories:
- Trophic feeds before MOM available
- Supplement to QNS MOM
- When MOM not pumping (medical or social reasons)
- Adoption or surrogacy (when surrogate refuses to pump)

Specific indications
- VLBW (<1500 gm) and no MOM (until reach full fortified feeds or > 1500 gm)
- Feeding intolerance
- Post GI surgery
- Short Gut
- Post-NEC
- Other

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- Conclusions/ Q & A
Current Problems - Clinical

- Not enough available colostrum to start G1 priming
- Difficulty establishing a mother’s full milk supply
- Difficulty maintaining a mother’s milk supply
- Transitioning to breastfeeding while maintaining a full milk supply

- Are mothers of preterm infants at a physiologic disadvantage re establishing a full milk supply? (YES)
  - Lack of full term breast development
  - Delayed Lactogenesis II (“milk coming in”)
  - Inadequate emptying with pumping
  - Inadequate milk ejection reflex (“let-down”) with stress, fatigue

- Establishing & Maintaining Milk Supply
  - Week 1 milk output is strong predictor of milk output at 6 weeks (Hill PD et al, J Hum Lact 2005)

Risk Factors for Insufficient Lactation After Preterm Delivery

- Predetermined
  - Demographics
    - Age, G-P, marital status, SES, educ, etc.
  - Perinatal History
    - IVF, gest age at delivery, multiples, route of delivery, etc.
  - Other
    - Previous breastfeeding experience, problems
    - BMI

- Modifiable
  - Anticipatory Guidance
  - Availability of pump
  - Availability of LC support
  - Pumping initiation time
  - Frequency/Interval of Pumping
  - Use of Massage/Hand expression
  - Keeping score
  - Using early milk
  - Skin-to-skin care
  - Maternal discharge planning

Establishing and Maintaining a Mother’s Milk Supply

- Anticipatory guidance
- Pumping initiation & frequency
- Pumping equipment
- Keeping score
- Hand expression
- "Power pumping" – massage
- Skin-to-skin
- Maintaining milk volume
- Galactogogues

Volume Goals for Pumping Mothers

<table>
<thead>
<tr>
<th>Day 1-2 post partum:</th>
<th>By day 5-7 post partum:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drops - 20 mls</td>
<td>75 mls / pumping session</td>
</tr>
<tr>
<td>8 sessions / 24 hours</td>
<td>8 sessions / 24 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 3 post partum:</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 - 45 mls</td>
</tr>
<tr>
<td>8 sessions / 24 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 4-5 post partum:</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 - 60 mls</td>
</tr>
<tr>
<td>8 sessions / 24 hours</td>
</tr>
</tbody>
</table>

**FIGURE 1 Relationship between volume of milk expressed per day and gestational age at delivery**

- Smaller volumes when pumped < 6 times/day
- Lower lactose concentration with decreasing gestation
- Significant increases in volume:
  - Day 3 for 29-33 wk mothers
  - Day 4 for < 29 wk mothers
- Steroid treatment 3-7 days before birth resulted in lower volumes than treated < 3d or > 7d in 29-33 wk mothers
Establishing and Maintaining a Mother’s Milk Supply

- **Anticipatory Guidance**
  - Prenatal assessment and counseling (Neo & LC)
  - Breast pump rental and supplies
  - Continued monitoring and support
  - Recommended milk volumes by 7-10 days pp
    - Abundant: >600 mL/day
    - Marginal: 350-600 mL/day
    - Low: <350 mL/day

- **Breast Pump Management**
  - Pump early: within first 1-12 hours
  - Pump often: 8-10 times/24 hours
  - Round the clock to start, and when notice decrease in supply (never longer than 5-6 hours between pumpings)
  - Mimic normal term newborn feeding pattern
  - Relaxation/visualization (baby pictures or smell clothes)
  - Pump after baby breastfeeds if baby to be supplemented with formula OR breastmilk

Pumping Equipment:
- Automatic cycling, “double” pump:
  - Increased prolactin levels
  - Increased efficiency

Teach hand expression and provide containers

1.2 mL

http://www.simport.com/products/77/T310

Combining hand techniques with electric pumping increases milk production in mothers of preterm infants.

Rush Mothers’ Milk Club

Keeping Score

RCT of Oropharyngeal Colostrum to ELBW Infants in the First Days of Life
Rodriquez et al. Abstract A 76. ISRHML, Oct 8-11, 2010, Lima, Peru

- ELBW (<1000g) who were NPO
- Randomized to OP administration q 2 hrs X 48 hrs:
  - 0.2 mL mother’s colostrum (N=9)
  - 0.2 mL sterile water (N=7)
- Results:
  - No adverse effects
  - Increased urine lactoferrin and IgA 6 hrs after end of Tx
  - Colostrum group reached full enteral feeds 10 days earlier (14.3±5.7 v. 24.2±8.7 days, p=0.032)
Kangaroo Care is Associated with Increased Milk Output

- Fewtrell MS et al. Pediatrics 2001; 107:1-10

"Skin-to-skin care was correlated positively (r=0.47, p<0.001) with intake of mother's milk."

Handling Human Milk

- Human Milk Banking Association of North America
  www.hmbana.org

  "Best Practice for Expressing, Storing and Handling of Human Milk in Hospitals, Homes and Child Care Settings" at $75.00/copy

Use of Galactagogues: Basic Caveats

- Before using any substance to try to increase milk supply:
  - Evaluate current milk supply and effectiveness of milk transfer or expression.
  - Inform mothers of data (or lack of data) re efficacy, safety and timing of substance
  - Screen mother for any contraindications and list possible side effects.
  - Physician who prescribes med is obligated to follow, or ensure appropriate follow-up, of both mother & infant re milk supply and side effects
  - Have some short-term data, but no long-term evaluations.

Pharmacologic Galactagogues

- Metoclopramide (Reglan)
- Domperidone (Motilium)
- Oxytocin (Syntocinon)
- Other drugs/hormones
  - Sulpiride (Egonyl)
  - Chlorpromazine (Thorazine)
  - Human growth hormone
  - Thyrotropin-releasing hormone
- Herbal/Homeopathic

Lactagogues (Galactagogues)

- A herb that stimulates the flow of breastmilk.
- Mechanisms are poorly defined
- Herbs commonly used as lactagogues:
  - Fenugreek seed (Trigonella foenum-graecum)
  - Fennel seed (Foeniculum vulgare)
  - Goat’s Rue (Galega officinalis)
  - Milk thistle (Silybum marianum)

Adapted from Tieraona Low Dog MD

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**Mother – Baby Separation**

Highest risk factor for breastfeeding failure of any breastfeeding challenge!

---

**Skin to Skin – Kangaroo Care**

- Stimulates hormone release of prolactin and oxytocin that promote **parental attachment /closeness**
- Increases **parent’s confidence** in infant care / feeding
- Stabilizes **viral signs**
- Supports **thermoregulation** of infant - breasts are warmer than core temp
- Infant’s skin is colonized with mother’s normal flora providing **protection from infection**
- Enhances milk production
- Lengthens time nursing after discharge.
- Promotes **enteromammary pathway**
- Increases baby’s production of **growth hormone**
- Can **shorten infant’s stay**
Effect of early skin-to-skin contact after delivery on duration of breastfeeding: a prospective cohort study

Influence of duration of skin-to-skin contact on duration of breastfeeding

<table>
<thead>
<tr>
<th>Skin-to-skin contact</th>
<th>N</th>
<th>Exclusive breastfeeding (mo)</th>
<th>Overall breastfeeding (mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of Contact</td>
<td>208</td>
<td>2.47 ± 1.98</td>
<td>6.97 ± 7.40</td>
</tr>
<tr>
<td>Any contact</td>
<td>921</td>
<td>2.86 ± 2.21</td>
<td>8.40 ± 8.75</td>
</tr>
<tr>
<td>Short</td>
<td>532</td>
<td>2.79 ± 2.21</td>
<td>8.33 ± 8.87</td>
</tr>
<tr>
<td>1-5 min</td>
<td>532</td>
<td>2.70 ± 2.20</td>
<td>9.01 ± 9.26</td>
</tr>
<tr>
<td>5-9 min</td>
<td>200</td>
<td>2.75 ± 2.05</td>
<td>7.95 ± 8.32</td>
</tr>
<tr>
<td>10-15 min</td>
<td>113</td>
<td>2.70 ± 2.20</td>
<td>9.01 ± 9.26</td>
</tr>
<tr>
<td>Extensive</td>
<td>23</td>
<td>3.82 ± 2.46</td>
<td>9.07 ± 8.23</td>
</tr>
<tr>
<td>20-29 min</td>
<td>53</td>
<td>4.02 ± 2.72</td>
<td>10.07 ± 8.85</td>
</tr>
<tr>
<td>≥ 30 min</td>
<td>53</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data are means ± SD

Getting Started for the Premie

“Dry Breastfeeding” or “tasting”
- Infant can practice sucking before he/she ready to fully coordinate suck, swallow, and breathing
- Mother pumps immediately prior to putting infant to breast
- Opportunity to practice positioning
- This is the next step toward true breastfeeding after initiating Kangaroo Care
- Infant licks and nuzzles at the breast = successful “breastfeeding” for now
- Infant can be fed via the indwelling feeding tube while at the breast or in Kangaroo Care

“True Breastfeeding” = nutritive breastfeeding

Infant readiness:
- **NO weight or gestational age criteria**
  - Can have accelerated neurologic maturity
  - Breastfeeding less stressful than bottle
  - When sucking well on finger, fist, pacifier or “dry breast” and handling own secretions
  - When medically stable
- Mom may want to pump half the usual pumping time immediately prior to breastfeeding to reduce strong flow to baby
- Assist mom and baby with positioning for comfort and optimum chance for effective latch
- Encourage mother to express small amount of milk to entice baby to latch

“Dry” Breastfeeding = Empty Breast Nursing = Non-nutritive Nursing

- Pump, then breastfeed + gavage feed measured amount
- Empty-breast nursing
  - Promotes milk production
  - Provides sucking experience without worrying about caloric intake or suck/swallow coordination
  - Extended times of exclusive and total breastfeeding post discharge

<table>
<thead>
<tr>
<th>Intervention Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD) duration of exclusive BF (mo)</td>
<td>3.7 (±1.3) n=13</td>
</tr>
<tr>
<td>Mean (SD) duration of total lactation (mo)</td>
<td>5.1 (±2.2) n=16</td>
</tr>
</tbody>
</table>

Feeding Techniques

- Can go from gavage to breast without bottles
- If Mom not available, consider alternative feeding techniques
- Can use supplemental nursing system as a transition
- Test-weighing
- Cue-based feedings (Nyqvist/Meier)
- Nipple shields

Enteromammary Immune System

Lawrence & Lawrence, 5th ed, 1999, pg 166

- Get Started for the Premie
- “Dry Breastfeeding” or “tasting”
- “True Breastfeeding” = nutritive breastfeeding
- “Dry” Breastfeeding = Empty Breast Nursing = Non-nutritive Nursing
- Feeding Techniques
The development of preterm infants’ breastfeeding behavior

- “Opportunities for preterm infants to breastfeed should be made based on cardiorespiratory stability rather than current maturity, age, or weight.”
- “Infants born at 28 weeks were able to efficiently root, grasp, and latch onto the breast, with nutritive suckling achieved from 30.6 weeks, and full breastfeeding for most of these infants at 36.0 weeks.”

Assessment of Infant Feeding: The Validity of Measuring Milk Intake

- Review of 32 studies
  - Direct observation
  - Test weighing
  - Doubly-labeled water
- Correlations with actual intake were the highest with test weighing and doubly-labeled water
- “Regardless of whether the clinical assessments were performed by nurses, mothers, or lactation educators, the differences between the clinical estimates and the test weight estimates of milk intake were large and random.”

Nipple Shields and Milk Transfer
Meier PP. J Hum Lact 2000; 16(2):106-114

- Retrospective analysis of 34 preterm infants
  - Gestational age: 25-37 wks
  - Birth weights: 770-2820 gm
  - Wt at 1st breastfeeding: 1080-2820
- Indications for nipple shield use:
  - Infant not achieving/maintaining effective attachment to breast (62%)
  - Infant falling asleep at breast quickly (29%)
  - Other (9%)
- Mean milk transfer significantly greater for feedings with nipple shield in place
  - 18.4 ml vs. 3.9 ml (p=.0001)
- Mean duration of nipple shield use 32.5 days
- Mean duration of breastfeeding 169.4 days
- No significant association between duration of nipple shield use and duration of breastfeeding.

Current Alternative Feeding Techniques

- Most common techniques:
  - Developing countries: CUP
  - Developed countries: BOTTLE
- Other techniques:
  - Finger-feeding
  - Dropper, spoon
  - Syringe
  - SNS

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Barriers to Breastfeeding in the NICU

- Environment
  - Noisy, bright, intimidating
  - Tubes and wires attached to infant
  - Can’t be handled, held
  - Lack of privacy
  - Distance from mother
- Medication
  - Infant sedation: poor suck/swallow
  - Other infant medications
  - Maternal medications: most not a problem in breastmilk
Barriers to Breastfeeding in the NICU

**Infant-specific Factors**
- Appearance of premature or ill infant
- Lack of response to mother/parents
- Malformations: eg CL/CP
- Specific illnesses: eg NEC, PDA, Neuro damage
- Delayed breastfeeding
- Complex malabsorption syndromes
- Long term fluid restriction essential

**Family**
- Maternal Illness
- Anxiety over sick/premature infant
- Misinformation re breastfeeding in general/ability to breastfeed an infant in the NICU
- Availability and cost of breast pump rental, lactation help
- Influence of FOB and other family and friends

Barriers to Breastfeeding in the NICU

**Physicians & Staff**
- Inconsistent advice
- Lack of knowledge/ misinformation
- Poor attitude
- Lack of time
- Hospital “policies”

Challenges to Breastfeeding in the NICU

- Can mother “bear the extra burden” of providing her milk
- Mother be “allowed” to pump for non-viable infant
- Formula used as no-one realized breastmilk was in the freezer
- “Trial” of formula before human milk
- Infant bottle-fed moments before mother arrives to breastfeed

Lactation Support Services

**Patient education**
- Prenatal
- Inpatient outpatient/ inpatient

**Consultation**
- Prenatal outpatient, inpatient
- Postnatal outpatient, inpatient
- Home health

**Durable Medical Equipment**
- Breast pump rental
- Breast pump purchase

**Supplies**
- Pump kits
- Mother supplies (pads, shields, shells)
- Infant supplies (SNS, feeders)
- Donor milk
- Pasteurized donor human milk (fresh donor milk)

**Support**
- Support groups
- Telephone hotlines/warmlines
- Peer counselors

Other Services

- Coordination of Care
- Education
  - Lactation consultants
  - Healthcare providers (MD/RN/RD/etc)
- Public
- Staff Support
- Advocacy
- Program Evaluation/ CQI
Physicians/NNPs/PAs
Nursing admin/education support staff
Staff RN, LVN
Lactation educators, consultants
Occupational therapy/physical therapy
Social workers
Aids, housekeepers, ward secretaries, other ancillary personnel
Beg, borrow or steal a perinatally-trained RD!
Mother, father, family, friends, childcare help

Lactation Education:
Train EVERYONE!

Lactation Counseling for Mothers of VLBW Infants: Effect on Maternal Anxiety and Infant Intake of Human Milk

Sample:
All VLBW (700-1500g) infants' mothers
Approached within 3 days of delivery
Intention to breastfeed group (IBG, N=115)
Intention to formula feed group (IFG, N=61)
Counseling on:
Infant health benefits
Collection & storage of breast milk
Breast pump procurement
Outcome measures:
State-Trait Anxiety Inventory
Parental Stressor Scale: NICU
Exit interview questionnaire
Infant breastmilk intake (% of total enteral intake)

Results:
Initiated milk expression
- IBG: 100%
- IFG: 84%
Lactation counseling did NOT increase anxiety regardless of breastfeeding assignment
Maternal anxiety trait scores were inversely correlated with infant breastmilk intake, suggesting that more anxious mothers were more likely to express milk if infant smaller, more immature
Breastmilk intake (mL/kg/day) was greater for infants of IBG v. IFG group
Most common reasons for stopping milk expression:
- Low milk supply
- Returning to work or school
- Inability to pump as needed

Effect of NICU-based Peer Counselors on Breastfeeding Duration Among Premature Infants

Premature (26-37 week)
38 mother/infant pairs (control)
38 mother/infant pairs (intervention)
Intervention
Breastfeeding peer support within 72 hrs of birth, then weekly for 6 wks
- Showed mothers the NICU & Kangaroo care video
- Reviewed benefits of breastfeeding
- Helped with set-up and use of breast pump
- Continued support at each meeting
- Feeding status at 2, 4, 8, 12 weeks
- All breastmilk
- Most milk expressed with some formula
- Most formula with some breastmilk
- All formula

Intervention group mothers had odds of breastfeeding 5.3 times as great as control group mothers at any contact point.

Dietician Involvement in the NICU: More is Better
Olsen, I et al. (2005) J Am Diet Assoc, 105(8), 1224-123.

411/812 (51%) NICUs completed surveys
10 key survey questions: NC Score (nutrition care score)
- In 168 (41%) NICUs had full or part-time RDs
- Additional 143 (35%) NICUs used RD on consultant basis.
- 99 (24%) had no formal RD input
- Full or part-time RD NICUs provided less TPN kcalories and more protein, and more enteral kcal and protein (consistent with best current practice)
- Mean NC Score increased with RD involvement:
  - No RD 4.6 ± 1.7
  - Consulting RD 4.7 ± 1.5
  - Part-time/full time RD 5.2 ± 1.7 (p<0.01)

Lactation Policy and Procedure
Basic Hospital Breastfeeding Policy
NICU Breastmilk Policies
Ancillary Policies
- Trophic feeding
- Kangaroo care
- Co-bedding twins
- Visitation
- Pre-discharge rooming in
- Outpatient follow-up
- Vendors/Gifts

Lactation Support

Percentage of NICU infants given their own mother's milk, usual support vs. IBCLC support

% Infants
Given OMM
During Hospitalization
At Discharge
Usual Support
IBCLC Support
Ross Employee Manual 1995

“Never underestimate the role of nurses. If they are sold and serviced properly, they can be strong allies. A nurse who supports Ross is like another salesman.”

Abbot Labs v. Segura, 1995
Legal Case: 907 S.W. 2nd 503, 515, Tex 2004

“NO!”

“YES!”

Effect of Professional Support on Initiation & Cessation of Breastfeeding

Women who were encouraged to breastfeed were more than 4 times as likely to initiate breastfeeding as women who did not receive provider encouragement. RR 4.39 (95% CI 2.96-6.49)

Sikorski et al. 2003; Cochrane Database Systematic Rev:
Effect of professional support on the risk of stopping BFing

Odds of BFing discontinuation at 12 wks if encouraged to breastfeed by healthcare provider: OR: 0.56 (95% CI 0.37-0.84)
Breastfeeding-Supportive Infant Environment?

Financial Issues: Costs
- Costs to NICU
  - Lactation consultant/support staff
  - Lactation staff education
  - Pump kits and other supplies
  - Patient education materials
  - Storage bottles and caps
  - Pumping room

Financial Issues: Revenue/Benefits
- Less NICU days/costs
  - earlier full feedings
  - less NEC/sepsis/ROP
- Marketing benefits for OB Service
- Breast pump rental income
- Breastfeeding/Women's Health Store
- Better long term outcome

Breastfeeding CQI

NICHD Glutamine Study
  - 74.9% of infants received breastmilk at some time in the NICU
  - Infants in the breastmilk group started formula at average of 22.8 days
  - At discharge 30.6% of infants in the breastmilk group were still receiving breastmilk.

Best Practice: Established NNTF (Neonatal Nutrition Task Force)

<table>
<thead>
<tr>
<th>Goals</th>
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<tbody>
<tr>
<td>To facilitate optimal nutritional practice for all NICU infants.</td>
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<tr>
<td>To provide consistent, evidence-based information and advice to all mothers/families to enable them to meet their own breastfeeding goals.</td>
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<tr>
<td>To assure sufficient expressed breastmilk is available to meet an infant’s needs throughout the hospital course.</td>
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<tr>
<td>To assist mothers to transition to full breastfeeding at home, by maintaining a full milk supply and providing opportunities to breastfeed to infant discharge and beyond.</td>
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</table>
Neonatal Nutrition Task Force

- Areas of Work
  - Policy and Procedure/GOC
  - Education: Parents/Families
  - Education: Physician/Staff
  - Support: Mother
  - Support: Staff
  - Measurement/Evaluation
  - Miscellaneous

SMBHWN NICU - First Feeding (< 1500g):
% MBM, PDHM, Formula

Breastmilk Use in Graduate NICU

VON – ANY Breastmilk at Discharge

QI Project to Increase Breastmilk Use in VLBW Infants


1. Annotated run chart of breast milk feeding at discharge for collaborative participants.
2. Percent of eligible infants with NEC by collaborative participation.

Human Milk & Breastfeeding in the NICU

- Introduction
- Human Milk in the NICU
- Donor Milk in the NICU & Beyond
- Establishing & Maintaining Maternal Milk Supply
- Strategies to Facilitate Breastfeeding in the NICU
- The Breastfeeding-Supportive NICU
- Conclusions/ Q & A
The "GUILT" Issue

"The medical profession has been hesitant to take anything but a neutral position in such discussions for fear of pressuring the mother. The evidence is stronger than ever that there are distinct advantages to the mother and the infant in breastfeeding. Parents have the right to hear the data. They can make their own choice. Fear of instilling guilt is a poor reason to deprive a mother of an informed choice."

R A Lawrence, 1990

"All 21 women denied feeling coerced to provide milk or made to feel guilty about their initial feeding plans. On the contrary, mothers expressed anger and frustration about health care providers from referral institutions who had told them that human milk and formula were the same or that method of feeding was their choice, without offering a professional opinion."  P P Meier, Ped Annals, May 2003

The potential benefits of human milk are such that all preterm infants should receive human milk. Mothers' own milk, fresh or frozen, should be the primary diet, and it should be fortified appropriately for the infant weighing less than 1.5 kg. If the mother's own milk is unavailable despite significant lactation support, pasteurized donor milk should be used.

American Academy of Pediatrics
Breastfeeding and the use of human milk, Pediatrics 2012; 129(3):e827-841

1. All preterm infants should receive human milk.
   - Fortified with protein, minerals, and vitamins for infants < 1500g at birth.
   - PDHM, appropriately fortified, should be used if MOM is unavailable or contraindicated.
2. Methods & training protocols for manual & mechanical milk expression must be available to mothers.
3. NICUs should have evidence-based protocols for collection, storage and labeling of human milk.
4. NICUs should prevent the misadministration of human milk.
5. There are no data to support routine culturing of human milk for bacterial or other organisms.

AAP Recommendations on Breastfeeding Management for Preterm Infants. Peds 2012; 129(3):e827-841

1. Begin TPN within first few hours of life
2. Begin trophic feeds within the first 3 days of life
3. Manage residuals appropriately
4. Fortify human milk adequately
5. Facilitate post-discharge feeding of breastmilk, including fortification

General Considerations:
- Breastmilk is the feeding of choice, including donor milk when mom's own is not available.
- ELBW infants (<1000g) deserve our special attention as they have lesser reserves and tend to receive less nutrition than larger infants.
- Protein is almost always the limiting nutrient.
CONCLUSIONS

- Human milk is the standard of care for preterm or ill infants.
- Human milk is necessary, but may not be sufficient, for optimal growth and development of the VLBW infant.
- Establishing and maintaining a mother's milk supply is a key factor in transitioning to direct breastfeeding.
  - Unequivocal message from all that MOM is best for baby.
  - Begin milk expression with pump NOW and make choice about breastfeeding LATER.
- Kangaroo care and non-nutritive suckling at the breast facilitate transition to full breastfeeding.
- NICU breastfeeding support can improve patient outcomes in a cost-effective manner.
- Outpatient follow-up and support is crucial for transition to full breastfeeding at home.

PROBLEM | SOLUTION
--- | ---
Poor infant nutrition | Breastfeeding
High cost of medical care | Breastfeeding
High cost of artificial milks | Breastfeeding
Falling IQ | Breastfeeding
Poor vision | Breastfeeding
Stroke and heart disease in the elderly | Breastfeeding
Allergies | Breastfeeding
SIDS | Breastfeeding
Obesity | Breastfeeding
Child abuse and neglect | Breastfeeding
Overpopulation | Breastfeeding
World hunger | Breastfeeding
World peace | Breastfeeding

Questions?