BREASTFEEDING

Recommendations, Benefits, and Best Practices

PRESENTED BY:
Lindsey Menge
Mackenzie Mueller

HISTORY OF INFANT FEEDING

2000 BC – Middle Ages

- Mother breastfeeding primary accepted practice, breast milk considered sacred and magical
- Wet nursing, a method where another woman breastfeeds a child, is common alternative feeding method when breastfeeding not possible by mother
- Artificial feeding with animal's milk (goat, sheep, donkeys, camels, pigs, horses) used in vessels

Middle Ages – Renaissance

- Wet nursing begins to carry widespread disapproval by physicians. Despite disapproval, high society aristocrats commonly use wet nurses to maintain figures and avoid interference with social activities. Wet nursing considered a good choice of employment for poor women.
- Perforated cow's horns most common type of artificial-feeding device

HISTORY OF INFANT FEEDING

16-18th Century

- Wet nurses starting to garner distrust by society and are criticized for using opiates to induce quietness in infants during feedings. Natural mother preferred for breastfeeding
- Pap boat devices used for artificial feedings. Consisted of bread soaked in water, milk, or broth. Bacteria build-up in these devices in conjunction with poor sterilization of milk leads to death of 1/3 all artificially fed infants during first year of life

Industrial Revolution into 19th Century

- Wet nursing moves from an aristocratic norm to being used in lower-income families.
- First infant formula developed and patented. Consisted of cow's milk, wheat and malt flour, and potassium bicarbonate. Hygienic feeding bottles also developed.
- Food sterilization techniques developed – evaporated milk
- Artificial feeding becomes a common substitute for wet nursing
- By 1883, over 27 different brands of infant formulas are patented

HISTORY OF INFANT FEEDING

20th Century

- Wet nursing profession is extinct in favor of artificial formula feeding
- Artificial formula is highly recommended by pediatricians. Considered a safe substitute.
- Formulas contain sugars, starches, dextrins, and fat, but lack protein, vitamins and minerals
- Scientists develop non-milk based formulas using Soy. They eventually become vitamin fortified.
- Breastfeeding steadily declines until the 1970s

HISTORY OF INFANT FEEDING

In the 20th Century, breastfeeding rate was as high as 90%...

By the 21st Century
Breastfeeding is only 42%

CURRENT WORLD HEALTH ORGANIZATION RECOMMENDATIONS

Breastfeed Exclusively for 6 Months

Infant receives only mom's breast milk and no other liquids or solids, not even water. Exceptions are vitamins, mineral supplements, or other medications.

WHO Recommendations

1. Protection

During the first initiation of feeding an infant's immature gastrointestinal system is suddenly exposed to something other than amniotic fluid nutrition. Their underdeveloped systems must now take over, beginning to digest the needed macronutrients necessary for life. The gut is now particularly vulnerable to the environment and microbial contamination. The unique blend of protective compounds in breast milk help infants receive all necessary nutrients for growth while maintaining low infection risk.

2. Digestion

In the initial months of life, breast milk is ideal due to its composition that provides all essential nutrients in an easy to digest, bioavailable blend of nutrients and flavors. Though infants can digest breast milk, their ability to do so increases as their GI tract and pancreas mature beyond a newborn state and are able to have higher production/secretions of digestive enzymes and stomach acids for more complex foods.

3. Growth

Infant weight should double in the first 6 months of life alone. The unique composition of breast milk helps to provides higher levels of fatty acids to promote growth and development.

CURRENT WORLD HEALTH ORGANIZATION RECOMMENDATIONS

Complementary Foods and Breastfeeding from 6 Months to 2 Years

Other foods and liquids are added into infant's diet along with routine breast feeding for optimal nutrition up to 2 years of life or more if desired.

BREASTFEEDING
WHO Recommendations

1. **Increased Energy Demand**

From 6-24 months of age, infants still need the protective factors that exclusively exist in breast milk, but they also need more energy, vitamins like iron, as well as minerals that breast milk alone cannot fully supply.

2. **Developing Motor Skills**

At this time, the child's motor skills are also sufficient for food handling and the digestive tract has developed enough to begin to fully digest and accept new foods. Textured foods are also important to begin around 6-7 months of age in order to develop oral motor skills to help prevent feeding problems later in development.

3. **Enhancing Taste Preferences**

Flavor patterning is primarily developed up to 24 months of life and has long term effects on food preferences.

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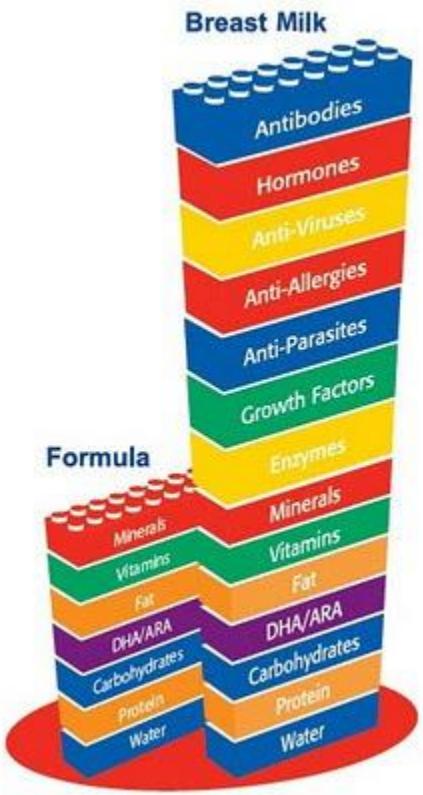
Composition and Nutrients



Composition

- Water (88%), lipid (40-50% of energy), HMO's (20.0 g/L→12.9 g/L), lactose, and protein (0.9 g/ml)

Changes throughout infancy and single feedings

- Colostrum→transitional milk→ mature milk
- Foremilk vs. Hindmilk

Considerations

- Vitamin D: Exclusively BF babies need 400 IU of vitamin D/ day OR mother should supplement with 6400 IU to meet needs of infant
- Iron: Stores until ~6 mo. Improved by delaying cord cutting

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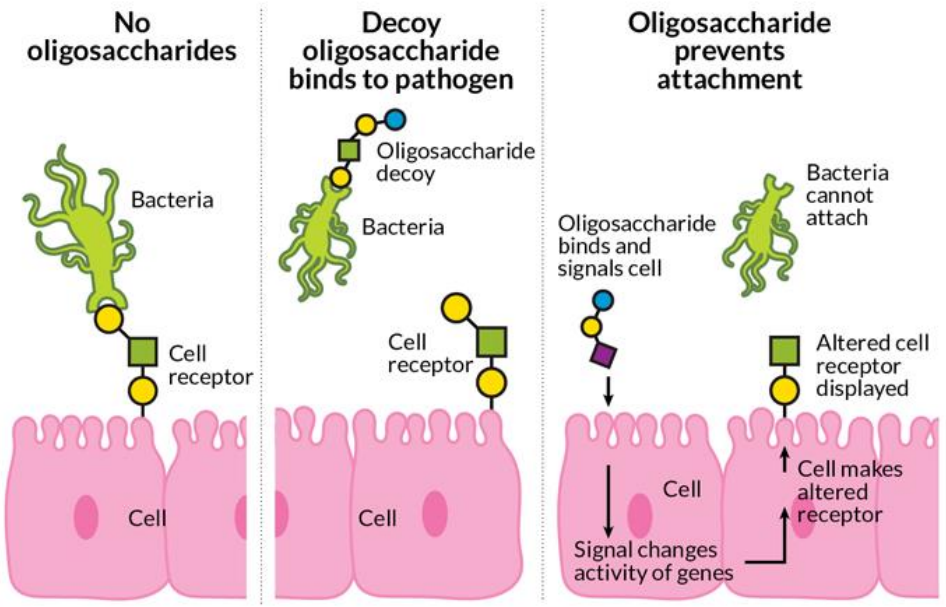
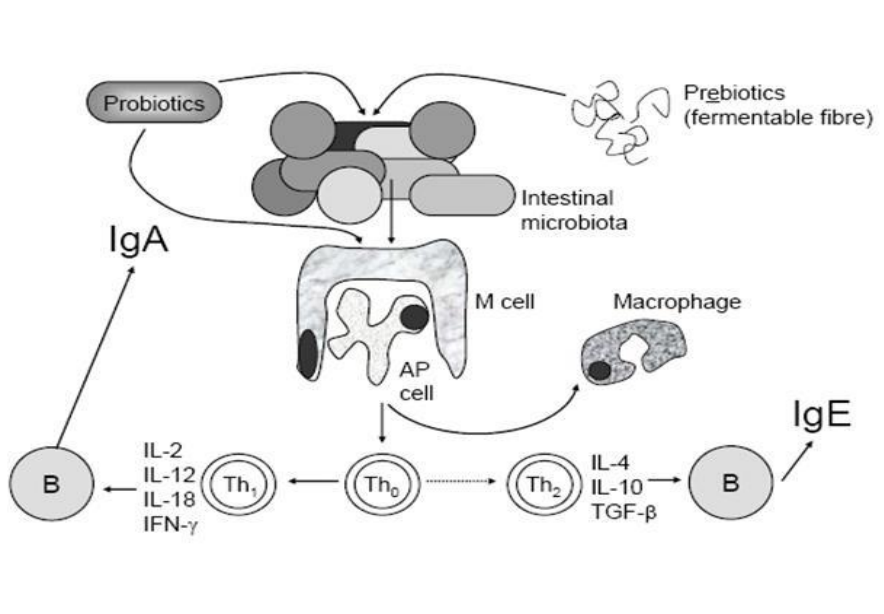
Protective Factors





Bioactive factors

- whey proteins- lysozyme, alpha lactalbumin, lactoferrin
- HMO's- indigestible, act as prebiotic, & prevent adhesion of pathogens
- Immunoglobulins- SIgA, produced from antigenic stimulation of maternal mucosa
- Epidermal growth factor, interleukins, & B cells
- Bile-salt stimulated lipase

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Immune Function and Atopy

Research has determined that breast fed infants have a more stable and less diverse microbiota compared with formula fed infants, however breast fed infants have two times the amount of bacterial cells

Disease	Breastfeeding duration	Reduction
Asthma	exclusive 3/4 mo	27%
Otitis Media	any/exclusive-3 mo	23%/50%
Celiac disease	BF>2 mo + gluten exposure	52%
IBD	any	31%
NEC	pre-term infants fed BM vs. BM +CM infused	77%
Eczema	exclusive 3/4 mo	27%
Non-specific GE	any	64%

What role do you believe colostrum would have in the reduced incidence of diseases among infants and children?

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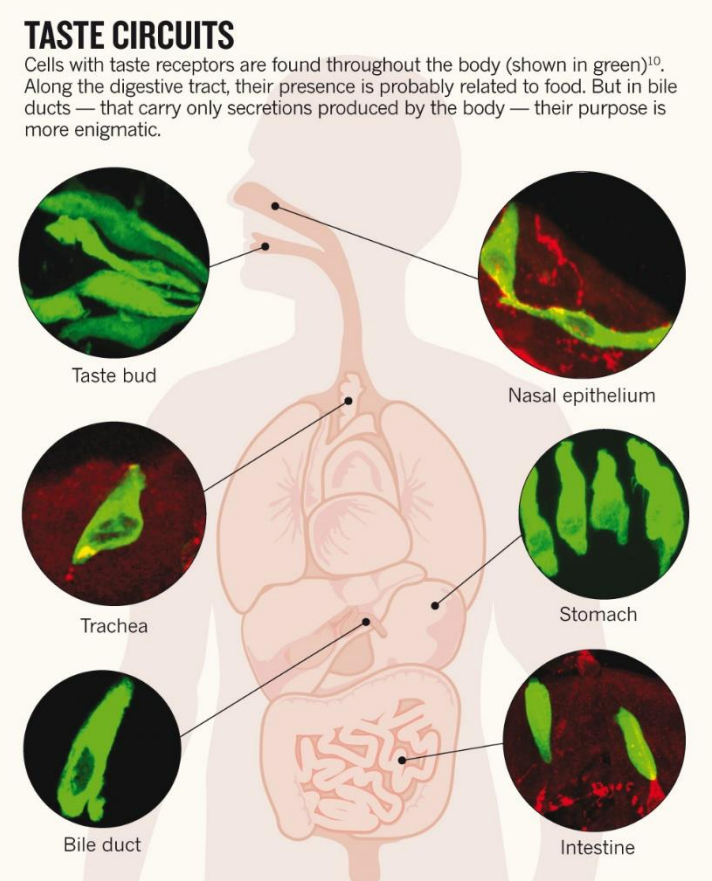
Appetite and Taste Preference



- Infants are exposed to different flavors as early as pregnancy in amniotic fluid
- Innate preference for sweet flavors is due to sweet taste receptors expressed in the mouth, gut, and pancreas that are developed prior to birth
- These sweet sensors lead to activation of pleasure-generating brain circuitry and can also reduce responses to pain while increasing feelings of calming.
- This sweet sensory patterning was initially developed in infants to help detect foods which would provide a source of energy (carbohydrates) and promote growth like breast milk.
- These early infant flavor exposures directly correspond to taste preferences all through life particularly in childhood

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Appetite and Taste Preference

- Despite the innate attraction to sweet tastes, studies found that infants are highly influenced in their taste preference development through varied flavor exposure until around 4 months of age
- Taste Preference Development – PHF Formula Study
  - Group 1 given PHF Formula exclusively
  - Group 2 given mix of Cow's Milk Formula and PHF Formula
  - Group 3 given Cow's Milk Formula ONLY
- Results
  - Infants exposed to ANY amount of bitter PHF formula prior to 4 months continued to tolerate the formula flavor throughout infancy
  - However, those given initial exposure to PHF formula after 4 months of exclusive cow's milk feeding strongly rejected the PHF bitter formula flavor throughout infancy

BREASTFEEDING
Appetite and Taste Preference

- Easier acceptance of flavors introduced prior to 4 months of age doesn't mean that these flavor patterning periods permanently shut down after this time
- Repeated exposure to new foods in infants can continue to initiate flavor acceptance up until around 2-3 years of age.
- Research indicates however, that by age 3-4, most dietary food habits have become stable, and will carry on into adulthood.




BREASTFEEDING
Appetite and Taste Preference

- A major nutritional challenge in our population today is the incorporation of so many added sugars beyond that in breast milk that solidify infant programming for more limited flavor preferences
- Limited development of taste preference profiles are thought to lead to long term challenges with maintaining a varied and balanced diet.
- This promotes a lifestyle into adulthood of high energy dense diets leading to development of chronic diseases such as obesity and diabetes.
- The variation in flavors infants are exposed to in breast milk cannot be mirrored by any infant formula, other liquids, or foods

Family education is important to help promote variety in the mother's diet during pregnancy, breastfeeding, and breastfeeding with complementary foods in order impact flavor preferences to encourage a more diverse diet that isn't so strongly driven toward sweet choices

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The Obesity Link

In 2010, more than 40 Million children under the age of 5 worldwide considered obese

- The growing trend in childhood obesity and its consequences into adulthood have led researchers to explore what patterns may exist in early infancy that could be contributing to this development

- Studies have shown evidence that infants exposed to any period of breastfeeding have up to 30% reduction in adolescent and adulthood obesity risk. Findings also suggest that risk of obesity is decreased by as much as 4% in adulthood for each additional month of breastfeeding in infancy.

- Furthermore in sibling models, those who were breastfed were an average of 14 pounds less obese than their siblings who were formula fed

BREASTFEEDING
The Obesity Link

Potential Mechanisms Effecting Obesity

1. Taste preferences developed in infancy – particularly in those who were exclusively formula fed and did not receive significant variation in flavor compounds
2. Breastfeeding develops appetite controls
3. Mothers of bottle fed infants tend to encourage bottle emptying

BREASTFEEDING
The Obesity Link

Potential Mechanisms Continued

1. High protein intake in infant formula leads to higher levels of serum insulin levels due to an increase in insulin-stimulating amino acids
2. Higher insulin levels lead to increased accumulation of adipose tissue deposition and early development of adipocytes
3. Breastfed babies receive appetite regulating hormone Leptin, and infants fed formula do not

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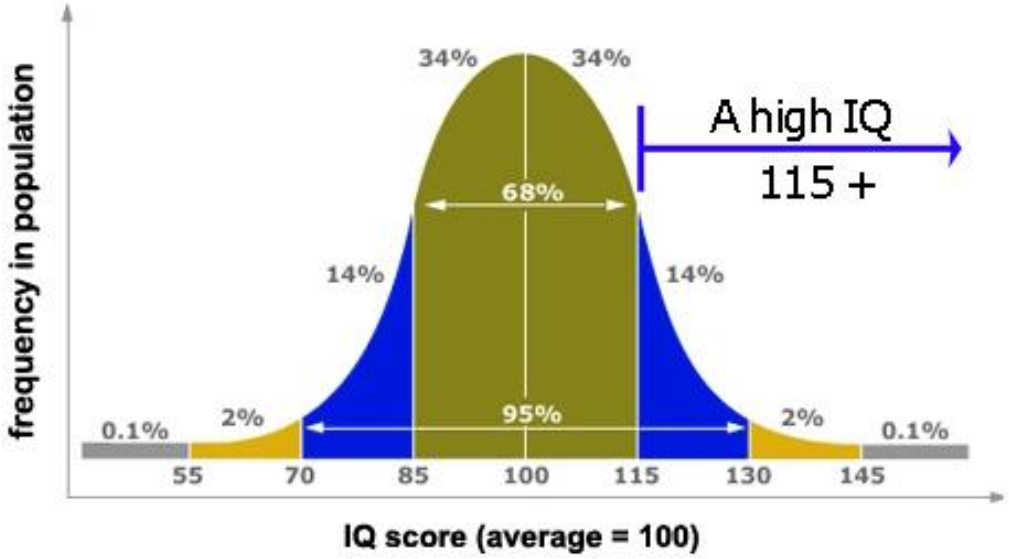
Cognitive Development

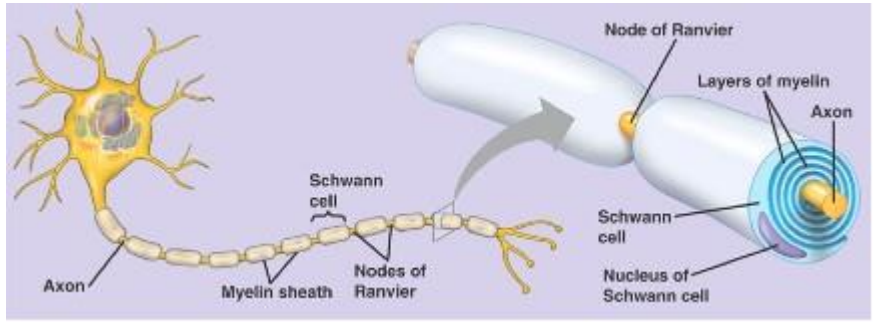
- Links between breastfeeding and cognition are challenging due to variables like genetics, infant home environment, and socioeconomic backgrounds
- However, current studies show that breastfed infants score higher on intelligence tests and have an IQ 2-5 points above formula fed infants especially if breastfed for 6 months or more
- Breastfed infants also show faster cognitive processing and development of brain white matter (responsible for motor learning)



BREASTFEEDING
Cognitive Development

Potential Mechanisms Effecting Cognitive Development

- Long chain polyunsaturated fatty acids DHA and Arachidonic Acid
- Lipids comprise 60% of the structural composition of the human brain
- DHA and AA are major components of the brain's lipid makeup and are provided in breast milk but not in infant formula
- Cholesterol in breast milk may also play a role in cognition due to its effects on neural myelination



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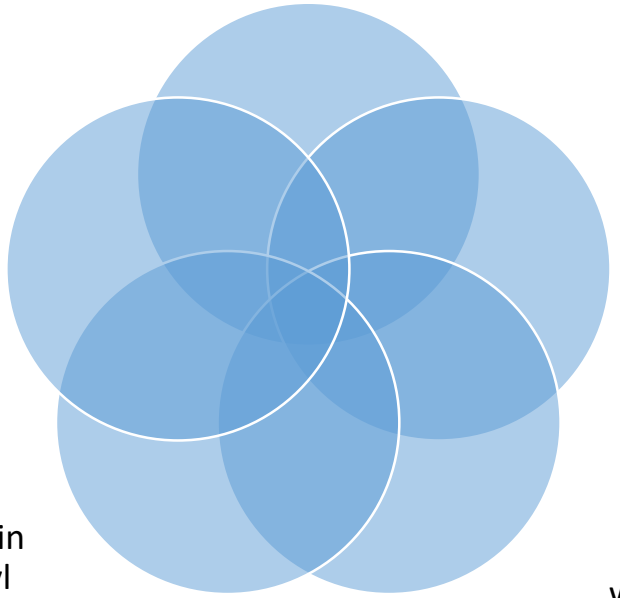
Considerations for Mothers

Additional energy needs of ~450-500 kcal/day

Maintain an overall healthy diet



Caffeine should be consumed in moderation

2-3 cups/day

Avoid fish that contain high levels of methyl mercury

Avoid alcohol

OR

wait at least 2 hours before infant is exposed

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Breastfeeding Patterns

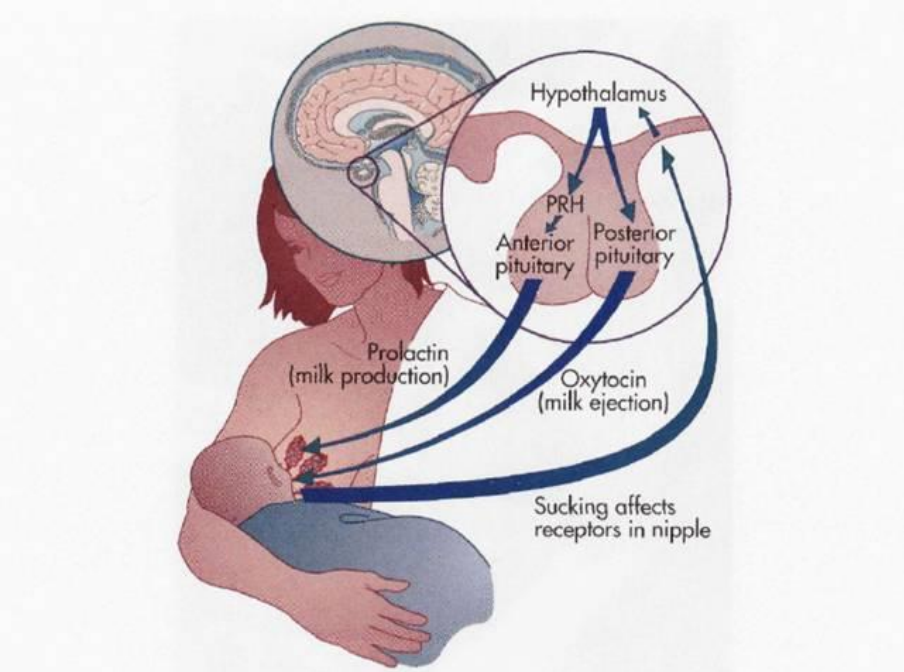

Figure 11-3 Maternal breastfeeding reflexes. (From Mahan KL, Escott-Stump S: *Krause's food, nutrition, and diet therapy*, Philadelphia, 2000, WB Saunders.)

Breastfeeding patterns

- Day 1-3: infant will consume colostrum, about 40-50ml
- Day 3-5: 300-500 ml - 500-800 ml
- Month 1-6: 800 ml/ day

Demand feeding: the infant chooses the rate, duration, and frequency at which they are breastfed for both day and night

- important due to compositional changes of milk
- infant does not empty the breast of milk

Attachment issues: may be indicated if a single feed lasts less than 30 minutes or more frequent than 1.5 hrs

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Additional Benefits to Moms

- Lactational Amenorrhoea Method
- Decreased risk for breast and ovarian cancer
- Decreased risk of T2DM
- Weight management support via increase caloric expenditure

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Local Resources

Latch MD - http://www.latchmd.com/
Designed to provide local support for breastfeeding help and pediatric care. Can view baby-friendly hospitals, baby-friendly public places, breastfeeding friendly doctors, lactation specialists, support groups, and milk banks all by typing in your city or zip code

La Leche League - http://www.lalecheleague.org/
An international organization dedicated to providing education, information, and local support for breastfeeding moms

Austin Born - http://www.austin-born.com/
The Breastfeeding Café provides weekly support for breastfeeding moms led by a lactation specialist. They also offer lactation counseling

BENEFITS OF BREASTFEEDING CONCLUSIONS

- Decreased risk of infant mortality
- Decreased risk of infections in infancy
- Decreased risk of food allergies
- Decreased risk of childhood obesity and diabetes in adulthood
- Increased cognitive function
- Increase food preferences
- Increased ability to self regulate appetite
- Increased immune function and protective factors
- Increased benefits and health to the mother

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ANY QUESTIONS???