Breastfeeding and Infant Nutrition

1. What are the Academy of Pediatrics recommendations on breastfeeding?

1. **Human milk** is the preferred feeding for all infants, including premature and sick newborns, with rare exceptions.
2. Breastfeeding should begin **as soon as possible after birth**, usually within the first hour.
3. Newborns should be nursed **whenever they show signs of hunger**, such as increased alertness or activity, mouthing, or rooting. Crying is a late indicator of hunger. Newborns should be nursed approximately **8-12 times every 24** hours until satiety, usually 10-15 min. on each breast.
4. No supplements (water, glucose water, formula, etc.) should be given to breastfeeding newborns unless a medical indication exists.
5. When discharged <48 hours after delivery, all breastfeeding mothers and their newborns should be **seen by a pediatrician** or other knowledgeable health care practitioner **when the newborn is 2-4 days of age.**
6. **Exclusive breastfeeding** is ideal nutrition and sufficient to support optimal growth and development for approximately the first 6 mo. after birth.
7. **In the first 6 mo., water, juice, and other foods are generally unnecessary** for breastfed infants.
8. Should hospitalization of mother or infant be necessary, **every effort should be made to maintain breastfeeding.**

2. What are some social trends that have contributed to the decline in breastfeeding rates?

- Formula marketing
- Working mothers
- Lack of societal support
- Media influences (portray bottle-feeding as the norm)

3. What are common reasons women give for not breastfeeding?

- Too difficult (need lactation specialists)
- Too many rules (etoh, smoking, drugs)
- Lack of good education & support (prenatal & postnatal)
- Lack of support from physicians & healthcare providers
- Working mothers
- Lack of societal support
- Early hospital discharge
- Media influences (portray bottle-feeding as the norm)
- Commercial influences (coupons, discharge kits, advertising in magazines)

4. Define Mother-Infant bonding. Discuss how breastfeeding contributes to this bond.

The connection between a mother and her child, which originates at or before birth and which is characterized as an intense physical, emotional, spiritual, bond that exists between the two. It is described as a sensitive dance that occurs between them, where each relies on the cues of the other and interacts in an intense intertwined fashion.

Repeated intimate contact between mother and infant fosters maternal-infant bonding.

5. Identify the two major hormones that control lactation and explain how they function together to maintain milk supply.

Prolactin - triggers milk production.
Oxytocin - triggers milk let-down.

When an infant suckles, the hormones prolactin and oxytocin stimulate milk production and release. Prolactin, secreted by the anterior pituitary, stimulates the mammary alveolar cells to synthesize milk. Milk is secreted continuously into the alveoli, but it does not flow easily from the alveoli into the ductile system. Oxytocin, secreted by the posterior pituitary, causes the mulscle-like cells around the alveoli to contract. The muscle contraction pushes the milk out of the alveoli and along the duct system where it is easily available to the nursing infant. Sucking and emptying stimulate milk production.

6. Compare and contrast breast milk and infant formula made from cow's milk in terms of the types of fat, protein and carbohydrate.

	Breast Milk	**Cow's Milk Formula**
Fat	More digestible More essential fatty acids More cholesterol (Triglyceride, phospholipids, cholesterol	Butter fat of whole milk is replaced by a variety of vegetable oils, such as palm, soy, corn, coconut, and safflower. Higher in polyunsaturated fatty acids and contain little or no cholesterol.
Protein	Whey (small curds) Easily digested Low casein (40%)	Casein (large curds) More difficult to digest High casein (80%)
Carbohydrate	Lactose (has positive effect on calcium absorption)	Lactose Some have corn syrup, sucrose, and modified tapioca starch (can be used for infants with gastrointestinal problems bec. of lactase deficiency.)

7. Briefly explain the importance of the feeding relationship in infant development.

Feeding is the first significant relationship of baby's life. Bonded to Mom (cuddling, warmth, love, food). From the earliest moments of life, the infants depend on establishment of a social relationship for their nutritional needs and, thus, the maintenance of life and physiologic well-being.

8. Identify two biologically active compounds found in human milk but not added to formula and identify the possible role the compounds play in infants' health or development.

Colostrum - facilitates the passage of meconium and facilitates the development of the protective **L. bifidus** bacteria in the gut of the young infant. These bacteria limit the growth of enteropathogenic organisms and promote the intestinal health of the breast-fed infant. Also contains **immune factors** which help protect the infant from pathogens..

Hormones - aid in development, maturation, and functioning of the physiologic systems of the newborn.

9. Define engorgement; nipple confusion, mastitis.

Engorgement - temporary swelling of the breasts that occurs as mature milk secretion begins.
Nipple confusion - Some infants have difficulty switching back and forth between human and artificial nipples. Artificial nipples are less flexible and the tongue movements used to control milk flow from a bottle are different from those used in breast-feeding.
Mastitis - infection of the breast.

10. How do you treat sore nipples or plugged ducts?

Sore nipples are commonly caused by poor positioning and incorrect latch on. Correct or change the feeding position. If the nipple becomes cracked or damaged, healing can be aided by leaving a few drops of milk to dry on the nipple after feeding. Could also be from an infection, so consult health-care provider for severe or persistently sore nipples.

Plugged ducts - application of warm and moist heat, breast emptying, and gentle massage of the tender area. If tenderness persists, the use of overly restrictive bras or clothing should be considered as a cause.

11. Discuss why latch-on and positioning are important?

Incorrect latch-on and poor positioning can lead to sore nipples and a tendency to stop breast-feeding. Correct latch-on and positioning leads to successful breastfeeding.

12. How do you store breast milk?

At room temperature - for 4-10 hrs.
In refrigerator - for 5-7 days.
In home freezer - 5-7 days.
In -20ºC freezer - 6-12 months.
If freezing, leave additional space for expansion; label container with date and amount; freeze in small portions; seal container tightly.

13. What are some resources for breastfeeding advice?

Academy of Breast-Feeding Medicine
American Academy of Pediatrics
National Healthy Mothers Healthy Babies Coalition (HMHB)
International Lactation Consultant Association (ILCA)
La Leche League International
Wellstart International
Journal of Human Lactation

14. Describe the function of: alveoli, lactiferous sinus and fat in the breast.

Alveoli - milk production and secretion.
Lactiferous sinus - the lactiferous ducts widen into short lactiferous sinuses where milk collects. The sinus gets milked.
Fat - fat in the breast does not play a role in milk production or secretion. It provides insulation and energy stores as in other parts of the body.

15. Why are rooting and latch on important?

Rooting is an early indication of hunger and an important feeding cue. It indicates readiness to breastfeed. Latch on is important to successful breastfeeding.

16. What part of the milk production process is influenced by prolactin and oxytocin?

Prolactin - milk production.
Oxytocin - let-down

17. How much extra energy is needed to produce milk?

Breast milk ~ 0.7 kcal/ml (70 kcal/100ml)
It takes 100 kcal to make 100 ml milk.

18. During breastfeeding, what are basic dietary recommendations for energy, fluid, weight loss, vitamins, minerals, and fats?

Energy - With the use of stores factored in, the RDA for both the first and second 6 mo. of lactation is an additional 500 kcal/da, or a total intake of 2700 kcal/day.
Fluid - Adequate fluid (2-3 liter/day), water, decaf bev, Ca-fortified OJ or juice.
Weight loss - The average amount of weight lost during ful lactation is 500 gm/mo which corresponds to the removal of 100-150 kcal/day from fat stores assumed in the RDA calculation. In healthy women with adequate or high fat reserves, weight loss of up to 500 gm/wk by moderate dietary restriction and exercise. Diets providing less than 1800 kcal.day make it difficult for a lactating woman to meet her nutrient needs, and severe caloric restriction or rapid weight loss is risky.

Vitamins -
Minerals -
Fat -

A varied, balanced diet that meets a womans energy requirements ususally provides adequate vitamins and minerals to support lactation. Women who consume a nutrient-dense diet and who meet the RDA for energy (2700 kcal) are likely to approach or meet the RDA for all nutrients.

19. What are contraindications for breastfeeding?

- infant with galactosemia (inborn errors in metabolism)
- infant whose mother is on illegal drugs
- infant whose mother has untreated active TB
- infant whose mother in US has HIV
- infant whose mother has pesticide or heavy metals exposure

20. How does caffeine or alcohol intake affect breastfeeding? Smoking?

Maternal consumption of caffeine and alcohol may adversely affect the breast-feeding infant. **Caffeine** can accumulate in the infant causing irritability and wakefulness. **Alcohol** is readily transferred to breast milk, with peak levels in milk at 30-60 minutes after maternal consumption. Daily consumption may reduce infant consumption of breast milk, may interfere with milk let down, and may disrupt the infant's sleeping pattern. **Smoking** results in lower milk volume and the presence of nicotine in breast milk. It may cause decreased growth and more respiratory infections.

21. What is an ideal caloric intake for breastfeeding?

The RDA for both the first and second 6 mo. of lactation is an additional 500 kcal/da, or a total intake of 2700 kcal/day.

22. If a breastfeeding woman consumes 1800-2000 kcal/day, what additional concerns do you have as her nutrition counselor?

Encourage increased intake of nutrient-rich foods to achieve an energy intake of at least 1800 kcal/day; if the mother insists on curbing food intake sharply, promote substitution of food rich in vitamins, minerals, and protein for those lower in nutritive value; in individual cases, it may be advised to recommend a balanced multivitamin-mineral supplement; discourage use of liquid weight loss diets and appetite suppressants.

Avoid diets and medications that promise rapid weight loss.
Eat a variety of breads and cereal grains, fruits, vegetables, milk products, meats, or meat alternatives each day.
Take 2-3 servigns of milk products daily.
Make a greater effort to eat vitamin A-rish vegetables or fruits often.
Be sure to drink when thirsty.
Keep caffeine in moderation.

23. What is an appropriate rate of weight loss for a breastfeeding woman when her child is 2 months old?

The average amount of weight lost during full lactation is 500 gm/mo which corresponds to the removal of 100 kcal.da from fat stores assumed in the RDA calculation. In healthy women with adequate or high fat reserves, weight loss of up to 500 kg/wk by moderate dietary restriction and exercise does not appear to negatively affect lactation.

24. What characteristics of the early breastfeeding experience are associated with breastfeeding success? Failure?

Success:

- Early frequent feedings
- Feed w/i 10 min - 1 hr.
- Do not want to discourage mothers by being too strict on time.
- 2 hrs between feedings.

Failure:

- 4-6 hrs. after birth
- 4 hrs. between feedings

25. What two factors are associated with growth failure in a breast-fed infant that are related to the mother?

Related to Mother:

1. Inadequate supply of maternal milk.
2. Non-organic factors: Psychosocial factors: Mom throws bottle in crib and then passes out on the sofa.

What three factors are associated with growth failure in a breast-fed infant that is related to the infant?

Related to Infant:

1. Impaired food utilization.
2. Organic failure: severe reflux problem (projectile vomiting).
3. Physical factors (tight tongue).

26. How does an infant's body composition change over the first year of life?

Water: 74% at birth; 60% at 4 mo. (Replaced by protein, fat).

Protein: 12% at birth; 15% at 1 yr.
Fat-free mass increases (by how much?) in 1 yr.
As a percentage of body weight, fat-free mass decreases throughout infancy. This reduction results from the drop in water content from about 75% to about 60% at 4 mo. and from a rise in body fat content.

Fat: 12-14% at birth
30% at 6-9 mo.
23% at 1 yr.

27. What nutritional factors are necessary to support the high rate of brain growth in the first year of life?

Essential fatty acids needed for rain and neuro deveopment.
Cholesterol needed for cell membranes and brain development.

28. How do the immature renal system and the immature GI system influence feeding recommendations in the first few months of life?

Renal system: - Difficult to concentrate urine.
- Problems with excreting too many minerals & protein.
  - concentration of formula
  - introduction of solids at right age.
    infants need water at that time.

Gastrointestinal System
- Immature gut.
- Low acid in stomach.
- Poor production of digestive enzymes.
  Breast milk esier to digest because of the whey to casein ratio.

29. What is the major goal of infant nutrition?

According to the American Academy of Pediatrics: feeding and nurturing infants to achieve optimal infant and child health, growth, and development.

30. How do we define normal growth?

The growth of a child is measured in terms of gains in stature and weight.
Length, weight, and weight/length are tracked over time.
Head circumference is not as sensitive in the short term.
Rate/pattern of growth is the most important.
Growth charts are essential tools for assessment. Growth charts, developed by the National Center for Health Statistics in collaboration with the National Center for

Chronic Disease Prevention and Health Promotion, are used to track growth over time compared to the norm for an age.
Standard of comparison Ref. Data.
Identify infants with decr. wt &/or length.

31. What three measurements are used most frequently to assess growth in infancy?

Assessment of nutritional status:
- length
- weight
- weight/length

32. What percentile on the growth charts for inadequate nutrition defines "At nutritional risk"? Over-nutrition?

<3%ile	At nutritional risk. Clinically, concerned for FTT
97%ile	Over-nutrition

33. Who has the higher energy need/kg body weight?

A newborn has the higher energy need/kg body weight.
A newborn needs 109 kcal/kg.
A 1 yr. old needs 58 kcal/kg.
An adult male needs 40 kcal/kg.

34. When is vitamin supplementation recommended?

If dietary counseling is ineffective in improving intake for lactating women, supplementation is recommended. Vit B supplements are recommended for vegans. Calcium supplements may be advisable for lactating women who avoid milk and dairy products. Vit D supplements are recommended for women who avoid vit D fortified foods and who have limited exposure to ultraviolet light.

35. Why is iron supplementation recommended for formula fed infants and not breast-fed infants?

A term infant is born with an iron reserve sufficient for 4-6 mo. Without an additional source, iron stores become depleted at about that time. For infants who are not breast-fed, the American Academy of Pediatrics recommends the use of iron-fortified formulas from birth to the end of the first year of life. Iron deficiency ad the concomitant developmental delays and abnormal behaviors can be prevented in infants through the use of iron-fortified formulas or iron-fortified cereals with iron compounds of high relative bioavailability and adequate vitamin C. Breast-fed infants receive iron in BM.

36. Describe the differences between formula and breast-milk.

Breast Milk

- Species specific
- Variable composition
- Variable flavor
- Multiple components

Formula

- Always the same
- Composition based on BM standard
- Federally regulated

37. Describe the nutritional changes that occur as breast-milk changes from colostrum to mature milk.

Colostrum:

- Approx. 3-6 days
- Small quantity, small stomach
- High protein, low fat
- High biologic activity
  - immune factors
  - Bifidus factor
- Coordinate suck & swallow
- Laxative quality to help move meconium stool.

Mature milk: (20 kcal/oz.)

- Protein (70% whey (small curds) and 30% casein (large curds))
  - lactoalbumin, lactoferrin, IgA, casein
  - Enzymes, hormones, complement, intact cells
- Lipids: 50% kcal
  - triglycerides, phospholipids, cholesterol
  - long chain fatty acids

38. Discuss the four developmental changes that need to occur before an infant is mature enough to handle solid food.

Infants are generally read for stage 1 foods when they have:

- doubled their weight
- have good control of head movements
- can sit without support
- can swallow a spoonful of pureed food easily.

Developmental readiness:

- Digestive enzymes (amylase, bile acids, lipase) - essential for digesting solids.
- Mucosal barrier is developed - against the penetration of harmful substances.
- Head control - head stable.
- Sucking (no choking or gagging) - ability to take small bites of soft foods.

Developmental window: 4-12 months. During this time, the infant increases in motor development, oral motor skills related to eating, self-help/social skills, and appetite.

39. How can you tell if an infant is full when feeding solid food?

Babies turn head away from spoon or hold lips closed.
Never force them to eat more food after they have indicated fullness.

40. What is the usual order of introducing solid foods?

Start with iron-fortified rice cereal.)single ingredient food).
Other cereals introduced gradually, with wheat and mixed cereals added last.
Single strained vegetables, fruits, meats, egg yolks, and bread.

41. What is baby bottle tooth decay? How can it be prevented?

Baby bottle tooth dcay - a form of rampant tooth decay that affects upper front teeth (incisors) and primary upper first molars. It is caused by infant feeding practices, specifically prolonged, inapropriate bottle feeding such as allowing an infant to fall asleep with a bottle in his mouth. Liquids containing sugars such as fruit juice and sweetened drinks, and milk and formula. It can be prevented by not using the bottle as a pacifier and not allowing theinfant to fall asleep with a bottle in his mouth. Also, reduce sugar content of beverages in the bottle. Only breast milk or formula should be offered in a bottle. Juice and other beverages should be in a cup.

42. When are infants old enough to feed themselves soft finger food? How can you tell?

- Picks up foods in fingers or palms
- Puts food in mouth
- Chews

7 months. Tries to finger-feed soft foods. Finger foods should be offered as infants develop hand and motor skills.

43. What would you tell your friend to discourage her from continuing to give her baby a low fat diet?

Do not limit the amount of fat in baby's diet. That means Whole Milk after 1st birthday and until age 2. Fat is needed for brain to grow.

- Fat is a nutritional factor that is necessary to support the high rate of brain growth in the first year of life.
- Essential fatty acids needed for rain and neuro deveopment.
- Cholesterol needed for cell membranes and brain development.
- Fat is essential in infancy.
- Brain growth at birth is at peak growth rate.

- Structural fat, coating neurons.
- Essential fatty acids needed for brain & neuro dev.
- Cholesterol (cell membranes, brain dev.)

44. What are some determinants of children's food preferences?

- Genetically determined
- Prefer foods that are sweet & salty and reject bitter and sour.
- Reject unusual foods.
- Associate foods w/contexts and consequences of eating them.
- Increase energy dense foods.
- Infants are more accepting of new foods than toddlers.
- The acceptance of new foods decreases with age.
- Family patterns are important! Especialy Mom's preferences.
- Boys are pickier than girls.

45. What are five tips for introducing new foods to toddlers?

1. Kids need 5-10 exposures to accept a new food.
2. Tastes or samples increase intake.
3. Kids who eat with adults eat more.
4. Watch for food allergies.
5. Offer new foods gradually and in small portions.

6. Patterns of introduction of supplementary foods should be based on individual infant's nutritional needs, physiologic maturation, and development of feeding skills.
7. Build eating skills: semi-solid --> lumpy --> soft
8. Eating a new food with a friend who likes it increases chance that a child will change his mind about a food.

46. How do adults influence food preference in children?

- Rewards contingent upon eating decreased preference.
- Restricted access makes foods more desirable.
- Children may be more willing to try foods that they have had some part in preparing.

47 What are food aversions?

A distaste for foods or beverages that are normally consumed.

- Related to consequences of foods.
- Problem with children, especially ones who are frequently ill.
- Aversions form quickly and are persistent.
- Preferences form slowly and decay quickly.