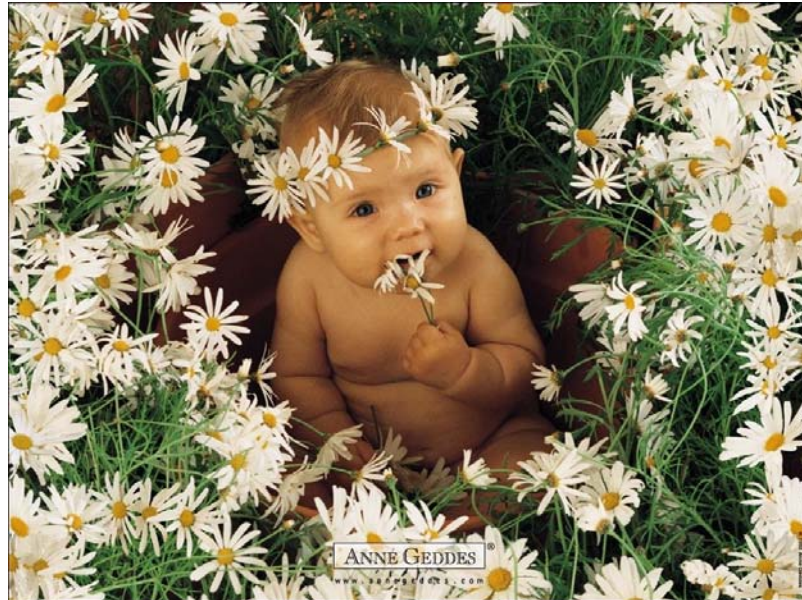


Zaporozhye State Medical University
Propedeutics of Pediatrics Department

The feeding of infants and children

Handbook

For the third-year students of the Medical faculty



Zaporozhye - 2013

UDK 613.22-053.2(075.8)=111
BBK 51.28Я73
K85

Authors:

Krut A.S., MD, Associate Professor of Pediatrics

Ivanko O.G., MD and PhD, Professor of Pediatrics, Head of Propedeutic Pediatrics Department

Kizima N.V., MD, Associate Professor of Pediatrics

Paschenko I.V., MD, Assistant of Propedeutic Pediatrics Department

Pidkova V.Y., MD, Associate Professor of Pediatrics

Radutna O.A. MD, Assistant of Propedeutic Pediatrics Department

Автори:

Круть О.С. к.мед.н., доцент кафедри пропедевтики дитячих хвороб

Іванько О.Г. д.мед.н., професор, зав. кафедрою пропедевтики дитячих хвороб

Кизима Н.В. к.мед.н., доцент кафедри пропедевтики дитячих хвороб

Пащенко І.В. к.мед.н., асистент кафедри пропедевтики дитячих хвороб

Підкова В.Я. к.мед.н., доцент кафедри пропедевтики дитячих хвороб

Радутна О.А. к.мед.н., асистент кафедри пропедевтики дитячих хвороб

Reviewers:

Nedelskaya S.N., M.D., Professor, Head of Faculty Pediatrics Department, ZSMU

Lejenko G.A., M.D., Professor, Head of Hospital Pediatrics Department, ZSMU

The feeding of infants and children : handbook for the third-year students of the Medical faculty / A. S. Krut, O. G. Ivanko, N. V. Kyzyma [et al.]. – Zaporizhzhia : [ZSMU], 2013. – 81 p.

The handbook can be used by teachers and students at practical classes and for module control 3 “The feeding of infants and children” in the discipline “Propedeutics of Pediatrics”.

The content of the handbook corresponds to the requirements of “Educational qualification characteristics of the specialist in specialty 7.120101 “General Medicine”.

*Recommended by Central Methodical Board ZSMU
Record №5 from May, 23, 2013*

Content

Preface	5
1. <i>Breastfeeding is rights start</i>	5
• Regulation of mammary development and function.....	6
• Benefit and advantages of breastfeeding.....	11
• Composition of breast milk.....	13
• Physiological daily requirements for food substances.....	15
• Breastfeeding:	
✓ <i>Early initiation</i>	16
✓ <i>Breastfeeding on demand</i>	18
✓ <i>Technique of breastfeeding</i>	19
✓ <i>Common breastfeeding difficulties</i>	23
✓ <i>Contraindications to breastfeeding from infant and mother</i>	25
✓ <i>Expression of breast milk</i>	26
✓ <i>Maintaining the milk supply</i>	27
• 10 steps to successful breastfeeding.....	28
• How to assess effectiveness of breastfeeding?.....	31
• Weaning	32
• Tests for breastfeeding.....	33
2. <i>Formula or artificial feeding</i>	39
• The main steps to creating a breast milk substitutes.....	41
• Classification of breast milk substitutes.....	41
• Technique of artificial feeding.....	45
• Tests for formula feeding.....	49
3. <i>Time and method of introducing complementary foods to infants</i>	54

- Value of the basic nutrients in the feeding of the child.....55
- Summary of method of introducing “solid” foods to infants.....59
- The balanced diet and basic food groups.....59
- Tests.....66
- 4. Feeding during the second year of life.....70**
- 5. Later childhood and adolescence.....73**
 - Tests.....76
- 6. Literature.....78**

Preface

Adequate nutrition is closely related to good health throughout life. The topic of feeding and nutrition has special importance in pediatrics because of the rapid growth and development of the pediatric patient, especially the infant. Dietary factors regulate growth at all stages of development, and their effects are very important in first years of life. Adequate nutrition provides the essential nutrients in the amount and balance necessary to sustain physiologic needs. These needs vary widely according to age, level of activity, and environmental conditions. Inadequacies in any or of all of these essential nutrients will be reflected in altered growth and health.

Therefore the correct organization of feeding of the child since the first days of life is one of the most important sections of pediatrics, as science about health of the child.

Optimal feeding for sustained child health and growth includes:

- initiation of breastfeeding within the first hour of life,
- exclusive breastfeeding for six months,
- timely complementary feeding with appropriate foods,
- continued breastfeeding for two years and beyond.

Brest Feeding: The rights start

Definition: Breastfeeding is the process of woman feeding an infant or young child with milk from her breasts, usually directly from the nipples. A process the production, secretion and ejection of milk is called **lactation**.

Exclusive breastfeeding means feeding a baby nothing but breast milk, no other food or fluids.

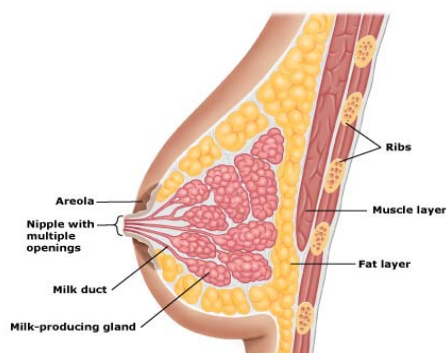
During the first 6 months of life, infants should be *exclusively* breastfed. This means that the healthy baby should receive breastmilk and *no other fluids*, such as water, teas, juice, cereal drinks, animal milk or formula.

The many compelling advantages of breastfeeding to infants, mothers, families, and society have been well documented. These include health, nutritional, immunologic, developmental, psychological, social, economic, and environmental benefits.

Breast milk helps to lower the risk of or protect against:

1. Diabetes
2. Gastroenteritis
3. Diarrhoea
4. Asthma
5. Allergies
6. Urinary tract infection
7. Chest infection and wheezing
8. Ear infection
9. Obesity

Regulation of Mammary Development and Function



Beginning lactation

There are 4 stages of mammary development. Each of the **four stages of mammary development**, mammogenesis, lactogenesis, lactation and involution is specified by both systemic and local hormonal control mechanisms.

Regulation of mammogenesis. Mammogenesis begins at puberty with the onset of estrogen secretion by the ovaries, usually between the ages of 10 and 12 in the girl. *Estrogen* stimulates the ducts grow (lengthening and branching of the mammary ducts) and causes enlargement of the mammary fat pad, one of the most estrogen-sensitive tissues in the human body. With the onset of the menstrual cycle the presence of *progesterone* stimulates the partial development of mammary alveoli.

During pregnancy full lobuloalveolar development takes place under the continued stimulation of estrogen, progesterone and the rising levels of *prolactin* from the pituitary and *placental lactogen* from the placenta. The cells of the mammary fat pad diminish in size and their place is taken by the developing ducts and alveoli. Although the mammary cells are fully competent to secrete milk after about mid pregnancy, the process is held in check by the high levels of circulating progesterone.

Lactogenesis (referred to as the time when the milk “comes in”) starts about 40 hours after birth of the infant and is largely complete within five days. Lactogenesis, or the onset of copious milk secretion, occurs just prior to parturition. However, in humans the process is delayed for about 40-48 hours due to a delay in the fall of progesterone to levels that no longer inhibit lactation.

Three factors are necessary for successful lactogenesis:

- a developed mammary epithelium,
- continued high plasma prolactin levels,
- and a fall in progesterone and estrogen.

It is important to note that the milk “comes in” at the same rate whether the infant suckles during the first 48 hours or not. Thus the onset of milk secretion depends, not on milk removal from the breast, but on the changes in hormonal

status associated with parturition. As we will see below, continued milk secretion does depend on milk removal from the breast.

Lactogenesis is associated with an abrupt increase in milk volume secretion to about 500 ml per day on day 4. After this time there is a gradual volume increase to about 850 ml/day by three months postpartum.

There are also profound changes in milk composition during the early postpartum period. Milk secreted during the period between colostrums secretion and mature milk is called transition milk

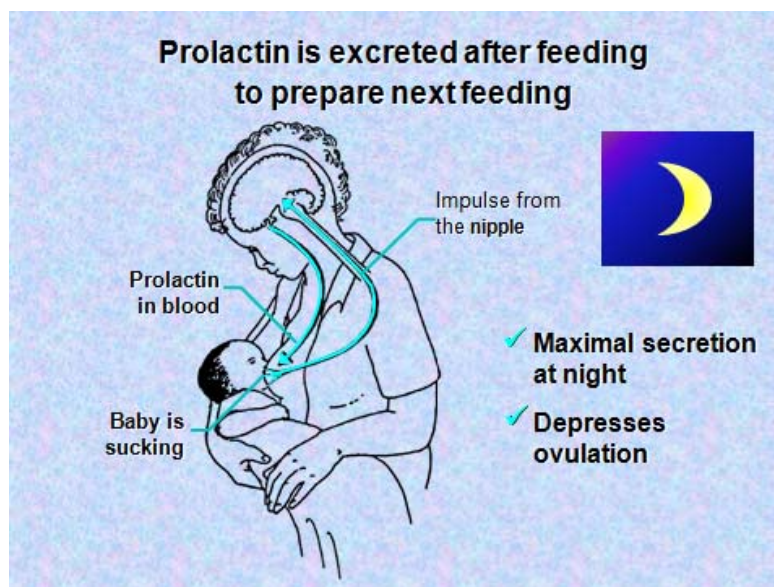
The **colostrum** (a thick, sometimes yellowish fluid) is the first milk the baby receives; it contains higher amounts of white blood cells and antibodies than mature milk, and is especially high in immunoglobulin A (IgA), which coats the lining of babies' immature intestines, helping to prevent germs from invading baby's system. Secretory IgA also works to help prevent food allergies. After a baby has been nursing for 3-4 days, the colostrum in the breast slowly begins the process of changing into mature breast milk over the next two weeks.

Protein composition of human colostrum and mature breast milk (per liter)

Constituents	Measure	Colostrum (1-5 days)	Mature milk (after 30 days)
Total protein	G	23	9-10.5
Casein	mg	1400	1870
α-Lactalbumin	mg	2180	1610
Lactoferrin	mg	3300	1670
IgA	mg	3640	1420

The most notable changes are a decrease in sodium and chloride concentrations, an increase in lactose and fat concentrations. In addition the protein concentration of the protective proteins IgA and lactoferrin decrease. By 10 days postpartum the milk has assumed the composition characteristic of mature milk.

Lactation. Milk production appears to continue in women so long as the infant is suckled more than one time per day. Two hormones are necessary for this continued production: oxytocin and prolactin. Oxytocin is necessary for the milk ejection reflex that extrudes milk from the alveolar lumen. Prolactin is necessary for continued milk production by the mammary alveoli.

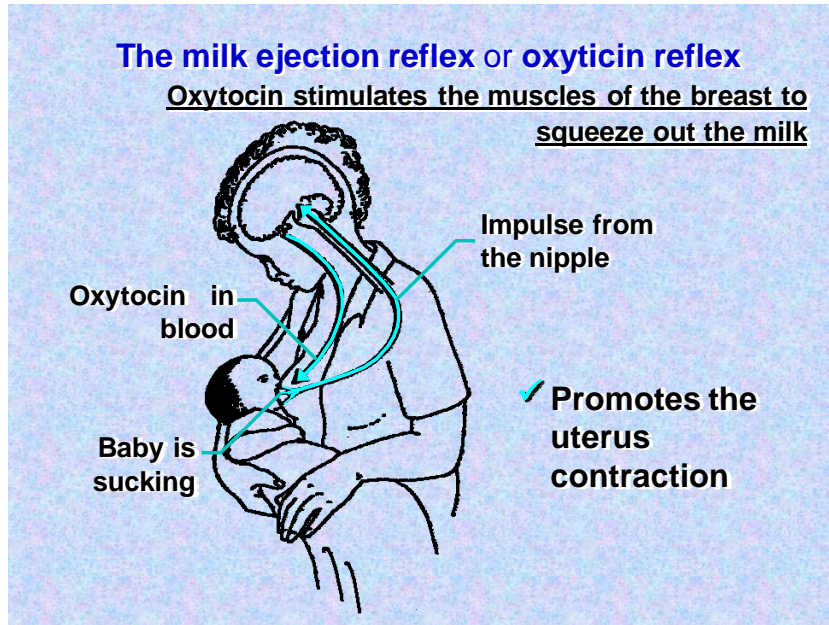


The **let-down reflex**, also known as the **milk ejection reflex**, is caused by the release of the hormone, oxytocin. Oxytocin stimulates the muscles of the breast to squeeze out the milk. The thought of nursing or the sound of any baby can stimulate the let-down reflex, causing unwanted leakage, or both breasts give out milk when one infant is feeding. If the mother is in a stressed or anxious state of mind, this can cause difficulties with breastfeeding.

Causes of a poor let-down reflex:

- Sore or cracked nipples

- Separation from the infant
- A history of breast surgery



After milk supply has been more firmly established, milk production is made on the law of supply and demand - begins the autocrine (or local) control. The more milk removed from the breast, the more milk the breast will produce. Thus milk supply is strongly influenced by how often the baby feeds and well it is able to transfer milk out of the breast. *Adequate milk removal from the breast is absolutely necessary for continued milk production.*

It is becoming increasingly clear that maternal nutrition and other maternal factors play a surprisingly small role in the regulation of human milk production. During weaning, the rate of milk production decreases in proportion to the amount of supplementary food taken in by the infant. These findings are important, because they suggest that **infant factors should be considered first when problems of inadequate milk production are presented.**

Full lactation, or the secretion of mature milk, continues as long as the infant receives substantial quantities of milk from his mother, up to three to four years in

some cultures. When nursing has ceased the gland undergoes partial involution, a process which is only completed after menopause.

Advantages of breast milk

The benefits of breastfeeding are both physical and psychological for both mother and child. Breast milk is the best and ideal food for newborn and infant. Nothing that money can buy is as good for a baby as breastfeeding. Breastfeeding is associated with several advantages.

1. **Provides Complete and Perfect Nutrition.** Breastmilk is a perfect food that cannot be duplicated. It is more *easily digested* than any substitute, and it actually alters in composition to meet the changing nutritional needs of the growing infant. It provides *all the nutrients and water* needed by a healthy infant during the first 6 months of life
2. **Provides Initial Immunization** Breastmilk, especially the first milk (colostrum), contains anti-bacterial and anti-viral agents (antibodies, leukocytes, lactoferrin, etc.) that protect the infant against bacterial and viral infections disease, especially diarrhoea. Breastmilk also aids the development of the infant's own immune system. So the breast-fed infant is more likely to survive.
3. **There is no risk of milk allergy** in infants exclusively breast fed during the early months of life. Milk intolerance is very rare in infants who take only breastmilk.
4. **Beneficial effect for intestinal microflora.** The stool of the breast-fed infant has a pH lower than that of the infant fed cow's milk. The flora of infants fed human milk may protect them against some intestinal infections.
5. **Low osmolarity of breast milk is benefit for undeveloped kidney function of newborn** especially preterm infants, decreases renal excretory load.

6. **Maximizes a child's physical and intellectual potential.** Malnutrition among infants up to six months of age can be eradicated by the practice of exclusive breastfeeding. For young children beyond six months, breastmilk serves as the nutritional foundation to promote continued healthful growth. Premature infants fed breastmilk show higher developmental scores as toddlers and higher IQs as children than those not fed breastmilk.
7. **Breastfeeding is Clean.** Breast milk is always available, ready to serve at the proper temperature, and free of contamination. It does not require the use of bottles, nipples, water and formula which are easily contaminated with bacteria that can cause diarrhoea.
8. **Provides psychological benefits for both mother and child.** Breast feeding promotes close physical and **emotional bonds** between the mother and the baby. The infant feels the warmth of mother's body, and sense a peaceful security. The mother has a very close feeling of union with her child and feels a sense of accomplishment and satisfaction. This leads to better parent-child adjustment, fewer behavioral disorders in children and lesser risks of child abuse by the mother, and reduce rates of infant abandonment.
9. **Helps Birth Spacing.** Frequent and exclusive breastfeeding delays the return of fertility known as lactational amenorrhoea. This allows for improved iron stores and the possibility of natural child spacing.
10. **Benefits Maternal Health.** Breastfeeding reduces the mother's risk of fatal postpartum hemorrhage and anemia; the risk of breast and ovarian cancer. Breastfeeding can also help the mother to return to her previous weight as the fat accumulated during pregnancy is used in milk production.
11. **Economic factors.** Breast-feeding is the most economical form of feeding, although it is not "free" milk because the lactating mother needs a high-protein, high-calorie diet.

12. Is Environment-friendly. Breastfeeding does not waste resources or create pollution. Breastmilk is a naturally-renewable resource that requires no packaging, shipping, or disposal.

Composition of breast milk

- Human milk has very high lactose content.
- Human milk has relatively low casein content. α -lactalbumin and lactoferrin, both are present in mature human milk. The fourth major milk protein is secretory immunoglobulin A (sIgA), also present in mature milk at a concentration of about 0.2 g/dl.
- Although the fat content is highly variable, on the average milk lipids comprise about 4% of human milk. The majority of these lipids are triglycerides.
- Human milk contains very small amounts of macrominerals such as sodium (8 mM), potassium (15 mM), chloride (14 mM), calcium (7 mM) and magnesium (about 1 mM), so it has low osmolarity.

Compositions of breast milk and cow's milk

	Breast milk			Cow's milk
	Colostrum (first 5 days)	Transitional milk (6-10 days)	Mature milk (15days-15mo)	
Calories (kcal/L)	671	735	747	701
Specific gravity	1.034	1.035	1.031	1.031
pH	-	-	7.01	6.6
Ash, total (g/L)	3.08	2.67	2.02	7.15
Protein , total (g/L)	22.9	15.9	10.6	32.46
Casein	21	5.1	3.7	24.9
Whey protein	-	-	7	7
Lactalbumin	-	7.8	3.6	2.4
Lactoglobulin	35	5.1	-	1.7
Blood-serum immunoglobulin	1.0	0.36	0.09	0.8
Carbohydrates				
Lactose (g/L)	57	64	68	47
Fats , total (g/L)	29.5	35.2	45.4	38.0
Vitamins				
Retinol (A) ,µg/L	1600	880	550	270
Carotenes , µg/L	1370	380	200	370
Calciferol (D) µg/L	-	-	1.3-76.0	-
Tocopherol (E) mg/L	14.8	8.9	2.4	0.6
Vitamin K , µg/L	-	-	0.6-9.3	
Thiamine (B1) mg/L	0.02	0.06	0.2	0.43
Riboflavin (B2) mg/L	0.3	0.37	0.6	1.56
Pyridoxine(B6) mg/L	-	-	0.18	0.51
Niacin (PP) mg/L	0.75	1.75	2	
Cyanocobalamin (B12) µg/L	0.45	0.35	0.50	6.6
Folic acid (Bc) µg/L	5	5.7	14	12
Pantothenic acid (B3) mg/L	1.8	2.9	2.4	3.4
Ascorbic acid (C) mg/L	72	70	62	11
Biotin , µg/L	-	-	4.8	22
Choline , mg/L	-	-	50-140	
Minerals				
Calcium , mg/L	481	464	344	1370
Phosphorus , mg/L	124	158	130	910
Sodium , mg/L	410	325	180	768
potassium , mg/L	810	650	455	1430
magnesium , mg/L	36	32	30	130
iron , mg/L	0.85	0.59	0.40	0.45
copper , mg/L	0.65	1.04	0.30	0.1
manganese , µg/L	trace	-	trace	0.02
zinc , mg/L	5.59	3.8	1.4	3.9
Iodine , I, µg/L	45-450	-	20-100	116
chlorine , Cl, mg	890	650	390	1080
fluorine , F, µg/L	-	130	5-100	

**Physiological daily requirements
for food substances and energy in infancy**

The average daily requirements for food substances and energy depend on age of infant, a kind of feeding (breast or artificial) and body weight.

The **protein** requirements rise with age: from 2.2 g/kg of body weight till 3 months to 2.9 g/kg by the 2nd half-year.

The **fat** requirements drop with age from 6.5 g/kg of body weight in first half-year to 5.5 g/kg of body weight in the 2nd half-year.

The **carbohydrate** requirements of infants are constant during first year and consist 13 g/kg.

The average **caloric** requirements of full-term infants are about 100–120 kcal/kg during the first few months of life and about 100 kcal/kg by 1 yr of age; individual variations are significant.

Physiological daily requirements for food substances and energy

Age	Energy, kcal	Proteins, g		Fats, g	Carbohydrates, g
		total	animals		
0-3 mo*	120	2.2	2.2	6.5	13
4-6 mo*	115	2.6	2.5	6.0	13
7-12 mo*	110	2.9	2.3	5.5	13
1-3 yr**	1540	53	37	53	212
4-6 yr**	2000	65	33	58	305

* - per kg of body weight

** - per 24/hr

Fluid requirements are high during infancy. During the first 6 mo of life, they range from 130–190 mL/kg/24 hr and may increase during hot weather.

The requirements for most **vitamins and minerals** are very high during first year of life and increase slightly during toddlerhood. For example, daily requirements for vitamin D are 400-500 IU that is higher in 10 times than in other periods of life.

The child's diet do not demand scrupulous calculation of nutrients, calories and water especially if one contains human milk or its hi-tech substitutes ("formulas") and the child has good appetite, well growth and development.

Calculation of daily caloric and nutrients requirements may be necessary in the following cases:

- For premature newborns
- Children with slow weight gain and bad appetite
- Convalescent from intestinal infections
- Children with intolerance for some food substances, for example, phenylketonuria, and cow's milk intolerance or celiac disease (congenital intolerance for gluten, one of the proteins of some grains: wheat, barley, rye, and oat).

Initiation of breastfeeding

Successful infant feeding requires cooperation between the mother and her baby, beginning with the **initial feeding** experience and continuing throughout the child's period of dependency. Feeding time should be pleasurable for both mother and child.

Breast-feeding should be begun as soon after delivery as the condition of the mother and of the baby permits, preferably within first hour of life.

As soon after birth as an infant can safely tolerate enteral nutrition (normal activity, alertness, suck, and cry), feedings should be initiated to maintain normal metabolism and growth during the transition from fetal to extrauterine life; to promote maternal-infant bonding; and to decrease the risks of hypoglycemia, hyperkalemia, hyperbilirubinemia, and azotemia.



“Place babies in skin-to-skin contact with their mothers immediately following birth for at least an hour and encourage mothers to recognize when their babies are ready to breastfeed, offering help if needed.”

Early initiation of breastfeeding for the normal newborn: *Why?*

- Increases duration of breastfeeding
- Allows skin-to-skin contact for warmth and colonization of baby with maternal organisms
- Provides colostrum as the baby’s first immunization
- Takes advantage of the first hour of alertness
- Babies learn to suckle more effectively
- Improved developmental outcomes

Early initiation of breastfeeding for the normal newborn: *How?*

- Keep mother and baby together
- Place baby on mother’s chest
- Let baby start suckling when ready
- Do not hurry or interrupt the process
- Delay non-urgent medical routines for at least one hour

The schedule of initial feeding in a hospital is less important than the principle of patient assistance and support for the mother. Mothers who wish to initiate breast-feeding in the delivery room and continue **on a demand basis** thereafter should be supported.

Breastfeeding on demand:

Breastfeeding whenever the baby or mother wants, with no restrictions on the length or frequency of feeds.

On demand, unrestricted breastfeeding: *Why?*

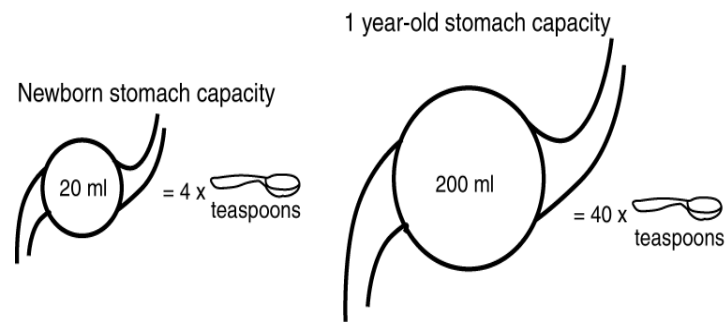
- Earlier passage of meconium
- Lower maximal weight loss
- Breast-milk flow established sooner
- Larger volume of milk intake on day 3
- Less incidence of jaundice

The time that it takes the infant's stomach to empty may vary from 1–4 hr or more; thus, considerable difference in the infant's desire for food is expected at different times of the day. Ideally, the feeding schedule should be based on this reasonable "self-regulation."

Variation in the time between feedings and in the amount taken per feeding is to be expected in the first few weeks during the establishment of the self-regulation plan. By the end of the first month, more than 90% of infants will have established a suitable and reasonably regular schedule.

Infants who cannot be fed on demand should be brought to the mother for feeding about every 3 hr during the day and every 4 hr during the night.

Most term infants will rapidly increase their intake from 30 ml to 80–90 ml every 3–4 hr at 4–5 days of life. Feeding should be considered as having progressed satisfactorily if the infant is no longer losing weight by 5–7 days and is gaining weight by 12–14 days.



It is important to appreciate that infants cry for other reasons besides hunger, and they need not be fed every time they cry; some infants are placid, some are unusually active, and some are irritable. Sick infants are often uninterested in food. Infants who awaken and cry consistently at short intervals may not be receiving enough milk at each feeding or may have discomfort from some cause other than hunger, such as too much clothing; colic; soiled, wet, or uncomfortable diapers and clothing; swallowed air ("gas"); uncomfortably hot or cold environment; or illness. Some infants simply need to be held. Those who stop crying when they are picked up or held do not usually need food, but those who continue to cry when held and when food is offered should be carefully evaluated for other causes of distress.

TECHNIQUE OF BREAST-FEEDING

It is essential for the infant to feed in the correct position and with an adequate latch. While for some people the process of breastfeeding seems natural there is a level of skill required for successful feeding and a correct technique to use. Incorrect positioning is one of the main reasons for unsuccessful feeding and can easily cause pain in the nipple or breast.

There are many positions and ways in which the feeding infant can be held. Most women breastfeed their child in the cradling position.

- **Cradling positions:**



Cradle hold: The baby is held with its head in the woman's elbow horizontally across the abdomen, with the woman in an upright and supported position.



Cross-cradle hold: As above but the baby is held with its head in the woman's hand



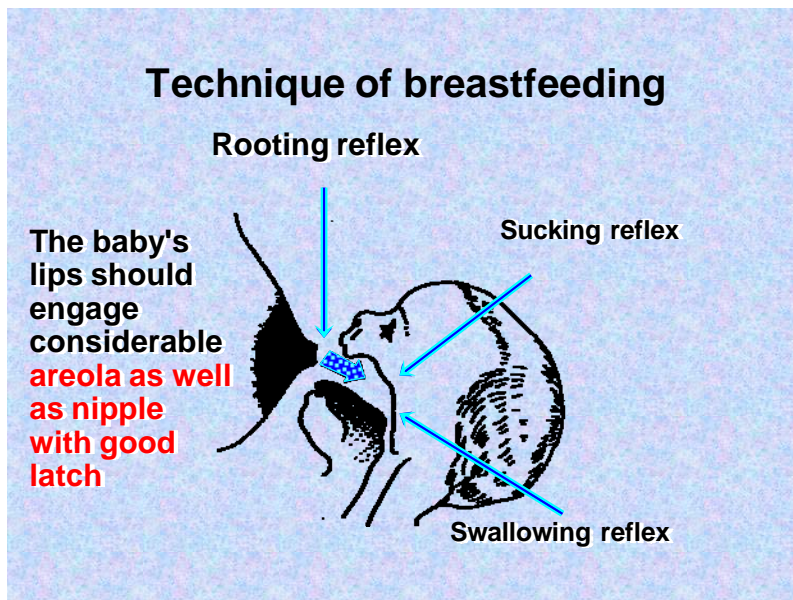
- **Football hold:** The woman is upright and the baby is held securely under the mother's arm with the head cradled in her hands.

- **Lying down:** Good for night feeds or for those who have had a caesarean section.
 - **On her back:** Mother is usually sitting slightly upright;
 - **On her side:** The mother and baby lie on their sides.



- **Mobile:** The mother carries her nursling in a sling or other baby carrier while breastfeeding.
- **Hands and knees:** The mother is on all fours with the baby underneath her (not usually recommended).
- **Tandem breastfeeding** if mother of twins.

At feeding time, the infant should be hungry, dry, neither too cold nor too warm, and held in a comfortable, semisitting position. The mother, too, must be comfortable and completely at ease. When she is able to be out of bed, a moderately low chair with an armrest is preferable, and a low stool is useful for resting her foot and raising her knee on the nursing side. The baby is supported comfortably with the face held close to the mother's breast by one arm and hand while the other hand supports the breast so that the nipple is easily accessible to the infant's mouth and yet does not obstruct the infant's nasal breathing. The baby's lips should engage considerable areola as well as nipple.



The length of feeding is quite variable. Some infants will empty a breast in 5 min; others nurse more leisurely for 20 min. Most of the milk is obtained early in the feeding: 50% in the first 2 min and 80-90% in the first 4 min. The infant should be permitted to suck until satisfied unless the mother has sore nipples.



At the end of the nursing period, the infant should be held erect over the mother's shoulder or on her lap to assist in expelling swallowed air; often this procedure is necessary one or more times during the feeding as well as 5–10 min after. It is an essential procedure during the early months but should not be overdone. When nursing is completed, the infant should be placed in the bed on the back or on the right side to facilitate emptying of the stomach into the intestines and to reduce the chances of regurgitation or aspiration.

Success in infant feeding depends greatly on the adjustments made during the first few days of life. Most problems can be avoided by conforming to the infant's spontaneous pattern.

How to relieve common breastfeeding problems

Common breastfeeding difficulties are:

Nipple problems:

- Sore nipples
- Thrush (candidiasis)
- Flat, retracted, and inverted nipples
- Teething

Breast problems: engorgement, plugged ducts, mastitis

Sore nipples - typically, sore, cracked, bleeding, and possibly blistering nipples are the signs of a poor latch. In pain, the mother will often feel depressed and discouraged about continuing to breastfeed. Here are some remedies for general nipple soreness.

- Warm saline soaks: 1 teaspoon of salt for 1 cup of warm water and soak the nipple for 10 minutes. Air dry the nipple and put on some lanolin.
- Express some milk onto the nipples and let it air dry.

Thrush (candidiasis) – *Candida albicans* the organism usually responsible) is a yeastlike fungal infection that can be acquired from a maternal vaginal infection during delivery, by person-to-person transmission (especially poor hand washing technique) or from contaminated hands, bottles, nipples.

It can cause severe nipple pain, generally described as a burning. The nipple becomes very red or pink, often shiny looking. Often, the baby will display symptoms as well – white patches in the mouth or on the tongue, extensive diaper rash.

Treatment consists of the following:

- Fungicide medication. For the mother – topical application of Nystatin cream or Fluconazole. The baby should be treated simultaneously with Nystatin oral suspension, even if showing no symptoms at all.

Good hygienic care:

- Wash nipples with soap and water daily and always wash hands with warm soapy water.
- After feedings, the mother should rinse her nipples with water and then air dry. She should wear a clean bra every day.
- Boil anything that comes into contact with the baby's mouth and with breast milk for 20 minutes each day (spores are heat-resistant).
- Use plain water to clean the baby's mouth after each feeding before applying the medication and when changing a diaper.
- Add acidophilus to the mother's diet and avoid sugar and bread products.
- Gentian violet is an excellent natural remedy. The yeast protocol for gentian violet is application once a day for 4 to 7 days.

Engorgement is an uncomfortable swelling of the breasts, typically associated with the onset of postpartum milk production. Lactating women can become engorged at any point during the breastfeeding experience, especially during weaning and when the baby begins to sleep longer stretches at night. Engorgement is when your breasts have not relieved themselves of the milk. Symptoms include:

- Onset of swelling between 2 and 10 days
- Rock-hard breasts
- Very warm, painful, tender breasts that have red spots or streaks on them
- Body temperature over 101° F (40° C)
- Very taut areolar tissue, where the baby has trouble latching-on

- Difficulty pumping any milk out of the breasts

The following advices help to alleviate engorgement:

- Breastfeed frequently: Every 2 to 3 hours from the *beginning* of a feed
- Massage, combing from the armpit (the axilla) down toward the nipple
- Use cold packs on the breasts. **No heat!**
- If necessary, after massaging and using ice packs, use a breast pump (if the baby is not able to be fed) to relieve the breasts.

Mastitis is inflammation of the breasts caused by the blocking of the milk ducts. Mastitis cause painful areas on the breasts or nipples and may lead to a fever or flu-like symptoms. It is not necessary to wean a nursling simply because of mastitis; in fact, nursing is the most effective way to remove the blockage and alleviate the symptoms, and is not harmful to the baby. Sudden weaning can cause or exacerbate mastitis symptoms. BF can be continued when mothers have mastitis, with appropriate treatments undertaken.

Contraindications to breastfeeding from infant and mother

There are rare exceptions during which the infant may require other fluids or food in addition to, or in place of, breast milk.

Acceptable medical reasons for supplementation or replacement

Infant conditions:

- Infants who cannot be BF but can receive BM include those who are very weak, have sucking difficulties or oral abnormalities or are separated from their mothers.
- Infants who may need other nutrition in addition to BM include very low birth weight or preterm infants, infants at risk of hypoglycaemia, or those who are dehydrated or malnourished, when BM alone is not enough.

- Infants with galactosemia should not receive BM or the usual BMS. They will need a galactose free formula.
- Infants with phenylketonuria may be BF and receive some phenylalanine free formula.

Maternal conditions:

- BF should stop during therapy if a mother is taking anti-metabolites, radioactive iodine, some anti-thyroid medications or medications that suppress the immune system.
- Breastfeeding can be harmful to the infant if the mother uses potentially harmful substances such as cocaine, heroin and amphetamines.
- Breastfeeding can be harmful to the infant if the mother has HIV or active tuberculosis
- BF is not recommended when a mother has a breast abscess or herpes lesions on her breasts.
- BF is not encouraged for mothers with Human T-cell leukaemia virus.

Expression of Breast Milk is artificially removing milk through manual massage or the use of a breast pump. Expression can be used to maintain lactation when the mother and child are separated for an extended period. If the baby is unable to feed, expressed milk can be fed through a nasogastric tube. Expressed milk can also be used to help a mother who is having difficulty breastfeeding such as engorgement of the breasts or sore nipples. Pumping can increase milk production and relieve sore nipples for a few feedings because it does not cause the same nipple irritation that suckling may.





Manual breast pump

Expressed milk can be kept in supplemental nursing system or a bottle for up to **6 hours**, refrigerated for up to **3 days** or frozen for up to **4 months**. Research suggests that antioxidant activity in expressed breast milk decreases over time but it still remains in higher levels than in infant formula.

Establishing and maintaining the milk supply

PSYCHOLOGIC FACTORS. No factor is more important than a happy, relaxed state of mind. Worry and unhappiness are the most effective means for decreasing or abolishing breast secretions.

FATIGUE. Avoiding fatigue is important, but the mother should exercise sufficiently to promote her sense of physical well-being.

HYGIENE. Once a day, the breasts should be washed. If soap is drying to the nipple and areolar area, it should be discontinued. The nipple area should be kept dry. Care should be taken to prevent irritation and infection of the nipples caused by prolonged initial nursing, maceration from wetness of the nipple, or rubbing of clothing.

DIET. The diet should contain enough calories to compensate for those secreted in the milk as well as for those required to produce it. The Subcommittee on Nutrition during Lactation advises approximately 1500–1800 calories per day. The nursing mother needs a varied diet, high in fluid, vitamins, and minerals. Milk is important but should not replace other essential foods. If the mother is allergic to

or dislikes milk, 1 g of calcium may be added to her daily diet. The fluid intake should approximate 2.5 L daily; urinary output is a good measure of the adequacy of fluid in the daily diet.

The idea that substances such as milk, beer, oatmeal, and tea are galactogenic is mistaken.

There are no foods which are absolutely contraindicated during lactation, although a baby may show sensitivity to particular foods in the mother's diet. Some breastfeeding advisers suggest mothers avoid certain gas producing food, such as beans, if the baby starts to develop colic or gas. Singular foods in the mother's diet seldom disturb the breast-fed infant. Occasionally, however, eating certain berries, tomatoes, onions, members of the cabbage family, chocolate, spices, and condiments may cause gastric distress or loose stools in the infant. No food need be withheld from the mother unless it causes distress to the infant.

Whenever possible, nursing mothers should not take drugs, because many preparations are harmful to the neonate and many have not been evaluated. Smoking cigarettes and drinking alcoholic beverages should be discouraged.

The Baby-Friendly Hospital Initiative (BFHI), a joint UNICEF and WHO initiative established in 1989 the ***Ten Steps to Successful Breastfeeding***

Step 1. Have a written breastfeeding policy that is routinely communicated to all health care staff.

Why have a policy? Helps establish consistent care for mothers and babies.

It should include an institutional ban on free or low cost supplies of breast-milk substitutes, bottles, and teats and its distribution to mothers

It should be posted or displayed in areas where mothers and babies are cared for.

Step 2. Train all health-care staff in skills necessary to implement this policy.

Areas of knowledge

- Advantages of breastfeeding
- Risks of artificial feeding
- Mechanisms of lactation and suckling
- How to help mothers initiate and sustain breastfeeding
- How to assess a breastfeed
- How to resolve breastfeeding difficulties

Step 3. Inform all pregnant women about the benefits of breastfeeding.

Antenatal education should include:

- Benefits of breastfeeding
- Early initiation
- Importance of rooming-in (if new concept)
- Importance of feeding on demand
- Importance of exclusive breastfeeding
- How to assure enough breastmilk
- Risks of artificial feeding and use of bottles and pacifiers (soothers, teats, nipples, etc.)
- Prevention of mother-to-child transmission of HIV

Step 4. Help mothers initiate breastfeeding within a half-hour of birth

Step 5. Show mothers how to breastfeed and how to maintain lactation, even if they should be separated from their infants

Supply and demand

- Milk removal stimulates milk production.
- The amount of breast milk removed at each feed determines the rate of milk production in the next few hours.
- Milk removal must be continued during separation to maintain supply.

Step 6. Give newborn infants no food or drink other than breast milk unless *medically* indicated.

Influence of routine formula supplementation

- Decreased frequency or effectiveness of suckling
- Decreased amount of milk removed from breasts
- Delayed milk production or reduced milk supply
- Some infants have difficulty attaching to breast if formula given by bottle

Step 7. Practice rooming-in — allow mothers and infants to remain together — 24 hours a day.

Rooming-in

A hospital arrangement where a mother/baby pair stay in the same room day and night, allowing unlimited contact between mother and infant

Rooming-in *Why?*

- Reduces costs
- Requires minimal equipment
- Requires no additional personnel
- Reduces infection
- Helps establish and maintain breastfeeding
- Facilitates the bonding process

Step 8. Encourage breastfeeding on demand.

Step 9. Give no artificial teats or pacifiers (also called dummies and soothers) to breastfeeding infants.

Alternatives to artificial teats

- cup
- spoon
- dropper
- Syringe

Step 10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

“The key to best breastfeeding practices is continued day-to-day support for the breastfeeding mother within her home and community.”

Support can include:

- Early postnatal or clinic checkup
- Home visits
- Telephone calls
- Mother support groups
- Family support system

Effect of training is 70% of 5 month old infants were exclusively breastfeeding, versus 6% in control group.

How to assess effectiveness of breastfeeding?

Signs of a Well-Fed Newborn

- At least 8 breastfeeds every 24 hours (10-12 in newborns)
- Obviously swallowing during the feeds
- Seems happily satisfied after the feeds
- No meconium faeces by Day-5.
- No constipation.
- Adequate diuresis: Six (6) to eight (8) wet cloth diapers in 24 hours.
- Baby should regain his weight birth by the second week. Gain at least 110-200 g per week after the fourth day of life. Thereafter gaining 100g-200g per week, 600-800 g per first month.

The average breastfed baby doubles birth weight in 5-6 months.

Signs of an Underfed Baby

- Continues to lose weight after day-5
- Below birth weight at day-14
- Gaining less than 500-600g per first month.
- Less than six wet nappies daily - oliguria
- Urine that is yellow and strong smelling
- Infrequent dry, hard, green stools or constipation
- Worried-looking face

- Unusually lethargic and sleepy
- Weak cry

WEANING. Weaning is the process of gradually introducing the infant to what will be its adult diet and withdrawing the supply of milk. Most infants gradually reduce the volume and frequency of their demand for breast-feedings at 6–12 mo of age. As they demand less breast milk, the mother's supply gradually diminishes, causing the mother no discomfort from engorgement. Weaning should be initiated by substituting formula by bottle or cup for part of a breast-feeding and subsequently for all of a breast-feeding. Over several days, one of the breast-feedings is replaced and then subsequently another, and so on, until the infant is weaned completely. These changes should be made gradually, for they should provide a pleasant experience, not a conflict, for the mother and infant. Praise, loving attention, and cuddling are vital to successful weaning.

When cessation of nursing is necessary at an earlier age, a tight breast binder may be used and ice bags may be applied for a few days to decrease milk production. Restriction of the mother's fluid intake is also helpful. Hormones, such as small doses of estrogen for 1–2 days (dospinex ½ tab.BID 2-3 days), also may help decrease milk production at the termination of nursing.

The infant is considered to be fully weaned once it no longer receives any breast milk and begins to rely on baby food or other solid foods for all its nutrition.

Tests for self-control (Breastfeeding)

Directions: Select the ONE lettered answer or completion that is BEST in each case.

1. The WHO recommends that the best form of infant nutrition is:

- A. Exclusive breast-feeding until 1 year of age
- B. Exclusive breast-feeding until 2 year of age
- C. Exclusive breast-feeding until 6 months of age
- D. Commercially prepared infant formula until 1 year
- E. Commercially prepared infant formula until 4 to 6 months of age

2. Breastfeeding on demand is:

- A. Breastfeeding whenever the baby wants
- B. Breastfeeding whenever the mother wants
- C. Breastfeeding whenever the baby or mother wants, with restrictions on the length of feeds.
- D. Breastfeeding whenever the baby or mother wants, with restrictions on the frequency of feeds.
- E. Breastfeeding whenever the baby or mother wants, with no restrictions on the length or frequency of feeds.

3. Choose three factors are necessary for successful lactogenesis:

- A. a developed mammary epithelium,
- B. continued high plasma prolactin levels,
- C. continued high plasma progesterone level
- D. continued high plasma estrogen level
- E. decreased in progesterone and estrogen levels.

4. What hormone does stimulate the ducts grow (lengthening and branching of the mammary ducts) and causes enlargement of the mammary fat pad?

- A. Estrogen
- B. Prolactin
- C. Progesterone
- D. Oxytocin
- E. Placental lactogen

5. Which hormone is necessary for the milk ejection reflex that extrudes milk from the alveolar lumen?

- A. Estrogen
- B. Prolactin
- C. Progesterone
- D. Oxytocin
- E. Placental lactogen

6. What is one of the main reasons for unsuccessful feeding which can easily cause pain in the nipple or breast?

- A. Feeding on demand

- B. Incorrect positioning and a poor latch
- C. Early initiation of breastfeeding
- D. Small mammary glands
- E. Good baby's appetite

7. There are many positions and ways in which the feeding infant can be held. Which position most women breastfeed their child in?

- A. the cradle hold
- B. cross-cradle hold
- C. football hold
- D. lying down
- E. mobile

8. What breastfeeding difficulty is a result of a poor latch?

- A. Sore nipples
- B. Thrush (candidosis)
- C. Flat, retracted, and inverted nipples
- D. Plugged ducts
- E. Mastitis

9. Oral candidiasis (thrush) in the neonate is which of the following?

- A. Bacterial infection that is life threatening in the neonatal
- B. Yeastlike fungal infection of mucous membranes that is relatively common
- C. Bacterial infection of mucous membranes that responds readily to treatment
- D. Benign disorder that is only transmitted from mother to infant during the birth process

10. The nurse is assessing a 3-day-old breast-fed newborn who weighed 3400 g at birth. The infant's mother is now concerned because the infant weighs 3147 g. the most appropriate nursing intervention is which of the following?

- A. Recommend supplemental feeding of formula.
- B. Explain that this weight loss is within normal limits.
- C. Assess child further to determine cause of excessive weight loss.
- D. Encourage mother to express breast milk for bottle-feeding infant.

11. Nursing mother has sore, cracked, bleeding, and blistering nipples. Your advice will be:

- A. Breastfeed frequently
- B. Recommend supplemental feeding of formula
- C. The infant should be permitted to suck until satisfied
- D. Express breast milk for spoon-feeding infant for a few feedings
- E. Apply ice pack on the breast.

12. Which of the following vitamins is in higher concentration in cow's milk than in human milk?

- A. A

- B. C
- C. E
- D. K
- E. B₆

13. The best source of iron for 1-month-old infants is

- A. iron fortified cereals
- B. yellow vegetables
- C. fruits
- D. breast milk
- E. 2% low-fat cow's milk

14. All following sentences about breast milk are true, EXCEPT:

- A. Gastrointestinal allergy less common
- B. Free of bacterial contamination
- C. Associated with prolonged unconjugated hyperbilirubinemia
- D. Higher carbohydrate concentration but lower protein concentration
- E. Associated with increased incidence of colic and eczema

15. There are relatively few contraindications for breast-feeding. Which of the following is a contraindication for breast-feeding?

- A. Mastitis
- B. Maternal asthma
- C. Acute respiratory infection
- D. HIV-positive mother
- E. None of the above

16. What mother's condition is not contraindication to nursing?

- A. Profuse hemorrhage
- B. Active tuberculosis and malaria
- C. Urinary tract infection
- D. Typhoid fever
- E. Septicemia

17. The nursing mother should avoid some foods may cause gastric distress or loose stools in the infant. What from following products may she eat?

- A. berries
- B. cheese
- C. onions
- D. spices and condiments

- E. tomatoes and cabbage
18. What sentence about colostrum is false?
- A. has a deep lemon yellow color
 - B. contains several times the protein of mature breast milk
 - C. contains more minerals than mature breast milk
 - D. contains less carbohydrate than mature breast milk
 - E. contains more fat than mature breast milk
19. The energy value of breast milk is approximately:
- A. 480 kcal/L
 - B. 550 kcal/L
 - C. 670 kcal/L
 - D. 760 kcal/L
 - E. 820 kcal/L
20. The average caloric requirements of full-term infants during the first year of life are:
- A. 45 -50 kcal/kg
 - B. 50 – 60 kcal/kg
 - C. 60 – 70 kcal/kg
 - D. 80 – 100 kcal/kg
 - E. 100 -120 kcal/kg
21. The daily fat requirements of full-term infants in the first half-year of life are (g/kg):
- A. 4.5-5.5
 - B. 5.0-5.5
 - C. 5.5-6.0
 - D. 6.0-6.5
 - E. 6.5-7.0
22. Breastfeeding on demand, unrestricted breastfeeding promotes all the following EXCEPT:
- A. Lower maximal weight loss
 - B. Breast-milk flow established sooner
 - C. Earlier passage of meconium
 - D. Less incidence of jaundice
 - E. Reduced milk supply
23. When mother should initiate breastfeeding for the normal newborn?
- A. within a half-hour of birth
 - B. in 2 hours
 - C. in 6 hours
 - D. in 12 hours
 - E. in 24 hours

24. What is more common first-year feeding problem?
- A. overfeeding
 - B. underfeeding
 - C. vomiting
 - D. diarrhea
 - E. colic
25. What infants should not receive breast milk?
- A. Preterm infants
 - B. Infants with oral abnormalities
 - C. Dehydrated infants
 - D. With galactosemia
 - E. Separated from their mothers
26. The secretion of the breasts during the latter part of pregnancy and for the 2-4 days after delivery is called:
- A. a transitional form of milk
 - B. mature breast milk
 - C. colostrums
 - D. premature form of milk
27. Protective effects of breast milk against infection associated with present all following components EXCEPT:
- A. secretory Ig A antibodies
 - B. macrophages, complement
 - C. vitamin C
 - D. lysozyme
 - E. lactoferrin
28. A hospital arrangement where a mother/baby pair stay in the same room day and night, allowing unlimited contact between mother and infant promotes all the following EXCEPT:
- A. Reduces infection
 - B. Helps establish maintain breastfeeding
 - C. Facilitates the bonding process
 - D. Requires additional personnel
 - E. Reduces costs
29. Why personnel should help mother initiate breastfeeding for the normal newborn within a half-hour of birth? All the following statements are correct EXCEPT:
- A. Allows skin-to-skin contact for warmth and colonization of baby with maternal organisms
 - B. Delay non-urgent medical routines for at least one hour
 - C. Provides colostrums as the baby's first immunization
 - D. Babies learn to suckle more effectively
 - E. Milk removal stimulates milk production
30. What does not influence for the milk production and milk composition?
- A. Mother's health
 - B. Fatigue
 - C. The mammary shape
 - D. Mother's diet

- E. Psychologic factors (worry, unhappiness, happy, relaxed state of mind)
31. What should be the length of feeding for newborn?
- A. 5 min
 - B. 10 min
 - C. 20 min
 - D. 30 min
 - E. The infant should be permitted to suck until satisfied unless the mother has sore nipples
32. What is time of stomach empty for breastfeed infant?
- A. 0.5 – 1 hour
 - B. 1.5 hour
 - C. 2 – 2.5 hours
 - D. 2.5 - 3 hours
 - E. 3 – 3.5 hours
33. The daily protein requirements of full-term infants in the first 3 months of life are:
- A. 1 g/kg
 - B. 2.2 g/kg
 - C. 2.5 g/kg
 - D. 3.0 g/kg
 - E. 4.0 g/kg
34. The daily carbohydrate requirements of full-term infants in the first year of life are (g/kg):
- A. 3.0-3.5
 - B. 4.0-4.5
 - C. 5.0-6.0
 - D. 6.5-7.0
 - E. 12-14
35. The newborn's sterile intestinal tract is unable to synthesize the vitamin K until feeding has begun. As a result of vitamin K deficiency within 1 to 5 days of life in newborn may appear:
- A. Vomiting
 - B. Diarrhea
 - C. Constipation
 - D. Hematemesis or melena
 - E. Jaundice
36. A pregnant woman plans to breast-feed her baby. She has read of the nutritional, psychological, and immunologic advantages but recalled breast-fed babies might still require vitamin supplementation. You recommend she supplement the baby's nutrition with:
- A. Vitamin A
 - B. Vitamin E
 - C. Vitamin C
 - D. Vitamin B₁
 - E. Vitamin D

37. The mother's milk supply is probably inadequate, if the infant:

- A. nurses avidly and completely empties both breasts but appears unsatisfied afterward
- B. does not go to sleep or sleeps fitfully and awakens after 1–2 hr
- C. fails to gain weight satisfactorily
- D. the skin becomes dry and wrinkled, subcutaneous tissue disappears
- E. all the above

. What's a situation where mom may want to delay weaning?

- A. If the child isn't potty trained
- B. If mother is under stress from work or relationships
- C. If child is ill*
- D. If holiday is coming up and mom want your child to enjoy it fully

Breast pumping stimulates milk production because:

- A. Breast milk works on a supply/demand basis – the more express, the more you make*
- B. The process of breast pumping helps relax the mother
- C. Breast pumping creates room in the breast for new milk
- D. Breasts are trained to produce milk faster when they are pumped

What is the best treatment for clogged milk ducts?

- A. Rub lanolin over the sore lump
- B. Nurse as much as possible*
- C. Stop nursing and feed baby with formula
- D. Drain breast using a breast pump

Nursing mothers are strictly prohibited from eating:

- A. tuna fish sandwiches
- B. tomatoes
- C. beans
- D. chocolate
- E. No food need be withheld from the mother's diet unless it causes distress to the infant*

When the weaning process is considered complete?

- A. When the baby indicates a preference for formula
- B. When the baby first eats solid food
- C. When the baby gets all its nutrition from sources other than breast milk*
- D. When it eats solid food 3 times or more daily

A new mother presents for her baby's 2-week well child visit with concerns that she may not be able to continue breastfeeding her baby. She states her nipples are very sore and cracked. You inquire about her feeding techniques and discover she nurses her baby about 20-25 min on each breast each feeding. You encourage her and inform her that the optimal time a baby should nurse on each breast is:

- A. 40-50 min
- B. 30-40 min
- C. 20-30 min
- D. 10-20 min
- E. 5-10 min*

Which of the following are power benefits of extended breastfeeding?

- A. Extended breastfeeding has led to fewer infants illnesses
- B. Children who have been nursed for longer are more independent
- C. Women who nurse for longer have a lower risk of breast cancer
- D. All of the above*

When cessation of nursing is necessary at an earlier age (contraindication to breastfeeding), what may help decrease milk production at the termination of nursing?

- A. a tight breast binder may be used

- B. ice bags may be applied for a few days
- C. Restriction of the mother's fluid intake
- D. small doses of estrogen for 1–2 days
- E. all of the above*.

Answers for tests (breastfeeding)

1	C	11	D	21	B	31	E
2	E	12	D	22	E	32	C
3	A, B, E	13	D	23	A	33	B
4	A	14	E	24	E	34	E
5	D	15	D	25	D	35	D
6	B	16	C	26	C	36	E
7	A	17	B	27	C	37	E
8	A	18	E	28	D		
9	B	19	C	29	B		
10	B	20	E	30	C		

FORMULA OR ARTIFICIAL FEEDING

If breastfeeding is not possible, infant formula can be fed to an infant by bottle. Hospitals that are accredited by the World Health Organization are tolerant of formula feeding but do not offer it to infants who can be breastfed.

Artificial feeding is feeding a child with infant's formula, based on cow milk, while breast milk is either completely absent or is less than 1/5 of daily quantity.

Artificial feeding leads to digestion and metabolism reorganization. As a result an organism accommodates to a new type of food. Although breast-feeding is the best for normal infants, many infants receive formula from birth.

Most formula available today has cow's milk as its main ingredient. The

protein in the milk is significantly altered to make it easier to digest, because young baby won't be ready to digest regular cow's milk until after his first birthday.

There are differences between breast milk and cow's milk. Human milk has very high lactose content and relatively low protein content. Although fat level is same, there is qualitative difference fat content in human and cow's milk.

Macronutrient Composition of Human Milk

Human vs. Bovine Milk Composition

Component	Human Milk	Bovine Milk
Carbohydrates		
Lactose	7.3 g/dl	4.0 g/dl
Oligosaccharides	1.2 g/dl	0.1 g/dl
Proteins		
Caseins	0.2 g/dl	2.7 g/dl
α -Lactalbumin	0.2 g/dl	0.1 g/dl
Lactoferrin	0.2 g/dl	Trace
Secretory IgA	0.2 g/dl	0.003 g/dl
β -Lactoglobulin	None	0.36 g/dl
Milk Lipids		
Triglycerides	4.0 %	4.0 %
Phospholipids	0.04 %	0.04 %
Minerals		
Sodium	5.0 mM	15 mM
Potassium	15.0 mM	45 mM
Chloride	15.0 mM	35 mM
Calcium	8.0 mM	30 mM
Magnesium	1.4 mM	4.0 mM

BMS or cow's-milk-based formulas are modified from a cow's milk base and their protein and total minerals levels are **reduced** nearer to those of human milk, thus decreasing osmolality and renal excretory load. Some formulas include higher whey protein and lower casein, such as in breast milk. The saturated fat of cow's milk is **replaced** with some unsaturated vegetable fatty acids, and vitamins are **added**. The concentration of lactose is lower in cow's milk than in human milk. Carbohydrates are **added** to formula.

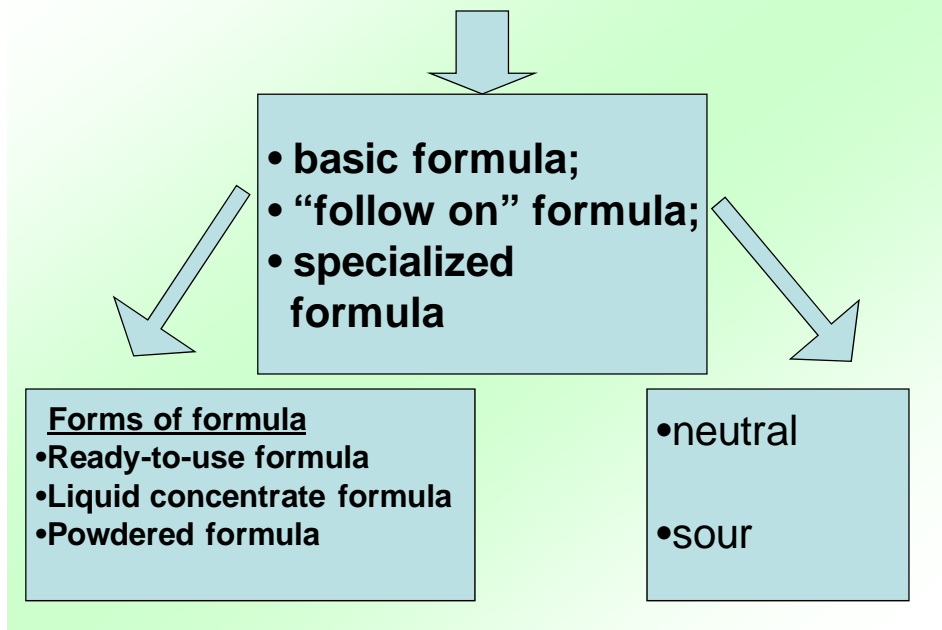
The main steps to creating a breast milk substitute from cow milk are:

- Total protein content is decreased (from 2.8-3.2g/100ml in cow milk to 1.5-1.8 g/100ml in final formula). Protein and amino acids contents are corrected (whey proteins, cysteine, taurine are added etc.). **Cysteine** is important for central nervous system development. **Taurine** is made from cysteine, and taurine is needed in the infant for brain development and function, retinal development and function, and conjugation of bile salts.
- Adaptation of lipid component includes partial or complete substitute of cow milk fat with a mixture of natural vegetable oils, which significantly raises the content of polyunsaturated essential acids of omega-6 (linolic acid) and omega-3 (linolenic acid). Small amounts of natural emulgators (lecithin, mono- and diglycerides) and carnitin are added.
- Increasing the level of carbohydrates. Lactose is added to substitute to adapt the carbohydrate component.
- Total mineral content is decreased in substitutes (calcium (Ca), sodium (Na), potassium (K)). The calcium and phosphorus ratio is provided to optimal (not less than 2:1); it is necessary for effective Ca absorption. Most formulas are fortified with iron. Modern substitutes of breast milk contain all necessary minerals (zinc, cuprum, iodine etc.).
- Enriching with a vitamin complex. Modern substitutes of breast milk contain all necessary vitamins in adequate and balanced quantity.
- bifidogene factors are added in some BMS.

Classification of breast milk substitutes

Breast milk substitutes are divided into basic formula; follow on formula, and specialized formula.

Classification of breast milk substitutes



Breast milk substitutes may be dry (powdered) and liquid (ready to use and concentrate), neutral and sour milk. Formulas come in three basic forms: ready-made, concentrate, and powdered.

Ready-to-use formula is the most convenient — no mixing or measuring required, just open and serve. It's hygienic and especially helpful in circumstances where you might not have access to safe water. It's also a good choice if baby was born with a very low birth weight or is immuno-compromised, because it's sterile. But for everyday use formula is expensive (costs about 25 percent more than powdered formula). Once opened, ready-to-use formula has a short lifespan — it must be used within 48hours.

Liquid concentrate formula requires mixing equal parts of water and formula, so read the instructions on the container carefully. Compared to ready-to-use formula, concentrate is less expensive and takes up less storage space. Compared to powdered formula, it's a little easier to prepare but more expensive.

Powdered formula is the most economical choice and the most environmentally friendly. It has a one-month life after the container has been opened. Besides, mom

can mix up just the right amount whenever she needs it — as much or as little as she wants — which is especially helpful for breastfeeding mom who may only need an occasional supplemental bottle for her baby.

Powdered formula takes more time to prepare than other types of formula, and mother must follow the directions exactly.

The basic formula is maximally closed to woman's milk content and corresponds to the peculiarities of infant's metabolism. It is used for infant feeding from first days of life. Figure "1" indicates basic formulas.

The basic formulas are: "Nan-1" (Switzerland), "Nutrilon-1" (Holland), "HiPP-1"(Austria), "Frisolak-1" (Holland), "Humana-1", "Lasana-1" (Germany), "Samper-Baby-1" (Sweden) and etc.

The "follow on" formula is used for infant feeding from 6 months of life and characterized less degree of adaptation (less closed to the breast milk).

The energy value and the content of protein are higher than in basis formula, what corresponds to the growing requirements for nutrients and energy of a second-half-year child. The "follow on" formula has a high content of iron, one of the effective ways of prevention the iron-deficiency anemia, which often occurred in children of the second half year of life due to running out of iron depot, stored during fetal life. The "follow on" formula contains all the necessary vitamins and minerals for the second half-year child.

Figures "2" and "3" indicate the "follow on" formula: "Hipp-2" (Austria), "Nan-2" (Holland), "Nutrilon-2" (Holland), "Gallia-2" (France), "Samper-Baby-2" (Sweden), Malutka, Malush (Ukraine), etc.

Formulas marked figure "3" are recommended for infants from 10 months and may be used during second year of life.

Choosing a formula for a child you should take into consideration:

- The age of a child - during the first 2-3 weeks of life a child should be given neutral formula and then evenly combined neutral and sour milk formula.
- The degree of formula adaptation - the younger infant needs more adapted formula; the "follow on" formula should not be given for a child before 6 months.
- Individual formula tolerance.

Specialized formulas

- **For premature and low-birth-weight babies:** often contain more calories and protein, as well as a more easily absorbed type of fat called medium-chain triglycerides. Examples: *Similac Special Care*, *Enfamil Premature LIPIL*, *Similac Expert Care NeoSure*, *Friso-pre*, *Humana HA-0*.
- **Soy-based formula:** if baby has trouble digesting cow's milk protein, if baby has colic, if parents are a vegan. These are made with a plant protein that is modified for easy digestion by babies. Examples: *NAN Soy*, *Humana-SL*, *Similac Isomil*, *Enfamil ProSobee*, *Nestle Good Start Soy*.
- **Lactose-free formula:** in which the lactose is replaced with a different sugar, such as corn syrup. Some babies may not have enough lactase, the enzyme used to digest the milk sugar lactose. If baby is lactose-intolerant or unable to digest lactose - for infants with diarrhea, galactosemia, celiac disease. Because these babies don't digest milk sugars well, they may be fussy or cry excessively (colic). Lactose-free formulas may help these babies cry less and feel more comfortable. Examples: *Similac Sensitive*, *Enfamil LactoFree*.
- **Hypoallergenic formulas:** Some babies are allergic to both cow's milk proteins and soy proteins. Hypoallergenic formulas contain pre-digested proteins, so babies who are allergic to milk proteins are usually able to tolerate hypoallergenic blends. These products are also lactose-free (see

below). Examples: *HiPP-HA*, *Humana-HA*, *Similac Alimentum*, *Enfamil Nutramigen*.

- **Extensively hydrolyzed formula:** In these the protein is broken down into smaller parts that are easier for baby to digest. If baby has an allergy or trouble absorbing nutrients. Some babies with severe stomach problems may not be able to break down even the predigested proteins found in hypoallergenic formulas. For these infants, a formula that contains free amino acids) may be the only option. Amino acid formulas are suitable for children who have severe or life-threatening food allergies, who have had surgery on their intestines, or who have other severe gastrointestinal problems. These products are lactose-free and may contain special fats for children who have difficulty absorbing fats from regular formulas. Examples: *Alfare*, *Enfamil Nutramigen LIPIL*.
- **Metabolic formulas:** recommended if baby has a disease that requires very specialized nutrition. Infants with phenylketonuria - phenylalanine free formula. Examples: *Lophenolak*, *Phenyl-free (USA)*, *Aphenylak (Russia)*.
- **Formulas with probiotics or/and prebiotics:** There is insufficient evidence to determine the role of prebiotic supplementation of infant formula for prevention of allergic disease and food hypersensitivity. Supplementation of infant formula with prebiotic oligosaccharides losses reported a reduction in eczema in high risk formula fed infants. Although, there is not enough evidence to state that supplementation of term infant formula with synbiotics, probiotics or prebiotics does result in improved growth or clinical outcomes in term infants.

Technique of formula feeding

The setting should be similar to that for breast-feeding, with the mother and infant in a comfortable position. The infant should be hungry, fully awake, warm, and dry and be held as though being breast-fed.

The bottle should be held so that milk, not air, channels through the nipple. Bottle propping should be avoided because it not only deprives the infant of the physical contact, comfort, and security but may also be dangerous to small infants, who may aspirate.



The bottle of milk is usually warmed to body temperature. The temperature may be tested by dropping milk onto the wrist. The nipple holes should be of the size so that milk will drop slowly.

A feeding may last from 5–25 min, depending on the age of the infant. Because the appetite varies from one feeding to another, each bottle should contain more than the average amount taken per feeding. In no case should the infant be urged to take more than desired, and excess milk should be discarded.

Especially during the first 3-6 mo of life, the eructation of air swallowed during feeding is important for avoiding regurgitation and abdominal discomfort. This technique is similar to that described after breast-feeding. All infants will, at times, regurgitate or "spit up" a small amount of milk after feeding. Spitting up occurs more often in the artificially fed than in the breast-fed infant.

Number of feedings daily. The number of feedings required per day decreases throughout the first year; by 1 yr of age, most infants are satisfied with 4-5 meals/day. The interval between feedings differs considerably among infants but, in general, ranges from 3–5 hr during the first year of life, averaging 4 hr for full-term, healthy infants. Small or weak infants may prefer feedings at 2- to 3-hr intervals.

For the 1st mo or 2, 8-10 feedings are taken throughout the 24-hr period, but thereafter the infant usually sleeps for longer periods at night.

Average Daily Number of Feedings	
Age	Average No. of Feedings in 24 hr
Birth-1 wk	10-12
1 wk-1 mo	8-10
1-3 mo	6-7
3-6 mo	6
7-12 mo	5

During artificial feeding a child may be underfed, as well as overfed (which occurs more often). That's why pediatrician should systematically control feeding by clinical data, which characterize general condition and development of a child, weight to height ratio. Besides you should count the amount of food and the quantity of nutrients per kg of weight, if it needs.

Daily volume of feeding

Age of child	Necessity volume(ml) of food per 1 day	Note
2 weeks to 2nd month	1/5 of body weight	Daily volume of feeding should not be more than 1 liter!
2 -4th month	1/6 of body weight	
4-6 months	1/7 of body weight	
older than 6 months	1/8 (not more 1000ml/24 hrs)	

Example: A 6-week-old infant has weight 4000 g

Daily volume of feeding is: $4000 / 5=800$ (ml per day)

If number of feeding is 6 - average quantity of feeding is: $800 / 6=133$ (ml)

Mother should prepare 150 ml formula (1 spoon powdered formula is diluted in 30 ml of water).

The requirements for proteins, fats and carbohydrates for the child fed adapted formula are same breastfed child.

Quantity of formula. Although the quantity taken at a feeding varies with different infants of the same age and with the same infant at different feedings, it is important to know the average amounts taken at various ages.

Average Quantity of Feedings	
Age	Average Quantity Taken in Individual Feedings
1st and 2nd wk	2-3 oz (60-90 mL)
3 wk-2 mo	4-5 oz (120-150 mL)
2-3 mo	5-6 oz (150-180 mL)
3-4 mo	6-7 oz(180-210 mL)
5-12 mo	7-8 oz (210-240 mL)

It is not recommended to use more than 1 L of milk per day. By the time the infant is taking these quantities, other foods will be added to the diet in increasing amounts. Ingesting more milk has no advantage, but the disadvantage is that other essential foods may be displaced.

Tests

Artificial feeding

Directions: *Select the ONE lettered answer or completion that is BEST in each case.*

1. Cow's milk contains less than breast milk:
 - A. proteins
 - B. carbohydrate
 - C. total mineral content
 - D. casein
 - E. vitamin K
2. Cow's milk contains more than breast milk:
 - A. whey proteins
 - B. lactose
 - C. total proteins
 - D. fat
 - E. vitamins D and C
3. How cow's milk is modified to creating adapted breast milk substitute?
 - A. minerals level is raised
 - B. the saturated fat of cow's milk is replaced with some unsaturated vegetable fatty acids
 - C. lactose level is reduced
 - D. vitamins are modified
 - E. protein level is raised
4. A 3-mo-old infant is artificial feed with adapted formula. What is approximate daily volume of feeding form child if his weight is 5400g?
 - A. 400 ml
 - B. 500 ml
 - C. 600 ml
 - D. 700 ml
 - E. 900 ml
5. The ratio of Ca:P in breast milk and adapted breast milk substitute is:
 - A. 2:1
 - B. 1:1
 - C. 1:2

- D. 1:3
E. 2:3
6. Choose the most appropriate formula for health 4-mo-old infant:
- A. "Semper-Baby-2"
 - B. "Alfare"
 - C. "Hipp-2"
 - D. "Humana-1"
 - E. "Malyutka"
7. High adapted breast milk substitute contains:
- A. High casein level
 - B. Saccharose and starch
 - C. High level whey protein
 - D. High level saturated acid fats
 - E. antibodies
8. Choose extensively hydrolyzed formula:
- A. "Alfare" (Holland)
 - B. "Malysh" (Ukraine)
 - C. "Nestogen" (Switzerland)
 - D. "Pre-Hipp (Austria)
 - E. "Nutrilon-2"(Holland)
9. lactose-free formula should be recommended for:
- A. Preterm infant
 - B. Infant with allergy to cow's protein
 - C. Infant with phenylketonuria
 - D. Infant with diarrhea
 - E. Infant with constipation
10. A 1-mo-old infant is artificial feed with adapted formula. What is approximate daily volume of feeding form child if his weight is 3500g?
- A. 400 ml
 - B. 500 ml
 - C. 600 ml
 - D. 700 ml
 - E. 900 ml
11. Taurin is essential free sulfur (S) containing amino acid. It is added to substitute, especially for newborn and preterm infant because: (all correct, EXCEPT)
- A. Is needed for brain development and function
 - B. It decreases excretory load for kidney

- C. It's important for retina development and function
 - D. It takes part in conjugation of bile salts
12. The casein: whey protein ratio for human milk and adapted substitute is:
- A. 80:20
 - B. 60:40
 - C. 50:50
 - D. 40:60
 - E. 10:90
13. How cow's milk is modified to creating adapted breast milk substitute?
- A. minerals level is increased
 - B. fat composition not changed
 - C. lactose is added
 - D. total protein level is raised
 - E. Whey protein is decreased
14. Choose the best formula for a 1-mo-old preterm infant with weight 2.5 kg:
- A. "NAN-3"
 - B. "Malysh" (Russia)
 - C. "Nestogen" (Switzerland)
 - D. "Pre-Hipp (Austria)
 - E. "Nutrilon-2"(Holland)
15. Choose the most appropriate formula for health 10-mo-old infant:
- A. "Pre-Hipp"
 - B. "Hipp-1"
 - C. "Hipp-2"
 - D. "Humana-1"
 - E. "Malyutka"
16. High adapted breast milk substitute contains all the following except:
- A. Whey protein
 - B. Lactose
 - C. Taurin
 - D. Starch
 - E. L-carnitin
17. Disadvantage of sour formula is:
- A. Band to acidosis
 - B. Inhibits effect for pathogen intestinal microflora (E.Coli)
 - C. Increases gastric secretion
 - D. Increases time of stomach empty
 - E. Coagulation of protein

18. What features of formulas for preterm infants do you know?

- A. Cow's protein replaced soy protein
- B. Protein level lower than in basic formula
- C. Lactose is replaced with other carbohydrates
- D. Mineral content more than in basic formula
- E. Contain more calories and protein than basic formula

19. An 18-year-old single mother of two children expresses concern in the family clinic that her daughter, age 5 months, is not as active as her 18-month-old son was at the same age. The physical assessment reveals a thin infant with pale complexion and poor skin turgor who weighs only 4.6 kg above her birth weight. When questioned about the infant's diet and elimination pattern, mother indicates that she is taking 60 to 90 ml (2 to 3 ounces) of powdered formula every 4 to 5 hours during the daytime and once late at night; mother indicates that at times she must dilute the formula in extra water to make it last. Your most appropriate response is to:

- A. Encourage mother to switch to ready-made liquid, iron-fortified formula.
- B. Prepare to have baby admitted to the hospital, and report to child welfare services for neglect.
- C. Encourage mother to mix the powdered formula as directed and assist her in obtaining more help through government agencies.
- D. Encourage mother to feed baby more frequently and at night to increase calorie and fluid intake.

20. The number of feedings per day for a 4-month-old formula-fed infant should be:

- A. 10
- B. 8
- C. 7
- D. 6
- E. 5

21. The enamel erosion in deciduous teeth, called the "baby bottle syndrome" is a result of the child's habit to go to sleep while sucking intermittently from a bottle:

- A. of formula
- B. whole milk
- C. sweet fruit juice, or water
- D. all the above

22. What should be added to the diet of a 2-month-old infant, if oligosacchariduria presents?

- A. Milk cereal
 - B. Milk formula
 - C. Vegetable pure
 - D. Fruit pure
 - E. Fruit juice
23. The reason of mixed feeding may be:
- A. Cleft lip and palate in infant
 - B. If the child was ill with a pneumonia
 - C. Galactorrea
 - D. Hypogalactia
 - E. Incorrect shape of nipples in mother
24. The control weighing is weighing:
- A. infant before and after nursing
 - B. in the morning on an empty stomach
 - C. three times per day
 - D. in the evening
 - E. every time after nursing
25. If there is an inadequacy milk production in nursing mother you should recommend:
- A. Avoid feeding on demand
 - B. Offer to infant milk substitute from bottle
 - C. Don't fed infant in nighttime
 - D. Increased frequency of feeding may be indicated
 - E. increasing the fluid intake (water, juice)
26. Correct introducing the milk substitute if the mother produces insufficient milk:
- A. Give formula before breast feeding
 - B. Give formula after breast feeding
 - C. The remained formula can be used for following feeding
 - D. a mother's weighing her infant before and after nursing every feeding
 - E. all of the above
27. The reason of mixed feeding may be:
- A. Mother's work and study
 - B. Hypogalactia
 - C. Bad state of mother's health
 - D. Mother's intake some medicines
 - E. All the above

28. Nursing mother should give no artificial teats or pacifiers (also called dummies and soothers) to mixed feeding infant. Alternatives to artificial teats may be:

- A. cup
- B. spoon
- C. dropper
- D. Syringe
- E. All the above

29. Clinical signs of underfeeding in infant can be all the following EXCEPT:

- A. restlessness
- B. failure to gain weight adequately, despite complete emptying of the breast or bottle
- C. Constipation or infrequently, hard, green stool
- D. failure to sleep, irritability, and excessive crying
- E. regurgitation

30. At a 2-month well child visit, a mother states her family has a history of milk-protein allergies and wonders if soy-protein formula would be better for her baby. Which of the following statements regarding soy-protein formula is correct?

- A. Infants fed exclusively with soy-protein formula display growth comparable to infants fed cow milk-protein formula.*
- B. The protein in soy-protein formulas is essentially nonallergenic, and clinically significant soy-protein hypersensitivity is extremely rare.
- C. Soy-protein formula is most useful in children with well-documented, severe, gastrointestinal allergic reactions to cow milk-protein.
- D. Soy-protein formula should not be used by patients with a family history of celiac disease.
- E. Infants fed soy-protein formula should receive supplemental dietary calcium.

In which situation should a baby feed on both formula and breast milk?

- A. Their diet should include formula and breast milk if they're slow to gain weight
- B. They should feed on both if they have jaundice
- C. If they're slow to take to the breast
- D. All of the above *

Mixed too little water into baby's formula could cause which of the following?

- A. Unbalanced sodium levels
- B. Dehydration
- C. A trip to the hospital (may appear lactobezoar)
- D. All of the above*

What are reasons to supplement breastfeeding?

- A. Low milk supply
- B. Working mom
- C. Too much stress
- D. Breast surgery
- E. All of the above*

Why is feeding cow's milk to an infant a bad idea?

- A. There is too much fat in cow's milk
- B. Cow's milk is much thicker than breastmilk*
- C. Cow's milk is hard on a baby's digestion
- D. It causes mucus buildup in the baby's throat

Answers (artificial feeding)

1	B	11	B	21	D
2	C	12	D	22	B
3	B	13	C	23	D
4	E	14	D	24	A
5	A	15	C	25	D
6	D	16	D	26	B
7	C	17	A	27	E
8	A	18	E	28	E
9	D	19	C	29	E
10	D	20	D	30	

Time and method of introducing complementary foods to infants

After six months of age, breast milk (or BMS) alone is not enough to make an infant grow well. Complementary feeding refers to food which complements breast milk and ensures that the child continues to have enough energy, protein and other nutrients to grow normally. **Complementary feeding is started at six months of age, while continuing breastfeeding.** Good weaning practices involve selecting nutritious foods and using hygienic practices when preparing them.

Value of the basic nutrients in the feeding of the child

Our food is made up of essential, natural complex chemical substances called *nutrients*. These nutrients can be grouped into the categories of *macronutrients* and *micronutrients*. The macronutrients are needed in large quantities (carbohydrates, fats and proteins), and are building blocks of the body. The micronutrients (minerals and vitamins), are needed in tiny quantities, and are crucial for their role in metabolic pathways and immunity.

Proteins are the second most abundant substance in the body, after water. They are required for the growth and synthesis of tissues in the body; formation of hormones, plasma proteins, enzymes and hemoglobin; as buffers to maintain acid-base equilibrium in the body; and as alternate source of energy for the body. Proteins are made of 20 different kinds of amino acids. The essential amino acids must be supplied in the diet because the body cannot synthesize them. Histidine and arginine are essential during infancy because the rate of their synthesis is inadequate for sustaining growth. Proteins provide 4 kcal of energy per gram.

Carbohydrates are the main source of energy in diet contributing to 55-60% of total energy intake. Lack of carbohydrates (less than 30%) in diet may produce ketosis, loss of weight, and breakdown of proteins. Excess carbohydrates are converted to fat. Carbohydrates provide 4 kcal of energy per gram.

The major functions of the **fats** are to act as major structural element of the cell membranes; major source of energy (provide 9 kcal of energy per gram), carriers of fat soluble vitamins; precursors for biosynthesis of prostaglandins and hormones.

The fats present in the diet or in human body are in the form of fatty acids (triglycerides), phospholipids and cholesterol. The fatty acids may be saturated and unsaturated. Essential fatty acids cannot be synthesized in the body and have to be supplied through dietary fat. They are polyunsaturated omega-3 and omega-6 fatty acids. Omega-3 fatty acids have antithrombotic, anti-hypertensive and anti-arrhythmic influences. They are important components of grey matter of the brain and improve intellectual performance. Infants fed omega-3 fatty acids have demonstrated better cognitive development than those who are not fed these fatty acids. Deficiency of EFAs leads to cessation of growth, alopecia, diarrhea, impaired wound healing, decreased calcium absorption, decreased calcium deposits in bones and decreased bone strength.

Water is solvent for cellular changes, medium for ions, transport of nutrients and waste products, regulation of body temperature

Water is the major constituent of body tissues. Newborns have large water content than children and adults. The percentage of total body water falls from 75-80% at birth to 58% in age 12. So infants and young children have a greater need for water and are more vulnerable to alterations in fluid and electrolyte balance. Therefore water requirements that above than are younger the child and are highest in age 1-2 months.

In humans there are 13 **vitamins**: 4 fat-soluble (A, D, E and K) and 9 water-soluble (8 B vitamins and vitamin C). Vitamins have diverse biochemical functions, including function as hormones (e.g. vitamin D), antioxidants (e.g. vitamin E), and mediators of cell signaling and regulators of cell and tissue growth and differentiation (e.g. vitamin A). The largest numbers of vitamins (e.g. B complex vitamin) function as coenzymes.

Sixteen **minerals** are required to support human biochemical processes by playing roles in cell structure and function as well as electrolytes. A number of minerals are essential nutrients. Disturbances in metabolism of calcium and phosphorus cause rickets, bony rarefaction, impaired growth, especially bones and teeth. Deficiency of magnesium and zinc causes to disturbance of immunity, digestion disorders, dermatitis. Iron, molybdenum and copper are a part of hemoglobin and myoglobin, essential component of several oxidative enzymes.

Sources of foodstuffs are presented in the table.

Functions of Water, Proteins, Carbohydrates, and Fats				
Foodstuffs	Functions	Effects of Deficiency	Effects of Excess	Sources
Water	Solvent for cellular changes, medium for ions, transport of nutrients and waste products, regulation of body temperature	Thirst, dryness of tongue, dehydration, anhydremia, high specific gravity of urine, loss of kidney function (acidosis, oliguria, uremia, death)	Abdominal discomfort, headache, cramps (water without salt), intoxication, convulsions, edema, and circulatory failure	Water as such, all foods
Proteins	Supply amino acids for growth and repair of tissue cells, solutions for osmotic equilibrium, buffer. Hemoglobin, nucleoproteins, glycoprotein, and lipoproteins. Enzymes, antibodies. Protective structures (nails and hair)	Lassitude, abdominal enlargement, edema, depletion of plasma proteins, kwashiorkor (protein malnutrition); marasmus (protein-calorie malnutrition)	Prolonged high protein intake may aggravate renal insufficiency	Milk, eggs, meat, fish, poultry, soybeans, peas, beans, nuts, lentils
Carbohydrates	Readily available source of energy, antiketogenic, structure of cells, antibodies, source of stored calories (glycogen and fat), resynthesis of amino acids, roughage	Ketosis if intake is less than 15% of calories or in starvation; underweight if total calories are low	Overweight if total calories are high. Various syndromes due to inborn errors of sugar metabolism.	Milk, cereals, fruits, sucrose, starches, vegetable
Fats	Concentrated source of energy; physical protection for vessels, nerves, organs; insulation against changes in temperature; cell membranes and nuclei; vehicle for absorption of vitamins (A, D, E, and K); essential fatty acids, appetite appeal; aid satiety (delay emptying time of stomach)	Lack of satiety (craving for fat), underweight, skin changes with intakes very low in linoleic acid	Overweight, abdominal symptoms in familial hyperlipidemia, high cholesterol intakes may be harmful to selected populations	Milk, butter, egg yolk, lard, bacon, neat, fish, cheese, nuts, vegetable oils. Breast milk usually supplies 4-5% of calories as linoleic acid; vegetable oils vary greatly, with safflower, corn, soy, and others being especially rich

The choice of complementary foods will depend on local patterns of diet and agriculture, as well as on existing beliefs and practices. In addition to breast milk, soft mashed foods (e.g. cereals) should be given, to which some vegetable oil has been added. Other foods, such as well cooked pulses and vegetables, should be given as the diet is expanded. When possible, eggs, meat, fish and fruit should be also given.

Recommended sequence of introduction different baby foods at appropriate age is presented in the table.

Foods	Appropriate age (mo) for introduction
Fruit juice	6
Fruit puree	6
Mashed vegetable	6-7
Cooked cereal; porridge	6 - 7
Curds	6,5 – 7,5
Egg yolk	7- 7,5
Meat puree	7- 8
Dried crust (bread)	7- 8
Kefir	8 - 9
Fish puree	10
Oil	6
Butter	7

Summary of method of introducing solid foods to infants

1. Introduce new food when infant is hungry.
2. Begin spoon feeding by pushing food to back of tongue because of infant's natural tendency to thrust tongue forward.

3. Use a small spoon with straight handle; begin with 1 or 2 teaspoons of food; gradually increase to a couple of tablespoons per feeding.
4. Introduce one food at a time, usually at intervals of 4 to 7 days to allow identification of food allergies.
5. As the amount of solid food increases, decrease the quantity of milk to prevent overfeeding.
6. Do not introduce foods by mixing them with formula in the bottle.

Balanced diet is defined as nutritionally adequate and appropriate; it provides all the nutrients in required amounts and proper proportions. A combination of *carbohydrate* rich food (any cereal, fruit and vegetable), a *protein* source (milk and milk products, pulse, egg, meat, fish, nuts) and a *fat* (oil, ghee, butter) and *sugar* should be used to make nutritionally adequate complementary food or feed. A balanced diet should be consumed by children to ensure proper growth and development and stay healthy and disease free. This diet should contain 55-60% calories from carbohydrates, 10-12% proteins and 25-30% fat.

For convenience and on basis of similar nutritive values, foods are divided into five basic food groups. A balanced diet can be achieved through a blend of these food groups.

Foods are conventionally grouped as:

1. Cereals, millets and pulses
2. Vegetables and fruits
3. Milk and milk products
4. Egg, meat, fish
5. Oils and fats

Fruits. Fruits content minerals and some water-soluble vitamins. Fruit and vegetable juices are given to the child since 6-th month. Juices are made from fresh fruit and vegetables directly before feeding and are given after primary feeding.

The juice starts to give with 1-2 drops gradually increasing to 50ml/24h at 6-month-old, and up to 100ml daily at second half year. Start from one kind of fruit.

When juice is introduced to child's diet, mom should pay attention to the allergic reactions and gastric dysfunctions. Giving two or more new different juices at the same time is not recommended. Apple's, blackcurrant juices are recommended for beginning. Apricot, plum, pears are usually well tolerated.

Grapes juice isn't recommended due to its high amount of sugar. Orange, mandarin, grapefruit, and wild strawberry may provoke allergic reactions.

A fruit puree is given since 6 months gradually increasing from 2-3g to 50g. Mashed banana is readily digested and enjoyed by most infants.

Offer fruit juice only from a cup, not a bottle, to reduce the development of "nursing bottle caries".

Avoid fruits and vegetables marketed in cans that are not specifically designed for infants, because of variable and sometimes high lead content and addition of salt, sugar, or preservatives.

Vegetables. Vegetables are moderately good sources of iron and other minerals and of the B-complex vitamins. They should be freshly cooked and strained or commercially prepared. Vegetables are usually added to the infant's diet by 6 mo of age.

The vegetable puree with addition of 3g of vegetable oil per portion (150-200g) is most favorable. Potato should not exceed 40% of volume vegetable puree, because it contains many starch, and few calcium. Carrot, beet, cabbage, pumpkin, vegetable marrow is good for children. Carrot it contains carotene, potassium's salts. Cabbage contains iron, zinc, cobalt. Cabbage, pumpkin, vegetable marrow has few carbohydrates, which is good for child with exceeding weight.

- **Cereal.** A wide variety of instant cereals is available in many markets in a convenient form and is the excellent choice for infants.
- Cereals contain carbohydrates, plant protein, B-vitamins, minerals, iron.

Cereal is introduced at 6 -7 months. Initiate from cereal contented one kind of grain. Not wheat but rice and buckwheat cereal is preferable. Semolina is rich with gluten (gliadin) and may provoke celiac disease in some sensitive to this protein child. Semolina should not be given more than twice a week. Cereals should be alternated or given as a mix (oat, rice, buckwheat) from 8 months.

Starts introduce cereal from 3-5 teaspoons, gradually replacing the breast feeding or formula.

Eggs are usually introduced at 7-7.5 mo of life. The yolk of the egg is used initially and is hard-cooked. As all new foods, a small amount is offered at first, with gradual increases up to a whole yolk 1–3 times a week. Egg white should be introduced with caution to minimize any possible allergic manifestations.

Meat is an excellent source of protein as well as of iron and vitamins. Ground fresh beef or poultry or the strained canned meats may be used initially by 7-8 mo of age. Meats may be mixed with another food. Avoid fatty meats.

The commercial soups and meat and vegetable mixtures are relatively high in carbohydrate and are not considered optimal sources of iron or protein. Many home-prepared soups are bulky out of proportion to their food value, and much of the vitamin content is lost by overcooking.

Potatoes, rice, spaghetti, bread, and similar starchy foods have principally a caloric value. As a rule, they are not included in the infant's diet until the more essential foods mentioned earlier are being taken regularly. Crackers, toast may be offered to the infant when he or she shows an interest in "gumming" on coarser foods (usually 6–8 mo of age). It is with such foods that infants learn to chew and to feed themselves.

Even at 9 months, infants need small portions of a mix food groups to be included in their diet to insure intakes of all macronutrients and micronutrients. A diet should be balanced. Table helps in it.

Salt intake Salt addition to baby foods is not recommended. The significance of large intakes of sodium in the development of hypertension later in life cannot be ignored.

Food additives Naturally occurring chemicals and food additives, particularly the artificial flavors and colors, have been implicated in health problems. Artificial flavors and colors have been associated with respiratory allergic disorders, with urticaria and angioedema, with lesions of the tongue and buccal mucosa, with digestive disturbances, with arthralgia and arthroses, and with headache and behavioral disturbances, including hyperkinesis in childhood.

Guidelines for feeding of infant during the first year

AGE	TYPE OF FEEDING	SPECIFIC RECOMMENDATIONS
Birth-6 months	Breast-feeding	<ul style="list-style-type: none"> • Most desirable complete diet for first half of year • Requires supplements of fluoride (0.25 mg) regardless of the fluoride content of the local water supply, and iron by 6 months of age • Requires supplements of vitamin D (400 units) if mother's diet is inadequate or if infant is not exposed to sufficient sunlight
	Formula	<ul style="list-style-type: none"> • Iron-fortified commercial formula is a complete food for the first half of the year • Requires fluoride supplements (0.25 mg) when the concentration of fluoride in the drinking water is below 0.3 parts per million (ppm) • Evaporated milk formula requires supplements of vitamin C, iron, and fluoride (in accordance with the fluoride content of the local water supply)
6-12 months	Solid foods	<ul style="list-style-type: none"> • May begin to add solids by 5 to 6 months of age; earlier introduction tends to contribute to overfeeding • First foods are strained, pureed, or finely mashed • "Finger foods" such as teething crackers, raw fruit, or vegetables can be introduced by 6 to 7 months • Chopped table food or commercially prepared junior foods can be started by 9 to 12 months • With the exception of cereal, the order of introducing foods is variable; a recommended sequence is weekly introduction of other foods, beginning with fruit, followed by vegetables, and then meat • Breast-fed infants require more high-protein foods than formula-fed children • As the quantity of solids increases, the amount of formula should be limited to approximately 900 ml (30 oz) daily
	Cereal	<ul style="list-style-type: none"> • Introduce commercially prepared iron-fortified infant cereals, and administer daily until 18 months of age • Rice cereal is usually introduced first because of its low allergenic potential • Can discontinue supplemental iron once cereal is given
	Fruits and vegetables	<ul style="list-style-type: none"> • Applesauce, bananas, and pears are usually well tolerated • Avoid fruits and vegetables marketed in cans that are not specifically designed for infants, because of variable and sometimes high lead content and addition of salt, sugar, or preservatives • Offer fruit juice only from a cup, not a bottle, to reduce the development of "nursing bottle caries"
	Meat, fish, and poultry	<ul style="list-style-type: none"> • Avoid fatty meats • Prepare by baking, broiling, boiling, steaming, or poaching • Include organ meats such as liver, which has a high iron, vitamin A, and vitamin B complex content • If soup is given, be sure all ingredients are familiar in child's diet
	Eggs and cheese	<ul style="list-style-type: none"> • Serve egg yolk hard boiled and mashed, soft cooked, or poached • Introduce egg white in small quantities (1 tsp) toward end of first year to detect any allergic manifestation • Use cheese as a substitute for meat and as "finger food"

Tests

Time and method of introducing complementary foods to infants

Directions: *Select the ONE lettered answer or completion that is BEST in each case.*

1. All sentences about introducing “solid” foods to infant are true EXCEPT:
 - A. introduce solids when infant is hungry
 - B. begin with 1 or 2 teaspoons of food
 - C. introduce one foods at a time
 - D. may introduce foods by mixing them the formula in the bottle
 - E. one food item is introduced at intervals of 1 to 2 weeks to allow for identification of food allergies
2. Choice of foods to introduce first is:
 - A. meat
 - B. egg yolk
 - C. cheese or curd
 - D. cracker
 - E. fruit or cereal
3. What vegetable shouldn't be added to infant's diet first?
 - A. Carrot
 - B. Cabbage
 - C. Potato
 - D. Pumpkin
 - E. Vegetable marrow
4. When complementary foods should normally be started in infant's diet?
 - A. 1-2 mo
 - B. 3-4 mo
 - C. 5-6 mo
 - D. 6-8 mo
 - E. 10-12 mo
5. What order of introducing foods to infant should be recommended?
 - A. Fruit and vegetables, then cereal, and then meat
 - B. meat, then fruit, and then vegetables
 - C. fruit, meat, cereal
 - D. egg yolk, fruit, meat
 - E. curd, fruit, meat
6. Meats to infants can't be prepared by:
 - A. steaming
 - B. boiling
 - C. baking
 - D. poaching
 - E. frying

7. Cow's milk contains more all following nutrients by comparison to breast milk, EXCEPT:
- A. proteins
 - B. carbohydrate
 - C. total mineral content
 - D. casein
 - E. essential fatty acids
8. Hard boiled and mashed egg yolk is recommended to infant's diet from age:
- A. 2 mo
 - B. 4 mo
 - C. 6 mo
 - D. 8 mo
 - E. 10 mo
9. What part of egg yolk should be added to infant's diet at 7-mo-old:
- A. 1/5
 - B. 1/4
 - C. 1/3
 - D. 1/2
 - E. whole
10. What kind of juice shouldn't be given to infant before 6 months of age?
- A. Apple
 - B. Grape
 - C. Orange
 - D. Apricot
 - E. Banana
11. What kind of cereal is usually preferable as an initial food because of its easy digestibility and low allergenic potential?
- A. barley
 - B. oatmeal
 - C. rice or buckwheat
 - D. wheal
 - E. cereal combination
12. What kind of meat shouldn't be given to infant's diet?
- A. Pork
 - B. Beef
 - C. Chicken
 - D. Rabbit
 - E. Mutton
13. What quantity of juice is recommended to a 7-mo-old infant?
- A. 5-10 droops
 - B. 5-10 ml
 - C. 20-30 ml
 - D. 40 - 50 ml
 - E. 100 – 120 ml
14. Curd is added to infant's diet at age:
- A. 1 mo

- B. 3 mo
 - C. 4 mo
 - D. 6.5-7.5 mo
 - E. 8 mo
15. Why low osmolarity of breast milk is benefit for newborn especially preterm?
- A. decreases renal excretory load for undeveloped kidney function
 - B. protects them against some intestinal infections
 - C. reduces risk allergy
 - D. benefit for undeveloped liver function
 - E. all of the above
16. Not fatty boiled fish is recommended to infant's diet from age:
- A. 4 mo
 - B. 5 mo
 - C. 6 mo
 - D. 8 mo
 - E. 10 mo
17. Any new food should be initially offered once a day in small amounts (1–2 teaspoonfuls):
- A. Before formula feeding
 - B. After formula feeding
 - C. Between formula feedings
 - D. 30 min before formula feeding
 - E. Instead formula feeding
18. The interval between formula feedings for a 4-mo-old full-term, healthy infant averaging is:
- A. 2 hr
 - B. 3 hr
 - C. 3.5 hr
 - D. 4 hr
 - E. 5 hr
19. What kind of food should be used to correction of fat deficiency in infant's dietary?
- A. Kefir
 - B. Egg yolk
 - C. Meat
 - D. Vegetable oil
 - E. Cod-liver oil
20. What kind of food should not be given to infant younger 1 year?
- A. Egg yolk
 - B. Bread
 - C. Fish
 - D. egg-white
 - E. butter
21. What age you should recommend introducing vegetable pure to infant's diet?
- A. 3 mo
 - B. 4 mo
 - C. 5 mo
 - D. 6 mo
 - E. 7 mo

22. All sentences about technique of introduce fruit and vegetable juices to infant's diet are true, EXCEPT:

- A. Fruits content minerals and some water-soluble vitamins
- B. Fruit and vegetable juices are given to the child since 4th month.
- C. Juices are made from fresh fruit and vegetables directly before feeding
- D. Juices are given before primary feeding
- E. The lightened juice start to give with 1-2 drops gradually increasing to 50ml/24h at 6 mo, and up to 100ml daily at the end of year.

23. All sentences about introducing "solid" foods to infant are true, EXCEPT:

- A. introduce new food when infant is hungry
- B. begin with 1 or 2 teaspoons of food
- C. introduce foods after meals (formula or breast milk)
- D. don't introduce new foods when infant is ill
- E. one food item is introduced at intervals of 1 to 2 weeks to allow for identification of food allergies

24. Why cereal with wheat **shouldn't** recommend first?

- A. Cereal is rich in vegetable protein
- B. contains iron
- C. contains vitamin B complex
- D. Semolina is rich with gluten (gliadin) and may provoke celiac disease in some sensitive to this protein child
- E. Contains some minerals

25. What kind of food should be used to correction of protein deficiency in infant's dietary?

- A. Egg
- B. Meat
- C. Kefir
- D. Bouillon
- E. Curd

26. The average caloric requirements of full-term infants during the first year of life are:

- A. 45 -50 kcal/kg
- B. 50 – 60 kcal/kg
- C. 60 – 70 kcal/kg
- D. 80 – 100 kcal/kg
- E. 100 -120 kcal/kg

27. What age you should recommend introducing fruit juice to infant's diet?

- A. 3 mo
- B. 4 mo
- C. 5 mo
- D. 6 mo
- E. 7 mo

28. All sentences about technique of artificial feeding are true, EXCEPT:

- A. The bottle should be held so that milk, not air, channels through the nipple.
- B. The bottle of milk is usually warmed to body temperature.
- C. The temperature may be tested by dropping milk onto the wrist.
- D. The nipple holes should be of the size so that milk will drop slowly.
- E. Bottle propping (holder) should be recommended

Which food do pediatricians recommend as a first “solid” food?

- A. Rice cereal*
- B. Mashed up banana
- C. Small bites of chicken
- D. Overcooked pasta

Which is NOT a requirement for babies to switch to “solid” food?

- A. They must be able to hold their heads upright and steady
- B. Babies should be able to sit well when supported
- C. The baby should have grown ideally to double its birth weight
- D. The baby should be fully weaned to formula from breast milk*

Answers (Time and method of introducing complementary foods to infants)

1	D	11	C	21	D
2	E	12	A	22	D
3	B	13	D	23	C
4	C	14	D	24	D
5	A	15	A	25	E
6	E	16	E	26	E
7	B	17	A	27	D
8	C	18	C	28	E
9	B	19	D	29	
10	B	20	D	30	

Feeding During the Second Year of Life

Most infants naturally adapt themselves to a schedule of three meals a day by about the end of the 1st yr of life. Although considerable latitude in the diet of

each infant should be permitted to allow for personal idiosyncrasies and family habits, the mother should be given an outline of the daily basic dietary needs. When malnutrition, either as dietary deficiency or excess, or failure to thrive exists despite an apparently satisfactory food intake, the infant or child's family relationships must be evaluated, not only for organic causes but especially for psychosocial ones.

Reduced Caloric Intake. Toward the end of the 1st yr of life and during the 2nd yr, because of the constantly decelerating rate of growth, there is a gradual reduction in the infant's caloric intake per unit of body weight. In addition, it is not unusual to have temporary periods of lack of interest in certain foods or even in food in general. Failure to recognize these features, especially the decreasing caloric needs, results in attempts to force feed. The child naturally rebels and feeding problems ensue. Because preventing problems is more effective than correcting them, the changing pattern of the infant's food habits during the 2nd yr of life should be explained to the mother before it appears.

Self-Selection of Diet. Children's strong likes or dislikes of particular foods should be respected whenever possible and practicable. Spinach is an example of a nonessential food whose virtues have been overemphasized. When consistently rejected foods include basic staples such as milk and cereal, food allergy should be considered.

Children, including infants, tend to select diets that, over several days, assume a balanced nature. Thus, the child may be permitted a wide choice of foods, as long as he or she eats adequately over the longer period. Normally, the child determines the quantity to be eaten of a given food and of the entire meal. At this age, eating habits may be strongly influenced by older children in the family, particularly in respect to food likes and dislikes. Eating patterns and habits developed in the first 2 yr of life usually persist for several years.

Self-Feeding by Infants. Before 1 yr of age, the infant should be permitted to participate in the act of feeding. By approximately 6 mo, the infant can hold a bottle; within another 2–3 mo, a cup. Zwieback, graham crackers, or other hand-

held foods can be introduced by the age of 7–8 mo. A spoon may be used as soon as it can be held and directed to the mouth, possibly by 10–12 mo of age. Mothers often inhibit this learning process because they object to its messiness.

Acquiring the ability to feed oneself is an important step in developing self-reliance and responsibility. By the end of the 2nd yr of life, infants should be largely responsible for feeding themselves.

Permitting infants and children to go to sleep while sucking intermittently from a bottle of formula, whole milk, sweet fruit juice, or water should be discouraged. Pedodontists emphasize the correlation between this habit and enamel erosion in deciduous teeth, calling it the "baby bottle syndrome."

Although nutritional requirements per unit of body weight constantly decrease with increasing age (110 kcal/kg in infancy; 50 kcal/kg at 15 yr), the need for calories as well as for protein, vitamins, and minerals is relatively greater in children than it is in adults.

Daily Basic Diet. Parents should be given a daily basic diet for the child from which the family menu can be prepared. Daily selection from each of the food groups provides a balanced diet with sufficient macronutrients and micronutrients. The quantity of intake after the basic requirements have been met can be determined usually by the healthy growing child. The child's history of dietary habits is essential for evaluating the nutritive intake, but such histories are often unreliable unless an accurate dietary diary is kept for several days. From such information, correcting the diet may be more effective.

The older child should learn the content of a basic diet and its importance to proper growth and good health, but this information should never be presented as a threat to enforce rigid feeding practices.

Eating Habits. Eating habits formed in the 1st yr or 2 of life distinctly affect those of the subsequent years. Feeding difficulties between the ages of 2–5 yr frequently result from excessive parental insistence on eating and subsequent anxiety when the child does not conform to some arbitrary standard. The child's negative reactions naturally result from undue mealtime stress, and correction

requires improvement in parent-child relations. Other factors that disturb eating are too much confusion at mealtime, insufficient time for eating, either on the part of the adult or of the child, food dislikes of other members of the family, and poorly prepared and unattractively served food. A comfortable chair of proper height with a foot-rest is important for a child's ease at the table. Mealtimes should be happy, and the conversation should be on subjects of interest to the entire family. The child's appetite should be respected; if his or her desire for food at times is below average, there should be no persuasion to eat more. Adults should realize that eating habits are taught better by example than by formal explanation.

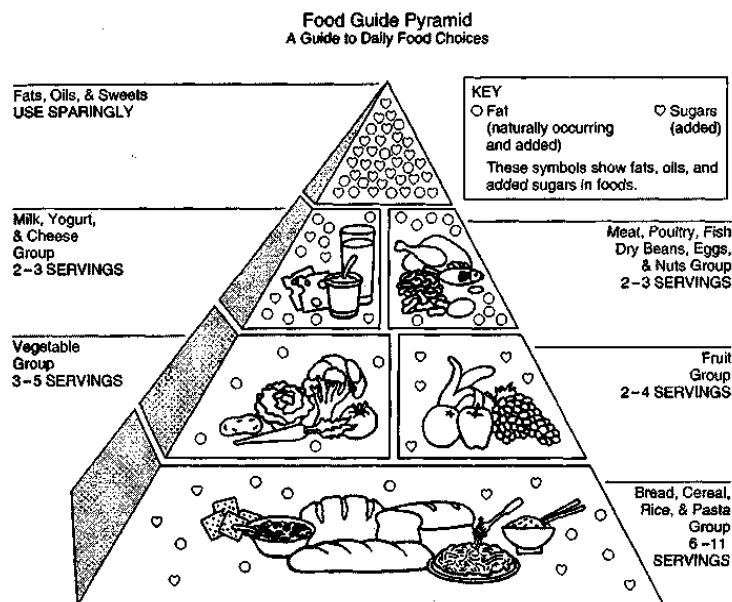
Snacks between Meals. During the 2nd yr and even for several years thereafter, orange juice or other fruit juice or fruit, together with a cracker, may be given in either or both of the between-meal periods. Snacks served in nursery schools and kindergartens should be nutritious. Older children should avoid between-meal snacking if it reduces their appetite for the next meal. After-school snacks, especially of fruit, should be encouraged if they produce greater enthusiasm and energy for play and do not reduce the appetite for the evening meal.

Vegetarian Diet

All vegetable diets supply all necessary nutrients when vegetables are selected from different classes. Vegetables are high in fiber content, vitamins, and minerals. Vegetarians usually have faster gastrointestinal transit time, bulkier stools, and low serum cholesterol levels and are said to have less diverticulitis and appendicitis than meat eaters. Those who consume eggs are ovovegetarians. Those who consume milk are lactovegetarians. Those who consume neither are vegans. Vegans may develop vitamin B₁₂ deficiency and, because of high-fiber intake, may develop trace mineral deficiency. Nursing vegan mothers must be given added vitamin B₁₂ to prevent methylmalonic acidemia in their infants. Vegetarian infants may not grow as rapidly as omnivores in the first 2 yr.

Later Childhood and Adolescence

As the child reaches age 2 yr, diet is similar to that of the family. All the known nutrients are supplied by a varied diet and should include selections from each of the food groups: cereals, fruits, vegetables, proteins, and dairy. The relative amounts are described by **the food pyramid**. Emphasis on cereal, fruits, and vegetables supports the recommendations of the National Cholesterol Education Program. Those recommendations include restriction of total fat in the diet to approximately 30% of the total daily calories, of which 10% is saturated fatty acids, 7–8% polyunsaturated, and 12–13% monounsaturated fatty acids. Dietary cholesterol should not exceed 100 mg/1,000 calories.



This diet is recommended to decrease atherosclerotic heart disease and may also be effective in limiting the development of obesity.

The food selections of the pyramid may be made as the infant begins to take supplemental foods, but fat in the diet should not be restricted until the child is past 2 yr. Some children given a more restricted diet in infancy fail to thrive.

My Plate is the current nutrition guide published by the United States Department of Agriculture, depicting a place setting with a plate and glass divided into five food groups. It replaced previous **My Pyramid** icon in 2011, which had been criticized as too abstract and confusing.



My Plate is divided into sections of approximately 30 percent grains, 30 percent vegetables, 20 percent fruits and 20 percent protein, accompanied by a smaller circle representing dairy, such as a glass of low-fat/nonfat milk or a yogurt cup.

My Plate is supplemented with additional recommendations, such as:

"Make half your plate fruits and vegetables,"

"Switch to 1% or skim milk,"

"Make at least half your grains whole," and

"Vary your protein food choices."

The guidelines also recommend portion control while still enjoying food, as well as reductions in sodium and sugar intakes.

In presentation **MyPlate**, First Lady Michelle Obama said, "Parents don't have the time to measure out exactly three ounces of chicken or to look up how much rice or broccoli is in a serving. ... But we do have time to take a look at our kids' plates. ... And as long as they're eating proper portions, as long as half of their meal is fruits and vegetables alongside their lean proteins, whole grains and low-fat dairy, then we're good. It's as simple as that."

Tests

Feeding during the second year of life

1. Average daily quantity of food for infant during the 2-nd year of life:
 - A. 1000-1100 ml
 - B. 1200-1500 ml
 - C. 1600 – 1800 ml
 - D. 1900 – 2000 ml
 - E. 2200 – 2500 ml
2. A spoon may be used in self-feeding by infants, possibly by:
 - A. 7-8 mo of age
 - B. 10-12 mo of age
 - C. 15 mo
 - D. 18 mo
 - E. 2 yr
3. Toward the end of the 1st yr of life and during the 2nd yr, the infant's caloric intake per unit of body weight:
 - A. gradually reduced
 - B. gradually increased
 - C. don't change
 - D. the need for calories is relatively lesser in children than it is in adults
4. Because preventing problems is more effective than correcting them, the changing pattern of the infant's food habits during the 2nd yr of life should be explained to the mother before it appears. All the following are correct, EXCEPT:
 - A. Feeding difficulties between the ages of 2–5 yr frequently result from excessive parental insistence on eating
 - B. The child's appetite should be respected
 - C. Older children should avoid between-meal snacking
 - D. Mealtimes should be happy, a comfortable chair of proper height with a foot-rest is important for a child's ease at the table.
 - E. Eating patterns and habits developed in the first 2 yr of life usually not persist for several years.
5. Number of feeding for an 18-mo-old infant:
 - A. On demand
 - B. 7
 - C. 6

- D. 5
E. 3-4 meals a day
6. Because preventing problems is more effective than correcting them, the changing pattern of the infant's food habits during the 2nd yr of life should be explained to the mother before it appears. All the following are correct, EXCEPT:
- A. Avoid in attempts to force feed (the decreasing caloric needs per unit of body weight)
 - B. Children tend to select diets
 - C. Eating habits may not be strongly influenced by older children in the family
 - D. The quantity of intake can be determined usually by the healthy growing child.
 - E. Children's strong likes or dislikes of particular foods should be respected whenever possible and practicable.
7. Proteins:fats:carbohydrates ratio in diet of preschool age child should be:
- A. 1:2:4
 - B. 1:1:4
 - C. 1:1:3
 - D. 1:1:2
 - E. 1:2:5
8. Acquiring the ability to feed oneself is an important step in developing self-reliance and responsibility. Infants should be largely responsible for feeding themselves:
- A. By the end of the 2nd yr of life
 - B. 1yr 9 mo
 - C. 1yr 6 mo
 - D. 1yr 3mo
 - E. 1yr

A mother is concerned because her 20-month-old son prefers to eat with his fingers rather than use a small spoon. Which of the following statements is correct?

- A. At 18 months of age, most toddlers prefer to feed themselves with a spoon.
- B. Most children learn to feed themselves independently during the second year of life.*
- C. Self spoon feeding usually begins at 12 months of age when well-defined wrist rotation develops.
- D. Most children can manage a cup by 10 months of age.
- E. Most children prefer to feed themselves with a spoon by 12 months of age.

Answers (feeding after 1 year)

1	B	5	E
2	B	6	C
3	A	7	B

Literature

1. T. Kapitan. Propaedeutics of children's diseases and nursing of the child: Textbook for students of higher medical education:- Vinnitsa. – 2006. 736 p.
2. Nykytyuk O.S. Manual of Propaedeutic Pediatrics. Ternopil. 2005.-467p.
3. Nelson Textbook of Pediatrics, 19th Edition. By Robert M. Kliegman, MD, Bonita M.D. Stanton, MD, Joseph St. Geme, Nina Schor, MD, PhD and Richard E. Behrman, MD. 2011.-2680 p.
4. Breastfeeding, 7th Edition. A Guide for the medical Professional. Ruthe A. Lawrence, MD. 2011.-1128 p.
5. Breastfeeding Updates for the Pediatrician. Ardythe L. Morrow, PhD and MD, Caroline J. Chantry, MD. 2013.
6. World Health Organization and UNICEF: Global Strategy for infant and Young Child Feeding. - Geneva, WHO, 2003.
7. Gastroenterology and Nutrition. Neonatology Questions and Controversies, 2nd Edition. Josef Neu, MD. 2012.- 430 p.
8. Whaley Lucille, Wong Danna. Nursing Care of infant and Children. St. Louis. Washington, D.C., Toronto, 1987, 1868 p.
9. Supplementation of infant formula with probiotics and/or prebiotics: a systematic review and comment by the ESPGHAN committee on nutrition. Braegger C, Chmielewska A, Decsi T, Kolacek S, Mihatsch W, Moreno L, Pieścik M, Puntis J, Shamir R, Szajewska H, Turck D, van

Goudoever J; ESPGHAN Committee on Nutrition. Journal of pediatric gastroenterology. 2011, Feb., 52(2) 238-50

10. Cochrane Database Syst. Rev. 2007. Oct. 17; (4): Prebiotics for prevention of allergic disease and food hypersensitivity. Osborn D.A., Sinn J.K.
11. Feeding and nutrition of infants and young children: Guidelines for the WHO European Region, with emphasis on the former Soviet countries/ K.F. Michaelsen, L. Weaver, F. Branca, A. Robertson. – WHO regional publications. European series, № 87. – World Health Organization updated reprint, 2003. – 296 p.