

Chapter Summary

Nutrition is important before and throughout pregnancy to support fetal development without depleting the mother's reserves. Each trimester of pregnancy is associated with particular developmental phases of the fetus. Pregnant women of normal weight should gain 25 to 35 pounds during pregnancy and should be especially careful to consume adequate amounts of folate, vitamin B₁₂, vitamin C, vitamin D, calcium, iron, and zinc.

A majority of pregnant women experience morning sickness and many crave or feel aversions to specific foods. Heartburn and constipation in pregnancy are related to the relaxation of smooth muscle caused by certain pregnancy-related hormones. Gestational diabetes and preeclampsia are nutrition-related disorders that can affect maternal and fetal health. Adolescents' bodies are still growing and developing; thus, their nutrient needs during pregnancy are higher than those of older pregnant women. Dieting, alcohol consumption, and smoking can prevent successful outcomes of pregnancy. Breastfeeding provides many benefits to both mother and newborn. Nutrient needs are different during pregnancy, and there are special concerns for some women. North American and international health organizations recommend breastfeeding exclusively for the first 6 months, and the effort to overcome challenges associated with breastfeeding is worthwhile.

Infancy is characterized by rapid growth and brain development. An infant needs to consume about 50 kcal per pound of body weight per day. Breast milk or formula provides necessary nutrients for the first 6 months of life. Solid foods can gradually be introduced when an infant is developmentally and physically ready.

Infants must be monitored closely for appropriate growth, dehydration, allergies, and other signs of distress. Colic, reflux, failure to thrive, nursing bottle syndrome, and ingestion of lead are concerns of infancy that can be prevented, diminished, or treated.

Nutrition Myth or Fact addresses the question: The fetal environment: Does it leave a lasting impression?

Learning Objectives

After studying this chapter, the student should be able to:

1. Discuss several reasons that maintaining a nutritious diet is important for a woman of childbearing age even prior to conception (pp. 656–657).
2. Explain the interrelationships of fetal development, physiologic changes in the pregnant woman, and increasing nutrient requirements during the course of a pregnancy (pp. 657–661).

3. Identify the ranges of optimal weight gain for pregnant women, and the implications of too little or too much weight gain during pregnancy for both the mother and the developing baby (pp. 661–663).
4. Identify the macronutrient and micronutrient needs of pregnant women, including for supplements and fluids (pp. 663–669).
5. Discuss the key nutrient-related disorders of pregnancy and the influence of maternal age on pregnancy (pp. 670–675).
6. Discuss the effects of exercise, caffeine, artificial sweeteners, alcohol, tobacco, illicit drugs, and medications and supplements on the pregnant woman and her fetus (pp. 675–678).
7. Describe the physiologic aspects of lactation, and identify the key nutrient recommendations for and needs of breastfeeding women (pp. 678–682).
8. Summarize the advantages and challenges of breastfeeding (pp. 682–686).
9. Describe an infant’s growth patterns and nutrient needs, and the nutrient profile of different types of infant formula (pp. 687–692).
10. Discuss several nutrient-related concerns for infants (pp. 692–696).

Key Terms

amniotic fluid	large for gestational age	small for gestational age
anencephaly	listeriosis	spina bifida
colic	low birth weight	spontaneous abortion
colostrum	morning sickness	trimester
conception embryo	neonatal	umbilical cord
failure to thrive	neural tube	urinary tract infection
fetus	pica	zygote
gestation	placenta	
gestational diabetes	preeclampsia	
lactation	preterm	

Chapter Outline

I. Why Is Nutrition Important Before Conception?

- A. Several factors make adequate nutrition important even before conception.
 1. Some deficiency-related problems develop extremely early in pregnancy.
 2. Adopting a healthful diet prior to conception requires women to avoid alcohol, illegal drugs, and other known teratogens.
 3. A healthful diet and appropriate levels of physical activity can help women achieve and maintain optimal weight prior to pregnancy.
 4. A balanced and nourishing diet before conception reduces the risk of developing a nutrition-related disorder during pregnancy.
 5. A man’s nutrition prior to conception is important in prevention of abnormal sperm.

Key Term: conception

II. How Does Nutrition Support Fetal Development?

- A. A full-term pregnancy, the period of gestation, last 38 to 42 weeks, and is divided into three trimesters of about 13 to 14 weeks.
- B. The first trimester is characterized by cell multiplication and tissue differentiation.
 - 1. The first trimester begins when the ovum and sperm unite to form a zygote.
 - 2. The zygote travels to the uterus and by day 10 the blastocyst, the inner portion of the zygote, implants into the uterine lining.
 - 3. After further cell growth, multiplication, and differentiation, an embryo is formed.
 - a. At this time, the embryo is most vulnerable to teratogens, including alcohol, drugs, megadoses of supplements, herbs, and more.
 - b. Exposure to teratogens can result in fetal malformations or spontaneous abortion (miscarriage).
 - c. Nutrient deficiencies at this time lead to irreversible structural or functional damage.
 - 4. By the fourth week a placenta has formed, which will eventually become a fully functioning organ through which the mother will provide nutrients and remove fetal wastes.
 - 5. The third month marks the transition from embryo to fetus.
 - a. The placenta is fully functioning and is connected to the fetal circulatory system via the umbilical cord.
- C. During the second and third trimesters, most growth occurs.
 - 1. During the second trimester (approximately weeks 14 through 17), the fetus continues to grow and mature.
 - a. Some babies born prematurely in last weeks of the second trimester can survive with intensive neonatal care.
 - 2. The third trimester (approximately week 28 to birth) is a time of remarkable growth and organ maturation for the fetus and requires adequate nutrients.
- D. Appropriate weight gain during pregnancy is essential.
 - 1. Nutrition is one of the most important modifiable variables affecting newborn maturity and birth weight.
 - a. A birth weight of at least 5.5 pounds marks a successful pregnancy.
 - b. Low birth weight increases the risk of infection, learning disabilities, impaired physical development, and death.
 - c. Many low-birth-weight infants are born preterm, before 38 weeks' gestation.
 - d. Babies that are small for gestational age (SGA) are those born at term but that weigh less than would be expected for the gestational age.
 - 2. Recommendations for weight gain vary according to a woman's weight before pregnancy and whether the pregnancy is a singleton or multiple.
 - a. The average recommended weight gain for a woman of normal weight is 25 to 35 pounds, with underweight women needing a little more and overweight/obese needing a little less.
 - b. Women who have a low pre-pregnancy weight or gain too little weight during pregnancy risk a low-birth-weight or preterm infant and depleting their own nutrient supply.

- c. Excessive pre-pregnancy weight or gain during pregnancy increases the risk that the fetus will be large for its gestational age (LGA) and may result in trauma to the infant during delivery, higher risk of childhood obesity, and metabolic abnormalities.
 - i. It may also be difficult for the mother to lose weight gained during pregnancy leading to increased risk for type 2 diabetes and hypertension.
- 3. The pattern of weight gain is important as well.
 - a. Weight gain needed during the first trimester is small, increasing to about 1 pound a week thereafter.
 - b. If a woman gains more or less weight during a month, she should not attempt a drastic weight change.
 - c. Focusing on the quality of food consumed rather than quantity and participating in regular physical activity helps women feel in control and gain appropriately.
- 4. Weight gained during pregnancy includes extracellular fluids, increased blood volume, fat, amniotic fluid, placenta and other tissues, as well as the fetus.
- 5. Weight loss after pregnancy is more easily achieved with physical activity and breastfeeding.

Key Terms: gestation, trimester, zygote embryo, spontaneous abortion, placenta, fetus, umbilical cord, neonatal, low birth rate, preterm, small for gestational age (SGA), large for gestational age (LGA),

Figures and Table:

Figure 17.1: Ovulation, conception, and implantation.

Figure 17.2: Human embryonic development during the first 10 weeks.

Figure 17.3: Placental development.

Figure 17.4: A timeline of embryonic and fetal development.

Figure 17.5: A healthy 2-day-old infant compared to two low-birth-weight infants.

Figure 17.6: The weight gained during pregnancy is distributed between the mother's own tissues and pregnancy-specific tissues.

Table 17.1: Recommended Weight Gain for Women During Pregnancy

III. What Are a Pregnant Woman's Nutrient Needs?

A. Macronutrients provide energy and build tissues.

1. Energy needs of pregnant women are modestly increased.
 - a. Energy requirements increase by about 350 to 450 kcal per day in the last two trimesters.
 - b. Choosing nutrient-dense foods is the key to getting adequate micronutrients without consuming too many extra Calories.
2. Protein needs increase to about 1.1 gram per day per kilogram body weight.
3. Adequate carbohydrates provide glucose to support fetal and maternal energy needs and prevent ketosis.
 - a. Women are advised to aim for a carbohydrate intake of at least 175 g per day.
 - b. Carbohydrates from whole foods offer ample B-vitamins and fiber to prevent constipation.
4. Fat recommendation does not change during pregnancy, but docosahexaenoic acid (DHA) is especially important for brain growth and eye development in the fetus.

- B. Micronutrients support increased energy needs and tissue growth.**
1. Micronutrient needs of pregnant women increase because of blood and tissue expansion.
 2. Folate is necessary for cell division and is critical during the 28 days after conception, when it is required for the formation and closure of the neural tube.
 - a. Folate deficiency is associated with neural tube defects spina bifida and anencephaly.
 - b. Increasing the folate intake of women of childbearing age to prevent neural tube defects is a goal of *Healthy People 2020*.
 - c. A deficiency in folate during pregnancy can result in macrocytic anemia and has been associated with low birth weight, preterm delivery, and failure of the fetus to grow properly.
 3. Vitamin B₁₂ is vital to regenerate active folate, but absorption increases during pregnancy so RDA increases only slightly.
 4. Vitamin C deficiency in pregnancy increases risk of premature birth
 - a. The RDA increases a little more than 10% over the RDA for nonpregnant women.
 5. Vitamin A deficiency increases the risk of low birth weight, growth problems, and preterm delivery.
 - a. Vitamin A needs increase during pregnancy by about 10%.
 - b. Excessive preformed or supplemental vitamin A exerts teratogenic effects.
 - c. A well-balanced diet supplies sufficient vitamin A.
 6. Vitamin D requirements do not increase during pregnancy, but supplementation is recommended for some women.
 7. Calcium requirements do not increase during pregnancy.
 - a. Calcium from the diet is more efficiently absorbed during pregnancy.
 - b. The extra demand for calcium has not been found to cause permanent demineralization of the mother's bones or to increase fracture risk.
 8. Iron requirements are increased to accommodate the expanded maternal blood volume, growing uterus, placenta, and the fetus.
 - a. Fetal demand increases during the last trimester when iron is stored for the first few months of life.
 - b. Inadequate iron intake most often prompts iron-deficiency anemia in the mother.
 - c. Severely inadequate iron intake can increase the rate of low birth weight, preterm birth, stillbirth, and death of the newborn.
 - d. The RDA for iron more than doubles during pregnancy and is typically supplemented.
 9. Zinc requirements are increased by about 38% to meet the needs for DNA synthesis, RNA synthesis, and protein synthesis.
 - a. Inadequate zinc leads to malformations in the fetus, premature birth, decreased birth size, and extended labor.
 - b. Supplemental zinc and iron compete for absorption, but zinc and iron absorption improve when eaten in food.
 10. Sodium requirements remain the same, and iodine requirements increase significantly during pregnancy.

11. Do pregnant women need supplements?

- a.** In addition to a nutrient-rich diet, most healthcare providers recommend prenatal supplements to help meet all the increased needs.
- b.** Vegans, adolescents, and others with low intakes are usually encouraged to take supplements.

C. Fluid needs of pregnant women increase and help maintain amniotic fluid, combat fluid retention, constipation, dehydration, and urinary tract infections.

Key Terms: neural tube, spina bifida, anencephaly, amniotic fluid, urinary tract infection

Table:

Table 17.2: Changes in Nutrient Recommendations with Pregnancy for Adult Women

IV. What Are Some Common Nutrition-Related Concerns of Pregnancy

A. Some disorders of pregnancy are related to nutrition.

- 1.** Morning sickness is nausea and vomiting that can occur any time of the day and occurs up to 80% of women during the first trimester.
 - a.** In severe cases, hospitalization or in-home IV therapy may be necessary.
- 2.** Cravings and aversions can occur during pregnancy.
 - a.** Cravings are more likely for a type of food rather than specific foods.
 - b.** Pica is craving nonfood substances and may result in health problems for the mother and fetus.
 - c.** Food aversions are common during pregnancy and may originate from social or cultural beliefs.
- 3.** Gastroesophageal reflux, heartburn, is common during pregnancy because pregnancy hormones relax lower esophageal smooth muscle and can be minimized with simple changes.
- 4.** Constipation is caused by relaxation of the smooth muscles and is remedied by increased fibrous foods, fluid, and regular physical activity.
- 5.** Gestational diabetes is a temporary condition in which a pregnant woman is unable to produce sufficient insulin or becomes insulin resistant.
 - a.** Strict control of blood glucose levels through diet, physical activity, and/or medication prevents any ill effects on the mother and fetus.
 - b.** If uncontrolled, it may cause larger babies, trauma during delivery, and increased risk for type 2 diabetes and obesity in the child later in life.
 - c.** Women who develop gestational diabetes are at much greater risk for developing type 2 diabetes in the next 5 to 10 years.
- 6.** Hypertensive disorders complicate about 8% of U.S. pregnancies.
 - a.** Gestational hypertension occurs in a woman who develops high blood pressure during pregnancy with no other signs or symptoms.
 - b.** Preeclampsia is characterized by sudden, high maternal blood pressure; swelling; excessive and rapid weight gain unrelated to food intake; and protein in the urine.
 - c.** If left untreated, preeclampsia can progress to eclampsia, a life-threatening medical condition characterized by seizures and kidney failure.
 - d.** Management of preeclampsia includes management of blood pressure, bed rest, and medical oversight.

7. A woman's immune system is altered during pregnancy and leaves her and her developing fetus more vulnerable to infectious disease, including foodborne illness.
 - a. Listeriosis is of particular concern and can cause a severe infection that triggers miscarriage or premature birth.
 - b. Pregnant woman should avoid:
 - i. Foods made with unpasteurized milk
 - ii. Refrigerated, smoked seafood and cold cuts, hot dogs, and other deli meats unless part of a thoroughly cooked dish.
 - iii. Melons unless scrubbed under running water and dried before cutting.
 - iv. Raw or partially cooked eggs, raw or undercooked meat, fish, and poultry
 - v. Unpasteurized juices and raw sprouts
 - c. Pregnant women should follow safe food-handling practices.
- B. Maternal age can affect pregnancy.**
1. Adolescent pregnancy is subject to greater nutritional risk than pregnancy for adult women and requires additional nutrients and care.
 2. Pregnancy over the age of 35 carries unique risks.
 - a. Fertility begins to decline and pregnancy is more likely to end in miscarriage or stillbirth.
 - b. Risk for chromosomal defects like Down syndrome rises
 - c. Increased risk for gestational diabetes and hypertension.
- C. Vegetarianism can be compatible with a healthy pregnancy if care is taken to get all required nutrients.**
1. Vegans need to be more vigilant and require supplementation.
- D. Physical activity can enhance the health of a pregnant woman, but new programs should begin slowly and with supervision.**
- E. Many substances can harm the fetus.**
1. Consumption of caffeine should be limited to no more than one cup of coffee a day to reduce risk of miscarriage and impairment of fetal growth.
 2. There is limited research on the safety of artificial sweeteners during pregnancy, although the FDA offers some guidance.
 3. Consumption of alcohol should be avoided during pregnancy to prevent a variety of birth defects.
 - a. Fetal alcohol spectrum disorders (FASD) encompass a range of complications that can develop when a pregnant woman consumes alcohol.
 - b. Heavy drinking throughout pregnancy results in fetal alcohol syndrome (FAS), increasing the risk of infant mortality or social and learning problems.
 - c. Alcohol-related neurodevelopmental disorder (ARND) causes more subtle abnormalities but can lead to behavioral and developmental problems.
 - d. Frequent drinking or occasional bingeing during pregnancy increases the risk of miscarriage, complications, low birth weight, neonatal asphyxia, and intrauterine growth retardation.
 4. Maternal smoking greatly increases the risk of poor outcomes of pregnancy, including SIDS and overall neonatal mortality.

5. Any use of illegal drugs could harm the development and growth of the fetus and cause symptoms of withdrawal in newborns.
 - a. Women should consult with their healthcare provider before using OTC drugs and herbal supplements.
 - b. Women should avoid medication during the first trimester if possible.

Key Terms: morning sickness, pica, gestational diabetes, preeclampsia, listeriosis

Table:

Table 17.3: Exercise Plan for Pregnant Women

V. How Does Nutrition Support Lactation?

A. Lactation is maintained by hormones and infant suckling.

1. The body prepares for lactation during pregnancy.
 - a. Alveoli and milk ducts are formed, and hormones physically prepare the breasts for lactation.
 - b. Prolactin, the hormone responsible for milk synthesis, increases toward the end of pregnancy.
2. Colostrum is the first substance to be released from the breasts and to be ingested by a suckling infant.
 - a. Colostrum is rich in protein, antibodies, and “friendly” bacteria.
 - b. Colostrum has a laxative effect to help expel meconium.
 - c. Within 2 to 4 days, colostrum is fully replaced by mature milk.
3. Mother–infant interaction maintains milk production.
 - a. Continued milk production is dependent on sucking or pumping.
 - b. The letdown of milk is dependent on the hormone oxytocin.

B. Breastfeeding women have higher nutrient needs.

1. Breastfeeding requires even more energy and macronutrient needs than pregnancy.
2. Milk production requires about 700 to 800 kcal per day.
 - a. Calories should be increased by 330 above pre-pregnancy need.
 - b. The remainder of the required Calories comes from the mother’s fat stores.
 - c. Through nursing and physical activity, a gradual weight loss will occur in the mother without Calorie restriction.
 - d. Protein and carbohydrate needs increase from those of pregnancy, and good dietary sources of DHA are still recommended.
3. The need for several micronutrients increases over the requirements of pregnancy.
 - a. Increased vitamin needs are for A, C, E, riboflavin, B₁₂, biotin, and choline.
 - b. Increased mineral needs include copper, chromium, manganese, iodine, selenium, and zinc.
 - c. Folate needs decrease after pregnancy.
 - d. Iron requirements decrease significantly during lactation because there is little iron in breast milk.
 - e. Recommended intake of calcium is unchanged as in pregnancy, but teen mother’s needs remain high.

4. Supplements are not necessary if a woman appropriately increases energy intake with nutrient-dense foods.
 - a. Omega-3 fatty acids should be supplemented or consumed in food.
 - b. Women who don't consume dairy products should monitor and possibly supplement calcium intake.
5. Fluid recommendations for breastfeeding women are increased by about 1 liter per day, and beverages should be consumed each time the mother nurses.

Key Terms: lactation, colostrum

Figures:

Figure 17.8: Anatomy of the breast.

Figure 17.9: Sustained milk production depends on the mother-child interaction during breastfeeding, specifically the sucking of the infant.

VI. What Are Some Advantages and Challenges of Breastfeeding?

- A. Breast milk is nutritionally superior to infant formula.
 1. Nutritional quality of breast milk is the best for infants.
 - a. Beneficial proteins in breast milk are easily absorbed, help protect the infant's health, and improve absorption of iron.
 - b. Lactose promotes nervous system development, provides energy, and prevents ketosis.
 - c. The fats in breast milk are essential for growth and development of the infant's nervous system and eyes.
 - d. The change in fat content during the feeding promotes satiation.
 - e. Breast milk is a good source of calcium and magnesium and contains a limited, but easily absorbed, form of iron.
 - f. As the baby matures, nutrient content of breast milk changes to meet the changing needs.
 - g. The American Academy of Pediatrics encourages exclusive breast milk for the first 6 months of life.
- B. Breastfeeding has many other physiologic, emotional and financial benefits.
 1. Protection from infections and allergies is provided by breast milk, and breastfed babies are less likely to be exposed to BPA in reusable bottles and formulas.
 2. Physiologic benefits for the breastfeeding mother include:
 - a. quicker return of uterus to pre-pregnancy size and reduced bleeding.
 - b. enhanced weight loss, especially if nursing lasts 6 months or more.
 - c. decreased risk of breast cancer and possibly osteoporosis.
 - d. suppressed ovulation, which increases recovery time.
 3. Mother-infant bonding is enhanced through breastfeeding.
 - a. The direct skin-to-skin contact, cuddling, and intense eye contact that occurs during breastfeeding enhances attachment.
 4. Convenience and cost are both benefits of breastfeeding.
- C. Physical, social, and emotional concerns can make breastfeeding challenging.
 1. Mechanical difficulties during initial breastfeeding can be overcome with counseling.

2. Effects of drugs and other substances on breast milk can cause symptoms in babies.
 - a. Women using illicit drugs and many prescription medications should not nurse while taking the substance unless the physician deems it safe.
 - b. Caffeine and alcohol enter breast milk and change the baby's disposition.
 - c. Exposure to environmental contaminants should be limited by mothers through control of their environments.
 - i. The benefits of breastfeeding far outweigh the negative consequences of environmental contaminants.
 - d. Chemicals and proteins in some foods are distasteful to the infant or cause allergic and other reactions.
- D. Maternal HIV infection can be transmitted through breast milk, so HIV-positive women in the United States and Canada should not nurse.
- E. Obesity appears to reduce the rate of successful breastfeeding.
- F. Conflict between breastfeeding and the mother's job presents several challenges.
 1. A 24- to 48-hour supply of breast milk can be pumped and frozen, if the employer accommodates the time and place.
 2. Women may need to pump breast milk for bottle feeding or provide formula while at work.
- G. Social concerns can be barriers to breastfeeding but are easily overcome, and many states are becoming more accommodating.

VII. What Are an Infant's Nutrient Needs?

- A. Nutrition fuels infant growth and activity.
 1. Typical infant growth and activity patterns mark an intense period of change.
 - a. During the first year, an infant grows about 10 inches in length and triples in weight.
 - b. The primary use of energy during the first 6 months of life is to support growth.
 - c. Activity gradually increases from the sixth month through the first year, and energy needed to support growth slows.
 2. Growth charts are used to track growth and adequate nutrition, but patterns are somewhat unique for each infant.
 3. Because growth of the brain is most rapid during the first year, infants' heads are large in proportion to the rest of their bodies.
 4. Body fat peaks around 9 months, muscle tissue increases slowly, and body calcium doubles during the first year.
- B. Nutrient needs for infants are unique.
 1. Macronutrient needs of infants differ from those of adults.
 - a. Energy needs are about 40 to 50 kcal per pound of body weight per day with the higher need in the younger months.
 - b. Forty to 50% of an infant's diet should come from fat during the first 2 years of life.
 - c. Fatty acids AA and DHA are necessary to support the rapid growth and development of the brain and nervous system.
 - d. The carbohydrate requirement is based on the lactose content of human milk.
 - e. Protein requirements are also based on the protein content in human milk

- i. Because protein in formula is less efficiently absorbed, formula is higher in protein than breast milk, but no more than 20% of daily energy requirement should come from protein.
- 2. Micronutrient needs of infants, which formula and breast milk provide, are high to accommodate rapid growth and development.
 - a. All infants are given a vitamin K injection after birth to help the infant's intestine develop its own healthful bacteria.
 - b. Human milk is low in vitamin D, and deficiencies have been seen in infants with dark skin or limited sunlight exposure.
 - c. Additional iron after the first 6 months can be obtained from iron-fortified cereal.
 - d. Fluoride supplements are not recommended during the first 6 months but may be needed thereafter, depending on the water supply.
 - e. Vegan mothers who breastfeed may need to give their infants supplemental B₁₂.
 - f. Supplements specifically formulated for infants are the only type that should be administered.
- 3. Fluid intake for infants must be sufficient to prevent dehydration.
 - a. Breast-fed or formula-fed babies do not need supplemental fluid.
 - b. If plain water or infant electrolyte formula is given, it should be limited to 4 ounces per day.
 - c. In conditions that cause dehydration, a physician should be consulted to determine appropriate fluid choice.
- C. Infant formula is a nutritious alternative to breast milk.
 - 1. Most formulas are based on altered cow's milk.
 - 2. Soy-based formulas are available for infants who cannot tolerate milk, although there are concerns about the isoflavones.
 - 3. Specialized formulas are available for specific conditions.
 - 4. Cow's milk and goat's milk are not suitable for infants during the first year.

Figures:

Figure 17.10: Energy expenditure during infancy.

Figure 17.11: An infant formula label.

VII. What Are Some Common Nutrition-Related Concerns of Infancy?

- A. Infants need solid foods around 6 months of age.
 - 1. Between four and 6 months, infants are developmentally and physically mature enough to consume solid foods, although the AAP recommends exclusively breast milk until 6 months.
 - a. Prior to 6 months, the extrusion reflux will cause a baby to push most of the food back out of the mouth, muscles are not fully developed and there is a risk for choking, and digestive and urinary systems are not of sufficient maturity.
 - 2. The need for solid foods is related to nutrient needs.
 - a. Because iron stores become depleted at about 6 months, introducing solids that contain iron is important.
 - 3. Commercially prepared baby foods are convenient and appropriately formulated and parents can use a food grinder to prepare homemade baby foods.

4. Throughout the first year, solid foods should only supplement, not substitute, breast milk or iron-fortified formula.
 5. What not to feed an infant includes:
 - a. Foods that could cause choking
 - b. Corn syrup and honey
 - c. Goat's milk or cow's milk
 - d. Large quantities of fruit juices
 - e. Too much sugar or salt
 - f. Too much breast milk or formula
- B.** Some infants develop disorders or distress related to food and feeding.
1. Allergies can be reduced by breastfeeding, introducing new foods in isolation, and avoiding cow's milk.
 - a. Allergies to egg whites, milk, and wheat cause a variety of symptoms, but many infants outgrow them. Very few infants outgrow a peanut allergy.
 2. Colic, or inconsolable crying spells, may have a number of causes, usually disappears spontaneously, and can be treated if necessary.
 3. Gastroesophageal reflux results in spitting up and can be avoided by not overfeeding and keeping the infant upright after feeding.
 4. Failure to thrive (FTT) is a condition whereby the infant's weight and height fall below the third percentile with a variety of causes that must be corrected quickly to prevent wasting and growth stunting.
 5. Anemia in an infant is treated with specially formulated supplements, iron-fortified formula, or fortified cereal.
 6. Dehydration is life-threatening in infants and must be treated immediately with fluids, sometimes with electrolytes.
 7. Feeding problems are common in children with physical abnormalities like cleft lip or cleft palate, infants with genetic or inborn errors of metabolism, and those with developmental delays.
 - a. Therapists, dieticians, and medical professionals can provide the family with skills and knowledge to ensure nutritional health.
 8. Nursing bottle syndrome, tooth decay from prolonged oral contact with high-carbohydrate liquids, can be prevented by not propping the bottle and encouraging a cup at around 8 months.
 9. Lead poisoning can occur if an infant consumes water from lead pipe fittings or lead paint chips.

Key Terms: colic, failure to thrive (FTT)

Figures and Table:

Figure 17.12: This baby has a condition known as unilateral cleft lip, also sometimes called hare lip.

Figure 17.13: Leaving a baby alone with a bottle can result in the tooth decay of nursing bottle syndrome.

Figure 17.14: Fetal adaptation to undernutrition can lead to a variety of diseases in childhood and throughout adulthood.

Table 17.4: Guidelines for the Introduction of Foods to Infants

Activities

1. Have students find the Nutrient Facts Panel from a prenatal vitamin/mineral supplement either online or from the pharmacy. Ask them to:
 - a. Compare the nutrients to the increased needs of pregnancy. Are the prenatal vitamins adequate? Are they excessive? Would they be useful during lactation?
 - b. Compare the prenatal supplement to an adult multivitamin/mineral supplement. How do they differ in nutritional content? In price?
 - c. Check the brand and price to compare with classmates.
 - d. Determine whether there are benefits to purchasing prescription prenatal vitamins instead of over-the-counter products. Discuss student findings in class.
2. Have each student take a poll of at least five mothers. Have them ask each mother:
 - a. Her age when her first child was born
 - b. Whether or not she breastfed her infant(s)
 - c. Why she made the decision she did
 - d. What barriers she encountered in infant feeding
 - e. How she overcame the barriers.

You can also have students ask questions about pregnancy (weight gained, complications, cravings, aversions, and so on). In class, discuss the findings and how important this type of interviewing can be to understanding a condition you have not (or may not, in the case of men) experienced.

3. Have students observe or volunteer at a local Women, Infants and Children (WIC), prenatal, or well-child clinic to learn firsthand how pregnant women and new mothers are counseled on their nutritional needs and appropriate infant feeding practices. Students can journal their observations and bring back educational materials to share with the class.
4. The March of Dimes website (www.marchofdimes.com/peristats/) has “In an Average Week” perinatal statistics for the United States and each individual state. This is a good introduction to the class and can be used to start a discussion on how these statistics could be improved. You may also want to find out where the United States currently ranks in infant mortality in the world and have students speculate why we don’t have the lowest infant mortality rate.

Diet Analysis Activity

5. Pregnant women need to be especially careful to consume adequate amounts of folate, vitamin B₁₂, vitamin C, vitamin D, calcium, iron, and zinc. Using the nutritional assessment previously completed, students should note their own intake of these nutrients. Ask students to compare their own intake to the recommended intakes for pregnant women. If any of their intakes are below recommendations, have them suggest ways to reach the appropriate levels for pregnant women and for lactating women.

Nutrition Debate Activity

6. Lately, controversy on the introduction of solid food has been an issue in the pediatric practice as well as the media. Have students research the current recommendations of various health organizations for introducing solid food and the rationale behind their recommendations. Suggest that they look at infant-feeding practices in other developed countries. Debate the following questions:
- Is there a universally accepted schedule of introducing solid foods in the United States?
 - Is the rationale for current infant feeding practices in the United States supported by research?
 - Would parents be wise to introduce solids that are similar to foods eaten by the family rather than choosing commercially prepared baby foods with no counterpart in the family diet? (Note: The assumption is made that the food would be an appropriate consistency and free of excessive sodium, sugars, and harmful substances.)

Web Resources

American Academy of Pediatrics

www.aap.org

ChooseMyPlate Plans for Pregnant and Breastfeeding Women

www.choosemyplate.gov/pregnancy-breastfeeding

Food and Nutrition Information Center of the USDA

www.fnic.nal.usda.gov

March of Dimes

www.marchofdimes.org

La Leche League

www.llli.org

National Organization on Fetal Alcohol Syndrome

www.nofas.org

National Partnership to Help Pregnant Smokers Quit

www.helppregnantmokersquit.org
