



BASIC INFANT FORMULA MODULE

Basic Infant Formula Module

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About this Module

Introduction

The Basic Infant Formula Module is written for WIC professionals who counsel families about feeding their infants. The purpose of this module is to provide WIC staff with knowledge of basic infant formulas so that they will be able to successfully assist WIC participants. After completing this module the staff will be able to identify basic infant formulas, their differences and uses.

WIC staff will also be knowledgeable of the proper sanitary techniques in measuring and mixing formula. The module also provides basic information on digestive issues such as constipation, diarrhea, colic, gastroesophageal reflux, food allergies and food intolerance. WIC staff will obtain knowledge of these common gastrointestinal problems to enhance understanding of the appropriate use of different formulas and to provide guidance and counseling in interactions with clients.

How to Use the Basic Infant Formula Module

The Texas WIC Basic Infant Formula Module has two components: 1) the **Basic Infant Formula Module** which contains the main text, and 2) the **Basic Infant Formula Workbook**, which contains the activities and test questions.

Local agencies can download the module from the Women, Infant, Children's website and will also have a printed copy for employees to share. As you read through each part, the following icons will prompt you to stop and go to your workbook to complete the activities and test questions.



Activity Icon - When you see this icon, stop where you are and complete the corresponding activity in the **Basic Infant Formula Workbook**.



Test Icon - When you see this icon in the module, stop and complete the corresponding test questions in the **Basic Infant Formula Workbook**.

Each local agency has different procedures for checking test answers and making corrections. Check with your supervisor to find out the procedure in your clinic.

Terms that appear in **bold type** in the text are defined in the glossary in the back of the module. There is a single Reference List in the back of the module that contains all the references cited throughout the text.

The Basic Infant Formula Workbook – You will have your own personal copy of the **Basic Infant Formula Workbook**. Use your workbook to complete module activities and answer test questions. Your workbook also contains a number of formula tables and other reference materials for you to keep.

This module is organized into two sections:

Section A: “Infant Formulas” provides detailed information on standard infant formulas, variations of these formulas, and indications for use. Having information on these formulas will help WIC staff learn which formulas are appropriate for different situations. Additional information on mixing and storage of formulas provides WIC staff with the knowledge for instructing parents on best practices and procedures.

Section B: “Common Gastrointestinal Problems” provides basic information on constipation, diarrhea, colic, gastroesophageal reflux, food allergies (food hypersensitivity) and food intolerance. Knowledge of digestive and intolerance issues will help WIC staff understand the appropriate use of different formulas and/or provide guidance and counseling.

Note: Due to fact that formula manufacturers frequently change the names and formulations of their products, the names of formulas are not included in the body of this module. Instead, each section will refer the reader to a table in the workbook where the names and nutrient composition of formulas referenced in the text are listed. Activities assigned with each table will provide opportunities for WIC staff to become familiar with brand names and types of formulas. The workbook will be periodically updated to reflect the most current names and nutrient content of formulas. Replace charts in the workbook when revisions are provided to keep your reference materials current.

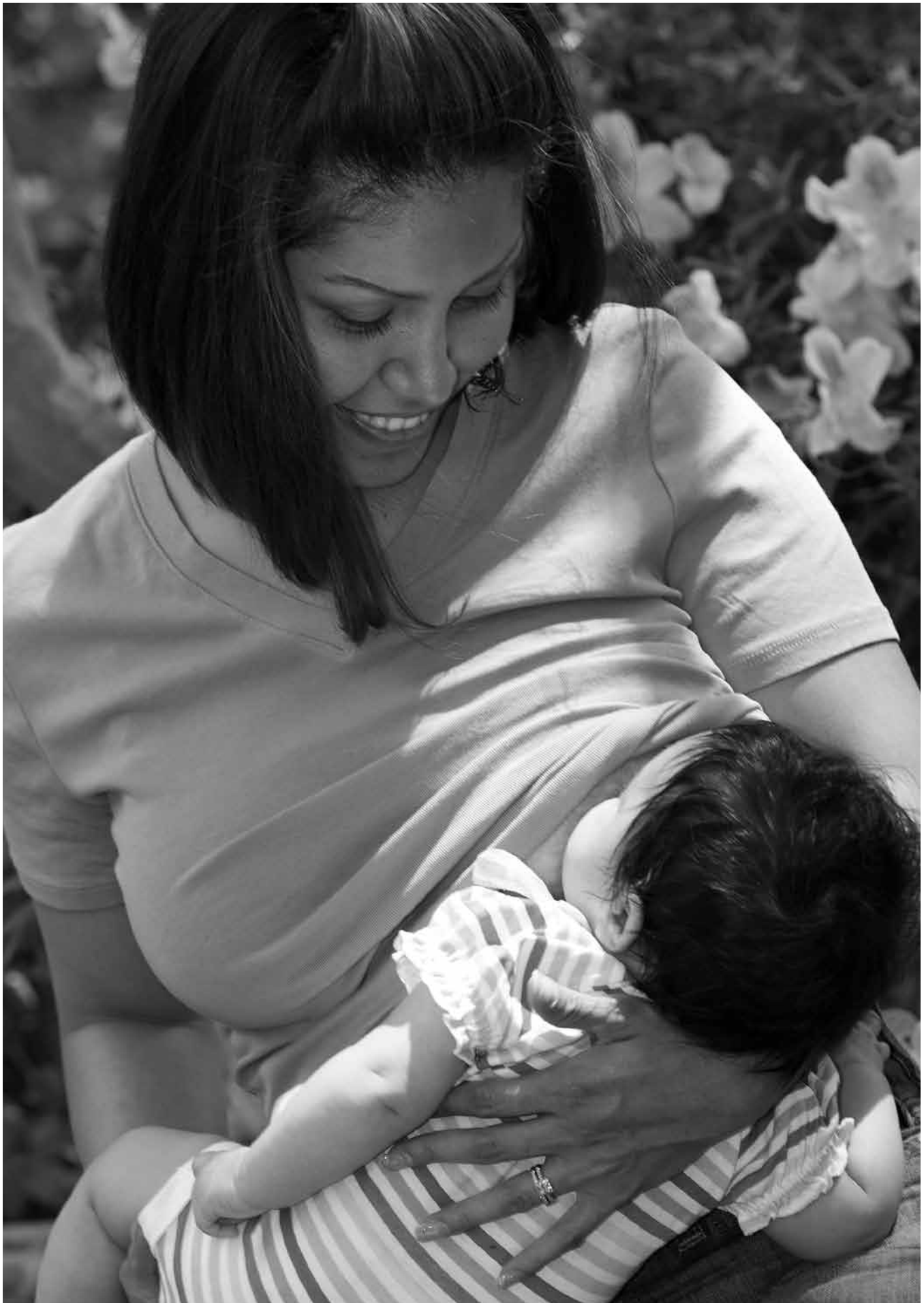


Objectives

After completing Section A of the Basic Infant Formula Module, you will be able to:

- Name at least three benefits of breastmilk that cannot be provided by infant formula.
- Name two medical conditions in which breastfeeding may be contraindicated.
- Define DHA* and ARA*.
- Define the difference between a prebiotic and a probiotic.
- List two other nutrients or additives that are added to standard infant formulas.
- Name three standard infant formulas with special characteristics and their indications for use.
- Identify the differences between soy-based infant formulas and cow's milk-based infant formulas.
- Identify five conditions when a soy-based formula would be appropriate.
- Identify three conditions when the routine use of a soy-based formula would not be recommended.
- Identify the difference between standard infant formula and post discharge formula for premature infants.
- Describe the use of toddler/follow-up formulas.
- Identify two reasons why cow's milk should not be given to infants.
- Instruct a caregiver on how to properly prepare infant formula.
- Define water intoxication.

*Words that are defined in the glossary will be bolded when they first appear in the text. The glossary can be found in G-1 of this module.



Human milk is recognized as the gold standard for infant nutrition. Therefore, it is important to promote breastfeeding as the optimal way to feed babies. Texas WIC joins all major health authorities in recommending that all infants, with rare exceptions, receive no other food or drinks besides breastmilk for approximately the first six months of life and continue to receive breastmilk at least through the first year. Although breastfeeding is optimal for infants, there may be exceptions or conditions when breastfeeding is not an option or is not recommended. Infant formulas provide appropriate amounts of nutrition for adequate growth and development.

Benefits of Breastmilk

There are many benefits to breastfeeding, and properties of breastmilk that have yet to be duplicated in infant formula:

- Breastfeeding reduces a baby's risk of infections, asthma, allergies, sudden infant death syndrome (SIDS), childhood leukemia, obesity, and diabetes; and it improves cardiovascular health.
- Breastmilk is easier to digest than formula because it contains enzymes that help digest fat, protein and carbohydrate.
- Breastmilk contains antibodies, which increase an infant's immunity to infections. The composition of breastmilk changes to meet the specific nutrient needs of each infant as the infant matures. Infant formulas are designed to provide nutrients similar to the nutrients contained in breastmilk. However, a manufacturer cannot add antibodies to formula, and a formula cannot change composition to meet an infant's changing needs.
- Breastfeeding strengthens the infant's facial and oral muscles that are needed later in life for eating and talking, whereas drinking from a bottle uses a different set of muscles.
- Breastfeeding reduces the mother's risk of diabetes and breast and ovarian cancers.



Breastmilk

is easier to digest than formula because it contains enzymes that help digest fat, protein and carbohydrate.

Section A



Although breastfeeding is optimal for infants, there are a few special conditions when breastfeeding may not be best for the infant.

Although breastfeeding is optimal for infants, there are a few special conditions when breastfeeding may not be best for the infant.

Breastfeeding is not recommended for infants who have:

- Galactosemia, a rare genetic metabolic disorder
- Mothers who have been infected with the human immunodeficiency virus (HIV)
- Mothers who have been infected with the human T-cell lymphotropic virus (HTLV) type I or II
- Mothers who have active untreated tuberculosis disease (a mother receiving treatment can breastfeed)
- Mothers who are undergoing radiation therapies; however, such nuclear medicine therapies require only a temporary interruption in breastfeeding
- Mothers who are taking prescribed cancer chemotherapy agents
- Mothers who are abusing drugs
- Mothers who have herpes lesions on a breast

In rare instances of severe jaundice, breastfeeding may need to be interrupted temporarily. These situations may call for the need to supplement with formula. Inadequate weight gain in a breastfed infant may also necessitate supplementation. However, with prompt and adequate breastfeeding support, this issue can usually be resolved without supplementation.

All pregnant and new moms should be encouraged to breastfeed and be supported in their breastfeeding efforts. If a mother still chooses to formula feed after breastfeeding support is offered, WIC staff should fully support the mother in her infant feeding choice.



Nutrient Composition

All infant formulas must meet the requirements of the Infant Formula Act of 1980, which establishes minimum levels for 29 nutrients and maximum levels for nine others. Formulas can vary somewhat in the amount and type of a particular nutrient, but all still meet the requirements of the Infant Formula Act. Standard infant formulas provide 20 calories per ounce when prepared according to the directions on the label.

Manufactures of standard infant formulas include:

- Abbott Nutrition Similac brand
- Gerber Good Start brand
- Mead Johnson..... Enfamil brand
- PBM Nutritionals All Store brands

Note: Store-brand infant formulas are all manufactured by PBM Nutritionals. If a family runs out of formula, a store brand is a high-quality and far less expensive substitute for name-brand formulas.

Understanding the major nutrients in infant formulas can help the clinician determine the underlying cause of an adverse reaction to a formula.

The major nutrients in infant formulas are:

- Carbohydrate
- Protein
- Fat

Formulas differ in the type of carbohydrate, protein, and fat they contain. Formulas can also vary in composition depending on whether they are powdered, concentrate, or ready-to-use. For example, lecithin, carrageenan, monoglycerides, and diglycerides are added to liquid concentrate and ready-to-use formulas, acting as emulsifiers to prevent separation. **Emulsifiers** are not added to powdered forms.

Section A

Standard Milk-Based Infant Formulas



Standard milk-based formulas are the feeding of choice for healthy, term infants who are not breastfed or are partially breastfed.

Standard milk-based formulas are the feeding of choice for healthy, term infants who are not breastfed or are partially breastfed. Since breastmilk is the gold standard for infants, standard milk-based infant formulas are designed to be as similar in nutrient composition to breastmilk as possible.

Carbohydrate

Lactose is the major carbohydrate (sugar) found in both breastmilk and standard milk-based infant formulas. Lactose is only found in the milks of mammals, such as cows, goats, and humans. Milk-based formula is derived from cow's milk which has a lower lactose content than human milk. During the manufacturing process, additional lactose is added to milk-based formulas to bring the amount closer to that of human milk.

Lactose aids in the absorption of minerals, such as calcium, magnesium, and zinc and helps promote the growth of good bacteria.

Protein

The protein in standard milk-based infant formulas is derived from cow's milk protein, which has been modified to be more like breastmilk protein. Milk contains two major classes of protein: **casein** and **whey**. Cow's milk is about 80 percent casein and 20 percent whey, whereas breastmilk is about 20 to 40 percent casein and 60 to 80 percent whey. Casein proteins form larger curds in the infant's stomach and are harder to digest. Some formulas have been manufactured to be higher in whey protein. Although this produces a formula that is more similar to breastmilk, the whey proteins in breastmilk are very different from the whey proteins in cow's milk.

Lactalbumin is the major whey protein found in breastmilk, whereas **lactoglobulin** is the major whey protein of cow's milk. Lactoglobulin has a greater potential for causing protein allergy than lactalbumin. Goat's milk also contains lactoglobulin, which makes it a poor substitute for infants who are allergic to cow's milk protein.

Fat

Cow's milk contains butterfat, which is difficult for the infant to digest. When cow's milk-based infant formulas are produced, manufacturers remove the butterfat and replace it with vegetable

oils, which are easier to digest. Vegetable oils are added in a specific amount to create a formula that is more similar to human milk.

Various combinations of different fats used in standard milk-based infant formulas may include:

- Palm oleic oil
- Soy oil
- Coconut oil
- High-oleic sunflower oil
- High-oleic safflower oil
- DHA (Omega 3), ARA (Omega 6)



Workbook Activity 1

Refer to Table-A- 1: Comparison of Select Nutrients in Standard Milk-Based Powdered Infant Formulas and Human Milk

Standard Milk-Based Infant Formulas with Special Characteristics

There are several milk-based infant formulas that are modified to meet specific needs:

- Lactose-free or low-lactose formulas
- Formulas with added rice starch

Lactose-Free and Reduced Lactose Infant Formulas

Reduced lactose formulas are milk-based infant formulas that contain corn maltodextrin, corn syrup and/or sucrose, which partially or fully replace the lactose in the formula. The symptoms of lactose intolerance are very similar to symptoms of milk allergy so when an infant shows a negative reaction to a standard infant formula, it is not always clear which ingredient is causing the reaction. Gassiness, bloating, frequent loose stools, and a reddened diaper area can be symptoms of either food allergy or lactose intolerance. **Note:** Due to the addition of prebiotics, milk-based formulas are not completely lactose-free, but are approximately 99.8% percent lactose-free.



Gassiness, bloating, frequent loose stools, and a reddened diaper area can be symptoms of either food allergy or lactose intolerance.

Section A

Infant Formulas with Added Rice Starch



Infant formulas with added rice starch are designed for infants who spit up due to gastroesophageal reflux (GER).

Infant formulas with added rice starch are designed for infants who spit up due to gastroesophageal reflux (GER). For more information on GER, see Section B. A portion of the carbohydrate (lactose) in these formulas is replaced with rice starch. These formulas are slightly thicker than regular formula when prepared, and become thicker when combined with stomach acid. Infants with reflux may spit up less on thickened formula. Prior to the availability of formula with added rice starch, a measured amount of infant cereal was used as a thickener for formula or breastmilk. Using a formula with added rice starch has some advantages over using infant cereal as a thickener. For example, the ratio of carbohydrate, fat and protein does not differ from standard formula. The formula flows more easily through a nipple without clogging, the nutrients in the formula are not diluted, and the calorie content is not altered. Adding cereal to formula may be used when the formula thickness needs to be individually tailored to meet the needs of an individual child, or when thickening of expressed breastmilk is desired. Formulas with added rice starch require stomach acid to properly thicken, however stomach acid may be reduced by some medications (i.e. Zantac, Prevacid, Zegerid, or Prilosec). Physicians may choose to add cereal to thicken formula when large or frequent doses of acid suppressing medications are prescribed. Depending on the circumstances, rice starch added formula may also be used for an infant taking these medications.

Note: Thickened formula should not be given to preterm infants due to their immature digestive systems.



Workbook Activity 2

Refer to Table-A- 2: Comparison of Selected Powdered Milk-Based Infant Formulas with Special Characteristics and Handout Formulas with Special Characteristics

Soy-Based Formulas

Soy-based infant formulas (soy formulas) contain protein derived from soy rather than cow's milk. Soy formulas have been used since 1929 for infants with intolerance to milk-based formulas. The American Academy of Pediatrics' (AAP) Committee on Nutrition

issued recommendations for the use of soy formulas in infant feeding in 1998 and updated in a clinical report in 2008 (Bhatia, 2008).

AAP's Recommendations for the Use of Soy Formulas

1. In term infants, although isolated soy protein-based formulas may be used to provide nutrition for normal growth and development, there are few indications for their use in place of cow milk-based formula. These indications include (a) for infants with galactosemia and hereditary lactase deficiency (rare) and (b) in situations in which a vegetarian diet is preferred.
2. For infants with documented cow milk protein allergy, extensively hydrolyzed protein formula should be considered, because 10% percent to 14% percent of these infants will also have a soy protein allergy.
3. Most previously well infants with acute gastroenteritis can be managed after rehydration with continued use of human milk or standard dilutions of cow milk-based formulas. Isolated soy protein-based formulas may be indicated when secondary lactose intolerance occurs.
4. Isolated soy protein-based formula has no advantage over cow milk protein-based formula as a supplement for the breastfed infant, unless the infant has one of the indications noted previously. Soy protein-based formulas are not designed for or recommended for preterm infants.
5. The routine use of isolated soy protein-based formula has no proven value in the prevention or management of infantile colic or fussiness.
6. Infants with documented cow milk protein-induced enteropathy or enterocolitis frequently are as sensitive to soy protein and should not be given isolated soy protein-based formula. They should be provided formula derived from hydrolyzed protein or synthetic amino acids.
7. The routine use of isolated soy protein-based formula has no proven value in the prevention of atopic disease in healthy or high-risk infants.



Soy-based infant formulas (soy formulas) contain protein derived from soy rather than cow's milk

Section A

Composition

Soy formulas are free of cow's milk protein and lactose. These formulas contain **soy-protein isolate** with added **L-methionine** added to improve the biological quality of the protein. **L-Carnitine** and **taurine** are added in amounts equal to those found in breastmilk. The fat content of soy formulas is derived from vegetable oils. The carbohydrate source of soy formula may be corn maltodextrin, corn syrup, or sucrose.



Workbook Activity 3

Refer to Table-A-3: Comparison of Select Nutrients in Standard Soy-Based Powdered Infant Formulas and Breastmilk



As greater knowledge about the composition and qualities of human milk are discovered, formula manufacturers strive to make these additions and changes to their products.

Other Nutrients and Additives

As greater knowledge about the composition and qualities of human milk are discovered, formula manufacturers strive to make these additions and changes to their products. The following are some relatively recent additions that have been made to infant formulas.

Docosahexaenoic acid (DHA) and **arachidonic acid (ARA)** are sources of Omega-3 (DHA) and Omega-6 (ARA) fatty acids that occur naturally in breastmilk. These fatty acids have been found to be concentrated in the brain and eye. Clinical studies have shown these fatty acids are important for achieving optimal mental and visual development. Preterm infants have decreased stores of DHA and ARA and are inefficient in producing their own DHA and ARA.

In 2001, U.S. formula manufacturers began adding DHA and ARA to infant formulas. The source is a chemical extract from marine algae (*Cryptocodinium cohnii*-DHA source) and a fungus (*Mortierella alpina*-ARA source) manufactured by Martek Biosciences Corporation. Clinical studies have shown that preterm infants who receive formula supplemented with DHA and ARA achieve normal growth and improved visual and mental development compared with preterm infants who do not receive formula with DHA and ARA. Some clinical studies have shown that adding DHA and ARA to infant formula also improves the visual and mental development of term infants.

While breastfed infants tend to score higher on mental development tests than formula-fed infants, infants who receive formula supplemented with DHA and ARA score better than infants who receive formula without it (Fleith 2005).

Probiotics and Prebiotics

Soon after birth, a baby's intestines are colonized with bacteria. Two main factors that determine the types of bacteria are the baby's diet and whether the baby is born by cesarean section or vaginally. Studies have shown that the intestines of babies born vaginally and fed human milk contain greater quantities and varieties of "beneficial bacteria" when compared to the intestines of babies born by cesarean section and/or who are formula-fed. A complex mix of prebiotics and probiotics are transferred to the infant through breastmilk; they act to promote the establishment and growth of predominantly beneficial bacteria early in life. Recently, U.S. formula manufacturers have begun adding prebiotics and/or probiotics to their formulas in order to mimic some of the effects of naturally occurring prebiotics and probiotics.

Probiotics naturally get passed to the infant through breastmilk and are also added to some infant formulas. When added to formula, the idea is to produce an intestinal microflora more like that of the breast-fed infant and for the infant to gain similar health benefits. Probiotics are currently only added to powdered formula and when water is added, these live bacteria start to grow. Unlike formula with probiotics, which may contain only one strain of bacteria, breastmilk contains various strains and amounts of bifidobacteria. *Bifidobacteria lactis* (Bifidus BL) and *Lactobacillus rhamnosus* (LGG) are examples of bacteria that are currently added to select formulas. Different strains provide different health benefits. For example, some beneficial bacteria have been shown to decrease the incidence of rotavirus, a common cause of diarrhea in infants (Greer, 2008).

Prebiotics are carbohydrates which are resistant to digestion by stomach acid and enzymes. They pass intact to the lower gastrointestinal tract, and fuel the growth of naturally occurring "beneficial bacteria," such as bifidobacteria and lactobacilli. Bifidobacteria and other beneficial bacteria serve many health-protective functions. They ferment carbohydrates in the colon to produce short chain fatty acids such as acetic, butyric and lactic



Probiotics

naturally get passed to the infant through breastmilk and are also added to some infant formulas.



Prebiotics

are carbohydrates which are resistant to digestion by stomach acid and enzymes.

Section A

acids. These acids make the gut environment more acidic, which then inhibits the growth of potentially harmful bacteria, such as *Clostridium difficile* and *Escherichia coli*. This is thought to be one of the reasons why breastfed infants experience fewer occurrences of diarrhea and other types of infections than do formula-fed infants. In addition, these helpful bacteria line the intestinal wall, acting as a barrier to help prevent disease-causing bacteria and potential allergens from entering the body. Other beneficial effects include the enhancement of mineral absorption and the synthesis of vitamins, such as vitamin K and folic acid. Prebiotics found in human milk are known as human milk oligosaccharides (HMOs). The prebiotics added to formulas are not identical to HMOs. HMOs are dynamic, complex and vary highly among women and throughout lactation. For example, colostrum contains greater amounts and different varieties of HMOs than transitional or mature human milk. Prebiotics added to formula provide some, but not all of the health benefits of HMOs. Examples of prebiotics added to formula include galactooligosaccharides (GOS), Polydextrose (PDX), lactulose, inulin, and fructooligosaccharides (FOS) (Greer, 2008).

Some formulas contain added amounts of **nucleotides**, which are the building blocks for DNA and RNA and are present naturally in breastmilk and cow's milk. Nucleotides improve iron absorption, may enhance immune function, and are necessary for energy metabolism.

Taurine, a vitamin-like compound, is abundant in human milk. It is added to all commercial infant formulas and is needed for development of the brain, nervous system, and retina. Taurine also has an essential role in fat absorption.

Fluoride is a mineral which is essential for tooth and bone formation. However, in excess quantities, it can cause a condition known as **fluorosis** (see box A.1). Fluoride is present in only small amounts in infant formulas to prevent excess consumption of this mineral. Infant formula manufacturers assure that infant formula contains low fluoride levels. Although formula contains low amounts of fluoride, there may be a concern when infant formula (concentrate or powdered) is mixed with water that contains high levels of fluoride. If formula is the primary source of nutrition, it may introduce fluoride at levels above the recommended amount.

According to the Centers for Disease Control and Prevention, to minimize the risk for fluorosis, parents should follow the recommendations of the formula manufacturer, as well as their child's physician, regarding the type of water appropriate for the formula they are using. (USDA Book)

Box A.1 *Water and Fluoride*

Excess fluoride can cause fluorosis, which is the hypomineralization of the enamel surface of the tooth that develops during tooth formation. Damage to the permanent teeth can range from white lines or spots to pitting and staining of the outer enamel layer. Parents may express concern about the effects of mixing their infant's formula with fluoridated water. Exposure can be minimized by mixing formula with low fluoride water most or all of the time. While most public water systems are fluoridated, some tap water may contain safe levels of fluoride for using to mix with formula. Check the following site to determine the fluoride content of your local area water supply: <http://apps.nccd.cdc.gov/MWF/Index.asp>.

If tap water is fluoridated or has substantial natural fluoride (0.7 mg/L or higher), a parent may consider using a low-fluoride alternative water source. Bottled water known to be low in fluoride is labeled as purified, deionized, demineralized, distilled, or prepared by reverse osmosis. Most grocery stores sell these types of low-fluoride water (Levy, 2010).



If tap water is fluoridated or has substantial natural fluoride (0.7 mg/L or higher), a parent may consider using a low-fluoride alternative water source.

Vitamin D is a fat soluble vitamin that is essential to maintain bone health and normal calcium metabolism. In 2008, the American Academy of Pediatrics (AAP) increased the recommendations for the minimum daily intake of vitamin D from 200 IU/day to 400 IU/day for infants (beginning in the first few days of life), children and adolescents. All formulas sold in the United States have at least 400 IU per liter (33.8 ounces) of vitamin D. Most formula-fed infants ingest nearly one liter of formula per day after the first month of life and will achieve a vitamin D intake of 400 IU/day. A supplement of Vitamin D may be needed if the infant is ingesting less formula that would provide the recommended minimum daily intake.

Infants who receive a mixture of breastmilk and formula would also benefit from supplementation to ensure an adequate intake of vitamin D, as breastmilk contains insufficient quantities of vitamin D (Wagner, 2008).

Section A



Casein hydrolysate formulas are designed for infants who are unable to digest or may have an allergy to the cow's milk protein in standard infant formulas.

Protein Hydrolysate Formulas

Some milk-based formulas have been modified to produce formula that is more digestible and less likely to produce an allergic reaction. These formulas contain either casein or whey proteins that have been “hydrolyzed.”

Casein Hydrolysate Formulas

Casein hydrolysate formulas are designed for infants who are unable to digest or may have an allergy to the cow's milk protein in standard infant formulas. These formulas contain casein that has been extensively hydrolyzed (Leonberg, 2009). **Hydrolysis** is the process by which proteins are broken down by enzymes using water to produce smaller protein particles called **peptides** and free **amino acids**. The smaller the protein particle, the easier it will be to digest and therefore less likely to cause an allergic reaction.

Composition of formulas

Protein

Casein hydrolysate formulas are supplemented with three amino acids — cystine, tyrosine, and tryptophan — to provide a complete balance of protein. Although allergic reactions to casein hydrolysate formulas are rare, there are some very sensitive infants who are allergic to them. Allergies to casein hydrolysate formulas occur because not all of the casein is hydrolyzed in the process and larger protein particles remain. Infants allergic to these formulas would need a formula that is not derived from cow's milk proteins.

Fat

Some casein hydrolysate formulas contain medium-chain triglycerides (MCT) as the major fat source. “Medium-chain” refers to the length of the fat molecule. MCTs are easier to digest and absorb than fats with greater chain lengths (corn, soy, or safflower oils). Infants and children who have a difficult time digesting and absorbing longer chain fats in foods may benefit from MCT oil. Most infants who are allergic to milk and soy do not have fat malabsorption and will do fine on casein hydrolysate formulas that do not contain MCT oil.

Carbohydrate

All casein hydrolysate formulas are lactose free. Carbohydrate sources include corn maltodextrin, sucrose, corn syrup solids and modified corn starch.

Indications for Use

Casein Hydrolysate formulas indications:

1. Allergies to cow's milk proteins and soy protein
2. Infants with documented intestinal damage due to milk allergy frequently are equally sensitive to soy protein and should not be given soy formula routinely. They should be provided with casein hydrolysate formula.
3. Malabsorption
4. Casein hydrolysate formulas that contain a percentage of the fat as MCT oil is appropriate for conditions such as biliary atresia, liver disease, short-bowel syndrome, AIDS (with gastrointestinal involvement), cholestasis, and cystic fibrosis.
5. Gastroesophageal reflux disease (GERD)
6. Possible prevention of milk allergy for infants with a strong family history of allergy

There is no evidence to support the use of casein hydrolysate formula in the treatment of colic, sleeplessness or irritability.

Disadvantages to using casein hydrolysate formulas include, poor acceptance (by some infants) due to the taste, higher cost, and higher osmolality (may be important for sensitive individuals).

Whey Hydrolysate Formulas

Another type of infant formula that is available uses partially hydrolyzed whey as the protein source instead of casein. These formulas are not recommended once an infant has developed a milk allergy because the proteins are only partially hydrolyzed and have been known to cause allergic reactions. They may be helpful in preventing milk allergy in some infants. The advantage of whey hydrolysate formula compared to casein hydrolysate formulas is the taste.

Section A



Workbook Activity 4

Refer to Table-A-4: Comparison of Select Nutrients in Protein Hydrolysate Infant Formulas



Infants who are born prematurely (born at or less than 37 weeks gestation) are at risk for nutritional deficiencies due to decreased body stores of nutrients at birth and increased demands for growth.

Post-discharge Discharge Formulas for Preterm Infants

Infants who are born prematurely (born at or less than 37 weeks gestation) are at risk for nutritional deficiencies due to decreased body stores of nutrients at birth and increased demands for growth. During the last trimester, most of the infant's energy and protein reserves are stored, as well as calcium, phosphorus, iron, and most other nutrients. Prior to hospital discharge, premature/low birth weight infants may receive a formula that is very high in certain nutrients, calories and protein. These formulas are designed to help the infant attain growth and bone mineralization close to what they would have, had they not been born early. Rarely, an infant may be discharged on one of these formulas, but typically, the infant is changed to a "post discharge" formula designed for premature infants. Post-discharge formulas (sometimes called step-down formulas) have a calorie, protein and nutrient content about half way between the preterm formulas used in the hospital and standard infant formula designed for term infants.

Premature infants may have trouble digesting and absorbing nutrients, therefore, these formulas include a small portion of their lactose content replaced with **glucose polymers** and about 20% percent of the fat is medium-chain triglycerides, which are more easily absorbed. There are currently no definitive guidelines describing when to discontinue an infant from post-discharge formula, but birth weight, rate of weight gain, developmental status and medical conditions should be considered when deciding the appropriate time to discontinue use.



Workbook Activity 5

Refer to Table A-5: Comparison of Select Nutrients in Powdered Post-Discharge Formula for Preterm Infants and Standard Milk-Based Infant Formulas per 100 Calories

Toddler/Follow-up Formulas

Toddler/follow-up formulas are designed for infants who are at least 9 months of age and are eating solid foods. Infants have increased needs for both calcium and protein at the same age that they start eating solid foods, which typically contain less of these nutrients. When solid foods are added to an infant's diet, the infant often decreases the amount of formula he drinks. Ounce for ounce, toddler formulas are higher in calcium than standard milk-based or soy-based formulas. Some toddler formulas also have larger amounts of protein than either breastmilk or standard formulas. Toddler formulas are available with either milk protein or soy protein.



Workbook Activity 6

Refer to Table A-6: Comparison of Selected Standard/Follow-up Toddler Formulas, Milk Drinks, and Whole Cow's Milk



Toddler/follow-up formulas are designed for infants who are at least 9 months of age and are eating solid foods.



Infant Formula Mixing and Storage Part 3

Forms of Infant Formula

Infant formula is available in three forms: liquid concentrate, powdered, and ready-to-use/ready-to-feed. The different forms of a given formula are nearly identical in nutrient composition, but small differences may exist for technical reasons due to processing. Careful preparation and handling of infant formulas are important to ensure their safety.

- **Liquid concentrate** formula needs to be mixed with water in a ratio of 1-to-1. This means mixing one can of liquid concentrate formula with one can of water. After a can of liquid concentrate formula is opened, it should be prepared, refrigerated, and used within 48 hours. The preparation of formula from liquid concentrate requires dilution with an equal volume of water. Liquid concentrate should be shaken before being mixed.
- **Powdered formula** is prepared by mixing the powder with water following the directions on the can. Usually, the directions call for mixing one scoop of powder with 2 ounces of water. Parents and caregivers should be instructed to use the scoop provided by the manufacturer and not substitute standard measuring spoons or scoops from other formulas. Powders from different manufacturers provide slightly different amounts of nutrients per unit of volume; and scoop sizes will vary accordingly, so it is important to adhere closely to the manufacturer's mixing instructions on the label. **Note:** The directions refer to the scoop that is included in the can.

Powdered formula is often the best choice for breastfed babies who need occasional formula because it is easy to make small amounts, and the powder can be stored for up to one month after opening. Once the powder is mixed with water, the prepared formula should be used within 24 hours, or according to the directions on the label.

- **Ready-to-use formula** requires no mixing or diluting with water. It is available in bottles and/or cans of various sizes. This type of formula is usually the most expensive choice, but it may be the best choice when the water supply is questionable or when a mother has difficulty correctly mixing liquid concentrate or powdered formula. The bottle should be shaken before being

Section A

poured into the bottle to re-suspend any mineral sediment that may have settled during storage. After a can of ready-to-use formula is opened, it should be refrigerated and used within 48 hours (Leonberg, 2009).



Ready-to-use formula

Liquid concentrate formula

Powder formula

Ready-to-use and liquid concentrate formulas are sterile, meaning they do not contain disease causing bacteria. Although powdered formulas are heat-treated during processing, unlike the liquid formulas, they are not subjected to high temperatures for a sufficient amount of time to make the end product sterile. Powdered formulas must meet strict standards regarding the level of pathogenic organisms allowed; they are not sterile and in rare cases, may contain pathogenic organisms. One pathogen in particular that has occasionally been found in some powdered infant formulas is *Enterobacter sakazakii* (see box A.2 below). This organism has been known to cause severe infections in preterm infants and other infants with weakened immune systems. For this reason, powdered formulas generally are not recommended for these infants (Kleinman, 2009).

Box A.2 *Enterobacter sakazakii*

A concern about possible *Enterobacter sakazakii* (*E.sakazakii*) infections led the Food and Drug Administration (FDA) to issue an alert to healthcare professionals in April 2002. For more information see <http://www.cfsan.fda.gov/~dms/inf-ltr3.html>. *E.sakazakii* is a microorganism belonging to the family *Enterobacteriaceae* which may cause sepsis, meningitis, or necrotizing enterocolitis (NEC) (Hemelright, 2001).

According to the FDA, “clusters of *E.sakazakii* infections have been reported in a variety of locations over the past several years among infants fed milk-based powdered infant formula products from various manufacturers” The literature suggests that premature infants and those with underlying medical conditions may be most susceptible to developing *E.sakazakii* infection (Leonberg 2009).

Sanitation

One of the most important aspects of mixing and using formula is proper sanitation. Intestinal problems in babies are often due to poor water quality or unsafe handling of bottles or equipment rather than sensitivities to the formula itself. It is important to make sure the water is safe for a baby and make sure everything is as clean as possible. This includes bottles, water, hands, can openers, and anything else that comes in contact with the formula. It is also important to follow guidelines for proper storage of formula both at home and away from home.

Dilution

Another key factor in formula preparation is proper dilution. It is very important to mix the liquid concentrate or powdered formula with the right amount of water. Adding either too much or not enough water can lead to serious health problems for the infant. Only a physician should prescribe a dilution or recipe that is different from the manufacturer's directions.



Wash hands thoroughly with soap and warm water.

Mixing and Storing Formula

The following are guidelines that can be given to caregivers to help them prepare, store and use formula correctly and safely:

Sanitizing bottles

The safest practice during the first 3 months of life is to boil bottles and bottle parts. This is especially true when the water quality is questionable. Some physicians might tell parents to simply wash bottles in hot, soapy water or in the dishwasher, as this may be adequate for healthy newborns in many situations. Still, WIC advises participants to boil bottles since this is the best method for killing bacteria.



It is important that bottles are thoroughly cleaned; the safest practice for the first three months of a baby's life is to routinely boil bottles and bottle parts.

To boil bottles:

- Wash all bottle parts with hot, soapy water and a bottlebrush. Be sure water passes through the nipple.
- Rinse all bottle parts in hot water. Then place all bottle parts in a large pan, cover with water, and boil for five minutes.
- Remove items from pan, place upside-down on a clean cloth or paper towel and air dry.

Section A

Box A.3 Concerns about BPA

Some plastics are made with chemicals called phthalates or BPA (bisphenol A). These chemicals can leach from everyday plastic products like bottles, toys, containers and personal care products. Scientists and doctors are learning about these chemicals and the health effects that they may have, especially on young children.

Infant bottles made with BPA

The six major U.S. manufacturers of baby bottles and infant feeding cups have confirmed to FDA that as of January 2009, they have not manufactured these products using BPA for the U.S. market. These manufacturers represent more than 90 percent of the U.S. market. These manufacturers produce brands that include Avent, Doctor Brown's Natural Flow, Evenflow, First Essentials, Gerber, Munchkin, Nuk, and Playtex.

The FDA has found that powdered formula typically has no detectable level of BPA, but there are small amounts of BPA in liquid infant formula sold in cans. Parents using liquid formula in cans should not heat the cans on the stove or in boiling water. Ready-to-Use formula can be served at room temperature or gently warmed in a nursing bottle by running water over the outside of the bottle (HHS, 2010).

Plastic Containers Made with BPA Used in Food Preparation.

Plastic containers have recycle codes on the bottom. In general, plastics that are marked with recycle codes 1, 2, 4, 5, and 6 are very unlikely to contain BPA. Some, but not all, plastics that are marked with recycle codes 3 or 7 may be made with BPA.

Do not put very hot or boiling liquid that you intend to consume in plastic containers made with BPA. BPA levels rise in food when containers/products made with the chemical are heated and come in contact with the food.

Discard all bottles with scratches, as these may harbor bacteria and, if BPA-containing, lead to greater release of BPA.

How to avoid phthalates and BPA:

Do not heat foods in plastic cling wraps.

Put only plastics labeled, "dishwasher safe" in the dishwasher and only plastics labeled, "microwave safe" in the microwave.

If using hard polycarbonate plastics (baby bottles/ sippy cups/ water bottles), do not use for warm/hot liquids.

Use safe alternatives, such as glass or polyethylene plastic (symbol #1).

Avoid canned foods when possible (BPA maybe used in can linings).

Look for labels on products that say "BPA -free" or "phthalate-free."

Choose safer plastics:



Source: PEHSU, 2008

Plastics to avoid:



PVC or vinyl
(can contain
phthalates)

Polystyrene
Foam

Can contain
Bisphenol A

Sanitizing water for mixing formula

For at least the first 3 months of life, WIC recommends sanitizing water by boiling it for one minute and then allowing it to cool. All types of water should be sanitized, including bottled drinking water and distilled water.

For healthy infants 3 months and older, it is not necessary to sanitize the water unless a physician recommends it. If the water quality is poor or questionable, as in the case of well water, caregivers should continue to boil the water or use bottled water.

To properly boil water:

- Run cold tap water for one to two minutes before collecting the water in a clean pot or kettle. Running the water helps reduce the amount of lead in the water in case the pipes contain lead. Never use hot water from the faucet to make baby formula or for cooking.
- Bring the water to a rolling boil and boil for one minute. One minute is enough time to sanitize the water, and boiling the water for a longer time can concentrate lead in the water. Next, turn off the heat and cool the water with the lid on, either on the stove or in the refrigerator.

Mixing the formula

It is important to follow the manufacturer's instructions about how much water to add to the formula, unless a physician prescribes a different dilution.

There are several different options for filling and storing bottles, depending on how many bottles are prepared at one time. See Box A.4 for step-by-step instructions.

Storage

Bottles should not be left unrefrigerated for more than 1 hour. Store prepared formula in the back of the refrigerator, which is the coldest area.



Parents can sanitize water for formula by boiling water for one minute and then letting it cool.



Parents should follow the dilution directions on the can, unless a doctor has given different instructions.

Section A

Box A.4 *Preparing Infant Formula, Step-by-Step*



Check the formula's expiration date on the label or lid to be sure it has not expired. Also, check the formula's label for the proper dilution instructions. It is very important to add the right amount of water. Only a physician should prescribe a dilution that is different from the directions on the can.



Wash hands thoroughly with soap and warm water. Using hot, soapy water, wash a pitcher, its lid, and any other utensils you will use (can opener, measuring cups, etc.). Rinse all with boiling water.



If using liquid concentrate formula, before opening, shake the can and rinse off the top.

Open with a clean can opener. Mix the can of liquid concentrate formula with a can of boiled and cooled water in the clean container.



Stir to mix thoroughly and pour into sanitized bottles.

Infant Formulas



If using powdered formula, follow the directions on the can for measuring the water and powder. Usually, the directions are to add one scoop of powder to 2 ounces of water.

Start by measuring the sanitized water into a clean container.

Another option is to store the boiled water in the refrigerator (either in the container it was boiled in or in sanitized bottles), then mix formula as needed, using the bottle as the mixing container. Boil fresh water on a daily basis.



Next, add the correct amount of powdered formula to the water in the container.

You can mix enough for a full day's supply or make smaller amounts using sanitized bottles as the mixing containers.



After adding the powder, stir or shake the mixture thoroughly.



Open cans of powdered formula can be stored in the can for up to 1 month, but once powder is mixed with water and refrigerated, the prepared formula should be used within 24 hours. After liquid concentrate formula has been prepared, refrigerate and use within 48 hours. Throw away unused formula after 48 hours.

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The best method is to set the bottle in a pan or bowl of warm water for a few minutes, or hold it under warm tap water, and then shake the bottle after warming.

Warming Formula or Expressed Breastmilk

Babies can drink formula or breastmilk that is either room temperature, slightly cooler, or slightly warmer. If a baby prefers a warm bottle, caregivers should be careful to not warm the liquid beyond body temperature. The best method is to set the bottle in a pan or bowl of warm water for a few minutes, or hold it under warm tap water, and then shake the bottle after warming. A few drops of formula on the inside wrist is a good test of temperature. If it feels neither warm nor cold on the wrist, it is the right temperature for a baby.

Parents should never use a microwave to heat infant formula or expressed breastmilk because the liquid can get hot enough to cause serious burns. Even though the outside of the bottle or several drops on the wrist may feel cool, the liquid can heat unevenly inside the bottle. Formula in bottles with disposable plastic liners can become so hot that the plastic liners can burst. Additionally, heating breastmilk in a microwave can destroy many of the beneficial components of breastmilk.

Feeding a Bottle of Formula or Expressed Breastmilk

Here are some guidelines for using bottles to feed formula or breastmilk to a baby:

Hold the baby

It is important to always hold a young baby during a feeding rather than propping the bottle up with a pillow or blanket. Propping the bottle deprives the baby of human contact, increases the risk that the baby will inhale fluids into the lungs (**aspirate**) and can lead to tooth decay and ear infections. Holding the baby helps the parent sense behavioral cues of hunger and helps the parent and infant bond. Caregivers should hold the baby in the cradle of their arm, partially upright making sure the infant's head is a little higher than the rest of the body. This helps to prevent aspiration and can help prevent ear infections by keeping milk from backing up in the inner ear.



Holding the baby helps the parent sense behavioral cues of hunger and helps the parent and infant bond.

Tilt the bottle

Tilting the bottle and holding it at an angle keeps the bottle's neck and nipple filled with milk. This helps the baby to avoid swallowing too much air, which can make the infant feel full before adequate milk has been consumed.

Burp the baby

A baby will naturally swallow air during a feeding, which can lead to discomfort and irritability. This happens in both breastfed and bottle-fed infants, but it is more common when drinking from a bottle. Burping the baby often during a feeding helps to release the air and keeps the baby more comfortable. Parents should try burping a bottle-fed baby during natural breaks in the infant's sucking cycle or after every 2 to 3 ounces, even if the baby does not seem uncomfortable.

Do not worry about hiccups

Hiccups are also very common in infants, and they usually bother the parents more than the baby. If hiccups happen during a feeding, pediatricians suggest waiting a few minutes before finishing the feeding. Sometimes it helps to burp the baby and to change the baby's position. Also, it might help to offer feedings before a baby is extremely hungry. Many babies do not seem to be bothered by hiccups.

Throw out formula or breastmilk after a feeding

When an infant drinks from a bottle, the baby's saliva enters the bottle and mixes with the formula or breastmilk. This is not a problem during the feeding, but if the bottle is set aside, bacteria will grow and multiply, especially at room temperature. Over time the bacteria in the liquid can reach a level that can make an infant sick. After a feeding, caregivers should throw out any unused formula or breastmilk and then wash the bottle with soap and hot water.

Keep formula and breastmilk chilled when traveling

If a parent plans to take a baby on an outing (shopping, clinic appointment, etc.), the liquid in the bottles should start out very cold, and then be put in an insulated bag with an ice pack, or wrapped in a thick cloth to keep cold. For longer travel times, it is a



After a feeding, caregivers should empty the bottle since bacteria can grow and multiply in the bottle.



If a parent plans to take a baby on an outing, the formula should be kept in an insulated bag with an ice pack, or wrapped in a thick cloth to keep cold.

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good idea to keep bottles in a small ice chest. For formula-fed babies, other options include buying ready-to-use formula or taking sanitized water in clean bottles along with a can of powdered formula.

Use bottles only for formula, breastmilk, and if needed, small amounts of water for older infants

Caregivers should never put juice, fruit drinks, sweetened liquids, cereal or pureed foods in a bottle. **(Note:** a physician might recommend cereal in the bottle to treat **gastroesophageal reflux disease**, also called GERD. See section B page 9 for more information).

Do not put a baby to sleep with a bottle

Putting a baby to sleep in a crib or playpen with a bottle can lead to choking, ear infections, tooth decay, and problems with speech later on. If the parents are putting an older infant to sleep with a bottle, encourage them to put a small amount of plain water in the bottle as they work on changing this habit.



Water intoxication can result when a family is running low on formula and tries to “stretch” the formula by adding extra water.

Other Mixing Considerations

It is very important to prepare infant formula properly. Increasing the water to formula ratio is never recommended because it will yield a lower calorie formula. Decreasing the water-to-formula ratio may be recommended for infants who are failing to thrive, but it should only be done when prescribed by the health care provider (HCP).

Water Intoxication

Water intoxication occurs when an infant is fed fluids without proper amounts of sodium and other **solutes**. It typically occurs in formula-fed infants who are given formula that has been over-diluted with water, but it has also been known to occur with feeding excess soda, juice, or tea. This condition, while preventable, can be life-threatening to an infant. Symptoms of the condition include irritability, sleepiness, a drop in body temperature, fluid retention, and seizures which are caused by a rapid decrease in serum sodium levels. Also, infants fed excessive water will not receive adequate kilocalories to meet their needs for growth and development. Supplemental water is generally not recommended for healthy infants who are not yet receiving solid foods, except possibly in hot weather for formula-fed infants. Parents should be advised that when infants and children of any age are experiencing diarrhea or vomiting they should be given **oral rehydration solution (ORS)** instead of water, juice, soda, tea or other solute-free liquid (Leonberg, 2009).

Water intoxication can result when a family is running low on formula and tries to “stretch” the formula by adding extra water. Water intoxication is serious, so parents should always add the right amount of water to formula. WIC staff should help parents understand the dangers of giving excess water (Bruce, 1994).

Box A.5 What to do if the parent/caregiver runs out of infant formula

Since the WIC program allowance is intended to be supplemental and not intended to meet all the nutritional needs of infants, caregivers will need to obtain additional infant formula beyond what is provided by WIC. If the amount of infant formula provided by the WIC Program is insufficient to meet an infant’s needs, then:

Offer powdered infant formula instead of concentrated ready-to-use infant formula, since powdered infant formula has a higher yield.

Refer the parent/caregiver to financial or food assistance in their community for which they may be eligible (Leonberg, 2009).



Workbook Activity 7

Read the following publication in the workbook:

Bottled Water & Infant Formula. 2000. Nutrition Fact Sheet 20, Texas Department of Health. Stock no. 06-10760.

Concentrating Formula to Higher Calorie Levels

Powdered infant formula is prepared by mixing one unpacked level scoop of dry powder to 2 ounces of sterile water. Liquid concentrate infant formula is prepared by adding equal parts of water to the liquid concentrate. Ready-to-use infant formula is ready for the infant to consume. These preparations will yield an infant formula that is approximately 20 calories per ounce. (**Note:** These are general guidelines; the caregiver should always follow the manufacturer’s instructions for preparation.) (Leonberg, 2009)

The HCP may prescribe a higher concentration of kilocalories per ounce for infants with medical problems such as failure to thrive, cardiac or respiratory problems. Higher concentrations of formula at 22, 24 and up to 30 kilocalories per ounce can be achieved by decreasing the amount of water to formula ratio. WIC staff should never tell a parent to concentrate formula unless prescribed by the HCP.

Parent handouts on concentrating formula to 22 or 24 calories can be found on the WIC website. For higher concentrations contact your local agency director or state agency.



Cow's Milk

Cow's milk, including whole, low-fat and skim, should not be fed to infants during the first year of life due to a number of nutritional and medical problems that can result. Listed below are reasons why the AAP does not recommend babies be fed cow's milk during the first year of life.

- Cow's milk contains very little iron, vitamin E, vitamin C and other nutrients compared to breastmilk or infant formula. This may result in iron deficiency anemia and other nutritional deficiencies. Iron deficiency anemia may lead to long-term changes in learning and behavior that might not be reversible with iron supplements.
- Cow's milk can cause blood loss from the intestinal tract. Large curds can form in the stomachs of babies who drink cow's milk. As these curds pass through the intestines, they can cause scraping and bleeding, leading to blood loss in the stool. Over time, this can lead to iron-deficiency anemia.
- Since cow's milk is three to five times higher in protein, sodium, potassium and chloride compared to breastmilk and infant formula, the kidneys of babies who consume cow's milk have difficulty processing these nutrients. This places a strain on immature kidneys and can lead to serious dehydration.
- Cow's milk contains proteins that are more likely to cause allergic reactions in infants.

Goat's Milk

Goat's milk is not a good substitute for breastmilk or infant formula. It is deficient in a number of nutrients including iron, folate, vitamins C and D, thiamin, niacin, vitamin B6 and pantothenic acid. Some brands of goat's milk are fortified with vitamin D and folate, but others are not. Like cow's milk, it contains excess amounts of sodium, protein, potassium and chloride, which are not suitable for the infant's immature kidney to process.

The fat in goat's milk is easier to digest than the fat in cow's milk, but the lack of some nutrients and excess of other nutrients makes it inappropriate for feeding to infants. Goat's milk is not a good substitute for infants who have an allergy to cow's milk-based

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infant formula. The protein in goat's milk "cross-reacts" with cow's milk protein; meaning infants who are allergic to cow's milk formula will likely be allergic to goat's milk as well.

Soy Milk, Rice Milk, Almond Milk and Other Grain or Nut-Based Milks

Soy milk, rice milk, almond milk and other grain or nut-based milks should not be fed to infants. Although these milks are usually fortified with calcium, vitamins A and D, B12, and riboflavin, they are very low in calories, fat and protein compared to the infant's needs. Use of these milks can be dangerous to an infant's health. Malnutrition has been reported in infants when these beverages are consumed as their only or major source of nutrition.



This is the end of Section A.

Go to the self-test questions on page 24 in the workbook.



Objectives

After completing Section B of the Basic Infant Formula Module, you will be able to:

- Describe three common causes of constipation in infants.
- Identify three common causes of diarrhea in healthy infants.
- Identify five treatment options for GERD.
- Describe two symptoms of colic in infants.
- Define the difference between food allergy and food intolerance.
- Identify differences between lactose intolerance and milk protein allergy.



Constipation

Constipation is generally defined as a condition where bowel movements are hard, dry, and difficult to pass. Although some believe that constipation is related to the frequency of the passage of stools, this may not be as important as the consistency of the stools. Part of the difficulty in determining whether an infant is constipated is that each caregiver may have a different perception of how often an infant should have a bowel movement and whether an infant's stool is "too hard." Constipation is not very common among breastfed infants. Formula-fed infants tend to have firmer stools, but this does not indicate constipation. Some caregivers believe iron causes their infant to be constipated, but studies have demonstrated no relationship between iron-fortified infant formula and constipation.

Constipation can be caused by a variety of factors or conditions including dietary influences such as:

- Inadequate breastmilk or infant formula
- Improper dilution of infant formula
- Early introduction of complementary foods
- Excessive cow's milk intake
- Abnormal anatomy or neurologic functioning of the digestive tract
- Use of certain medications
- A variety of medical conditions and hormonal abnormalities
- Stool withholding due to rectal irritation from thermometers, vigorous wiping, diaper rash, etc.
- Excessive fluid losses due to vomiting or fever
- Lack of movement or activity
- Abnormal muscle tone

If a caregiver complains that an infant is constipated, refer the infant to an HCP for medical evaluation. If the HCP determines that the infant's diet is inappropriate and is a factor influencing

Section B

the constipation, it is appropriate to assess the infant's diet with particular focus on:

- The adequacy of breastmilk or infant formula intake
- Proper infant formula preparation and dilution if formula-fed
- Whether appropriate types and amounts of complementary foods are consumed
- Premature introduction of complementary foods if the infant is less than 4 months old



Workbook Activity 8

Read the following publication in the workbook:

Constipation in Infancy and Childhood. 1997. Nutrition Fact Sheet 14, Texas Department of Health. Stock no. 06-10324.



Workbook Activity 9

Read the following publication in the workbook:

Common infant problems: Constipation. 2011. Texas Department of Health. Stock no. 13-121.



Workbook Activity 10

Common infant problems: Constipation Case Study



Diarrhea

is defined as the frequent passage of loose, watery stools.

Diarrhea

Diarrhea is defined as the frequent passage of loose, watery stools. Diarrhea should not be confused with normal stools of breastfed infants. Diarrhea in infants can be caused by a reaction to food, excessive juice consumption, use of certain medications, medical conditions or infections, malabsorption of food, or consuming contaminated food or water. Proper infant formula preparation and

Common Problems

storage techniques are very important in assuring that infant formula is not contaminated and a potential cause of diarrhea.

Diarrhea, if left untreated in an infant, can rapidly lead to dehydration which can be life-threatening and is the most common cause of hospitalizations in otherwise healthy infants. Chronic diarrhea may lead to nutrient deficiencies because food that passes through the gastrointestinal tract too quickly cannot be digested and then the nutrients cannot be absorbed. Refer an infant to their HCP for medical evaluation if the caregiver reports that the infant is having diarrhea.

Use of ordinary beverages to treat diarrhea may actually worsen the condition and lead to further dehydration. In most cases of acute diarrhea, when dehydration is not present, continued feeding of the infant's usual diet is the most appropriate treatment. This is true whether the infant's usual intake is breastmilk, milk-based infant formula, soy-based infant formula, or any of these milks along with complementary foods. Caregivers should consult with the infant's HCP about the treatment of diarrhea and should not self-treat diarrhea by feeding ordinary beverages such as carbonated beverages, sport drinks, fruit juice, tea, or chicken broth (Leonberg, 2009).

The Centers for Disease Control and Prevention (CDC) and the AAP recommend the following during acute diarrhea without dehydration:

- Breastfed infants should continue to breastfeed on demand.
- Formula-fed infants should continue to be fed usual amounts of infant formula immediately following rehydration (if indicated).
- Low-lactose or lactose-free infant formula is usually not necessary.
- Infant formula should not be diluted during diarrhea.
- Infants eating complementary foods should continue to receive their usual diet during diarrhea, emphasizing complex carbohydrates (such as rice, wheat, and potatoes) and meats (especially chicken).
- Simple sugars (often found in soft drinks, juice, and gelatin) should be avoided; solid food intake should emphasize complex carbohydrates.

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Avoid withholding food for more than 24 hours or feeding the “BRATT” diet (bananas, rice, applesauce, tea and toast).

- Avoid withholding food for more than 24 hours or feeding the “BRATT” diet (bananas, rice, applesauce, tea and toast). It is no longer recommended due to the restriction of calories and nutrients.

Depending on the infant’s condition, an HCP may prescribe an appropriate oral rehydration solution ORS to prevent and treat dehydration resulting from diarrhea. ORS should be used only under the supervision of physicians and other trained health personnel. The AAP Practice Guidelines recommend that infants with diarrhea who are dehydrated should receive ORS therapy until their dehydration is resolved, and then they should be fed their age-appropriate diets, including breastmilk or full-strength milk-based formulas. Parents should be aware that the ORS replaces fluid and electrolyte losses but does not stop diarrhea and the diarrhea is likely to continue for three to seven days (Leonberg, 2009).



Workbook Activity 11

Read the following publication in the workbook: *Common infant problems: Diarrhea. 2011. Texas Department of Health. Stock no. 13-123.*



Workbook Activity 12

Diarrhea Case Study

Colic



Colic is very common, affecting one in four newborns.

Colic is very common, affecting one in four newborns. The reason for the irritability is not totally clear but includes:

- An immaturity of the baby’s nervous system
- Sleeping disruption
- Hypersensitivity to the environment
- Sensory overload

Common Problems

Only a small fraction of babies who have colic will actually be suffering from identifiable medical conditions such as gastroesophageal reflux (GER) or food allergies.

Colic is described as prolonged, inconsolable crying that appears to be related to stomach pain and discomfort (infants may pull their legs up in pain) often in the late afternoon or early evening. It usually develops between 2 to 6 weeks of age and may continue until the infant is 3 to 4 months old. Formula-fed infants seem to experience colic more often than breastfed infants; the cause of colic is unknown. Colic has also been associated with infants fed fruit juices containing **sorbitol**, such as apple, white grape, and pear juice (Leonberg, 2009).

A systematic review of a variety of therapies used to manage colic indicates that breastfed infants may benefit from breastfeeding mothers who eliminate dairy products and/or gas forming foods from their diet. If acid reflux is suspected, medicines can be tried and continued if they clearly help. If colic persists in conjunction with food allergies, the baby's formula may be changed to one that is hypoallergenic (NASPGHAN, 2008).

In most cases, what is needed is a lot of patience. Parents and other family members should take turns with the baby's care. Infant massage, soothing music, and swaddling can help the days pass for a colicky baby. Colic usually resolves by the time the infant is 3 months old. Colicky infants will continue to gain weight and grow normally.

Box B.1 Oversupply of Breastmilk and/or Overactive Let-Down

Breastmilk oversupply and/or overactive let-down is often misdiagnosed as colic in breastfed infants. See the Breastfeeding Promotion and Support Module for more information on oversupply and overactive let-down reflex.

If symptoms worsen, such as a change in baby's behavior or body language or sudden vomiting, refer to a health-care provider.

Section B



Workbook Activity 13

Read the following publication in the workbook: *Common infant problems: Colic. 2011. Texas Department of Health. Stock no. 13-120.*



Workbook Activity 14

Colic Case Study



Gastroesophageal reflux (GER) is a condition in which stomach contents flows backwards into the esophagus.

Gastroesophageal Reflux

Gastroesophageal reflux (GER) is a condition in which stomach contents flows backwards into the esophagus. It is normal for babies and young children to occasionally spit-up small amounts of breastmilk or formula following a feeding, especially when being burped or when having a diaper changed. This happens because the ring of muscles that separates the top of the stomach from the esophagus is not fully developed or not working properly. In most cases, GER resolves without intervention by the age of 8 to 18 months when the infant sits upright or walks and eats more solid foods. GER, although usually a benign condition, can range from mild spitting-up to a more severe form that may cause aspiration, failure to thrive, lung disease, or inflammation of the esophagus.

Spitting-up is the mildest form of GER. Growth and health is not affected, as symptoms will improve with time. Spitting up can be a result of:

- Immaturity of the lower esophageal sphincter
- Overfeeding: Many young infants cannot consume large volumes of milk or food at one time. If the infant's weight-for-length is at or above the 95th percentile, it may indicate overfeeding (Leonberg, 2009).
- Swallowing air before or during feeding: Start feeding before the infant becomes frantic and is crying; position the bottle so that the nipple is filled with milk; burp the baby frequently.

Common Problems

- Excessive stimulation: create a calm, relaxed feeding environment.

In the infant who has been diagnosed with uncomplicated GER or the “happy spitter,” parental education and reassurance are helpful and generally no other intervention is necessary. Thickening of formula or trials of hypoallergenic formula are other treatment options that may be suggested by an HCP (Rudolph, 2001).

Gastroesophageal-reflux disease (GERD) is a serious problem that can lead to serious health consequences. GERD in infants is GER that is complicated by one or more of the following:

- Weight loss, if pain or discomfort from acid reflux causes refusal to eat or when too much of what is eaten is lost.
- Inflammation or erosion of tissue in the esophagus from chronic exposure to stomach acid — if erosion is severe, blood loss resulting in anemia may occur. Inflammation can also lead to scarring and narrowing of the esophagus.
- Aspiration of stomach contents into the airways of the lungs — repeated aspiration can lead to chronic lung disease or pneumonia, which can result in permanent damage to the lungs.

Very few otherwise healthy infants have GERD. Infants or children with neurological or developmental disabilities are especially prone to GERD and their condition tends to be more severe and persistent. Low muscle tone or hypotonia is common with conditions such as Down syndrome. Slouching can put more pressure on the stomach and forces food back up into the esophagus. Children with low muscle tone also tend to get constipated more frequently, which can make reflux worse by “backing up” the system.

GERD can occasionally be caused by stress resulting from problems in the relationship between the infant and caregiver or any other type of environmental stress. Emotional stress affects movement in the gastrointestinal tract.

Signs of GERD may include one or more of the following symptoms:

- Vomiting/spitting up
- Irritability and/or crying
- Refusal or aversion to feeding
- Weight loss

Section B

- Wheezing/coughing/asthma
- Swallowing frequently
- Drooling
- Night time awakening with unexplained irritability
- Pneumonia
- Arching backwards (especially during and after a feeding)
- Apnea (episodes of not being able to breathe)

Treatment of GERD must be prescribed by a doctor and usually consists of:

- Smaller and more frequent feedings — if smaller feedings do not help, the doctor may prescribe a concentrated formula to give the infant adequate nutrients with a smaller amount of formula. Tube feedings may be required in extreme cases.
- Positioning — this recommendation should be made by the baby's doctor and not by WIC staff. Prone positioning, or laying the infant on their stomach, with the head of the bed elevated has been shown to reduce reflux symptoms and is sometimes recommended by doctors. However, since the AAP recommends that all healthy infants sleep on their back, or the supine position, to prevent Sudden Infant Death Syndrome (SIDS), recommendations have been modified. Prone positioning is acceptable while the baby is awake, particularly after feeding (Rudolph, 2001).
- Changing formula — unless vomiting is due to allergy, changing formula is usually not effective in reducing symptoms of GERD. The incidence of vomiting can be reduced by changing to a hypoallergenic formula when a cow's milk protein allergy is present (Rudolph, 2001).
- Thickening formula — adding cereal to formula is a traditional treatment which is controversial because it may reduce the number of episodes of vomiting but not reflux symptoms. Cereal can add unwanted calories, leading to obesity, and it can dilute the other nutrients in formula.
- Rice starch added formula — these formulas thicken in the presence of stomach acid. Effectiveness may be reduced if acid reducing medications are prescribed.

Common Problems

- Medication — medications may be given to increase the rate of stomach emptying or to decrease or neutralize stomach acid.
- Surgery — an infant with neurological problems is less likely to respond to medical management, like medicine and positioning, and more likely to require surgery.
- Other dietary measures — avoid high-acid foods such as orange juice, tomato products, and carbonated beverages.
- Psychological counseling — psychological counseling may be needed to resolve the problems between the infant and caregiver if stress is contributing to “nervous vomiting.”

Vomiting

Vomiting is the forceful expulsion of the stomach contents, unlike the passive movement of GER. Vomiting can be related to:

- Illness — may be accompanied by other symptoms such as fever, diarrhea, dehydration, and electrolyte imbalance.
- Allergy or intolerance — usually accompanied by diarrhea, rash, or respiratory symptoms such as wheezing or congestion.
- Inborn errors of metabolism — usually accompanied by failure to thrive, neurologic symptoms, seizures, or developmental delay.
- Structural problems in the gastrointestinal tract, e.g. pyloric stenosis.

Refer an infant to an HCP for medical evaluation if the caregiver notes that the infant is vomiting or that his or her spitting-up is unusual in terms of volume, contents, or accompanying symptoms.



Workbook Activity 15

Read the following publication in the workbook:

Common infant problems: Spitting up. 2011. Texas Department of Health. Stock no. 13-128.



Signs of GERD may include drooling.

Section B



Workbook Activity 16
Gastroesophageal Reflux Case Study



Workbook Activity 17
Vomiting Case Study

Common Problems



Nutrient Composition

An adverse food reaction is any negative physical reaction caused by eating a food. Adverse food reactions can be divided into two main groups: food hypersensitivity (also known as food allergy), and food intolerance.

Food Hypersensitivity

Food hypersensitivity is an immune reaction to the protein in a food or to a food additive. When the body recognizes that a specific substance is a threat, it produces antibodies to fight the threat. Food allergies affect about 6 percent of children who are under the age of 3 (Sampson, 2003).

Eight foods cause 90 percent of all allergic reactions: milk, eggs, peanuts, fish, shellfish, soy, wheat, and tree nuts such as walnuts, pecans, almonds, and cashews. A child will usually outgrow allergic reactions to the protein in eggs or cow's milk by age 5.

Most food-allergy reactions happen within a few minutes to two hours after the food is eaten. Other reactions may be delayed up to 48 hours after eating the allergy-causing food. Symptoms vary tremendously between people (see Table B-1). Differences can include the type of symptom(s) that will appear, where they appear, how severe they are, the amount of time from when the food is eaten to when the symptoms are seen, and the amount of food that triggers the reaction.

Anaphylactic reaction is the most severe allergic response. It occurs when the whole body becomes overwhelmed with the response to an allergen. Even though rare, it is the most severe and dangerous reaction to an allergy, and can result in death if not treated immediately. Symptoms of anaphylactic reaction include difficulty in breathing; dizziness; swelling of lips, tongue, throat, face, and skin; irregular heartbeat; changes in blood pressure; and shock. The foods that are most likely to cause an anaphylactic reaction include peanuts, shellfish, eggs, and tree nuts. Once the food is identified that food should never be given to the child. The child should always have the appropriate medicine available to immediately treat the symptoms.

Section B

Table B.1 Symptoms of Food Allergies

Abdominal pain	Hives	Sneezing	Anaphylaxis
Nausea	Rashes	Congestion	Failure to thrive
Vomiting	Eczema	Chronic coughing without an infection	
Diarrhea	Swelling of lips, tongue, throat, or face	Asthma	
Bloating			
Gas			

Food Intolerance

Food intolerance differs from a food allergy (hypersensitivity) in that it is an abnormal reaction to an ingested food but is not caused by an immune response. There are three types of food intolerance:

- Pharmacologic reaction — the body's response to a natural or added chemical that produces an effect resembling that of a drug. Examples of natural chemicals include alkaloids in mushrooms, goitrogens in cabbage, pressor amines in bananas, and caffeine in tea or coffee.
- Food toxicity — reaction caused by toxins contained in the food or released by microorganisms that contaminate the food. Aflatoxin, mercury, and pesticides are chemicals that are toxic to everyone and are considered more of a chemical contamination.
- Metabolic reactions — the body's inability to metabolize certain components of food, e.g. enzymes. Lactose intolerance is one of the most common food intolerances.

Lactose intolerance

Lactose is the sugar in most animal's milk and human milk. Lactose enhances the absorption of a number of minerals including calcium, magnesium, and zinc.

Common Problems

Lactase is the enzyme that is naturally present in human milk and also found in the small intestine. The purpose of intestinal lactase is to break down lactose so that it can be absorbed. Full-term infants are able to digest lactose. Lactase activity can be very low in premature infants, since lactase does not reach a peak until 34 to 38 weeks gestation.

There are three kinds of **lactose intolerance**:

- Congenital lactase deficiency — an extremely rare genetic condition that exists when lactase is very low or absent at birth.
- Secondary lactase deficiency — temporarily low amounts of lactase as a result of:
 - Intestinal infection or virus,
 - Certain antibiotics, or
 - Physical conditions that affects the cells lining the intestine.
- Adult (or late-onset) lactase deficiency — a genetic condition that does not occur in infants but is more common in adults and older children. Approximately 15 percent of Caucasian adults, 81 percent of African-American adults, and 100 percent of Asian adults are lactase deficient.



Cow's milk protein allergy is often mistaken for lactose intolerance in breastfed babies.

Box B.2 Lactose Intolerance in Breastfed Infants

Since lactase is also present in human milk, it is extremely rare for a breastfed infant to have lactose intolerance. Cow's milk protein allergy is often mistaken for lactose intolerance in breastfed babies.

Infectious diarrhea that comes on very suddenly can cause temporary injury to the areas of the intestine where lactase is made. When intestinal injury happens, the first enzyme to be affected and the last to recover completely is lactase.

For a person with lactose intolerance even very small amounts of lactose can cause severe watery diarrhea because undigested lactose actually acts as a laxative.

Most infants recovering from an acute episode of diarrhea do not need to be on a lactose-restricted diet. After initial rehydration, most infants can be continued on breastmilk or standard infant

Section B

formula. If diarrhea persists, then a lactose-free formula such as a soy formula or a lactose-free cow's milk-based formula can be used until the diarrhea resolves. Infants who are on a mixed diet of solid foods with formula or with breastmilk sometimes have diarrhea of shorter duration, because they are exposed to less lactose than babies who are consuming only breastmilk or standard, whole milk infant formula (See Table B-2).

Table B.2 Differences between Lactose Intolerance and Milk Allergy

Cause	Reaction after intake of too much lactose in relation to the body's ability to break it down by the enzyme lactase	Immune response to one or more cow's-milk proteins; immaturity of infant's digestive and immune processes likely contributes to this condition
When does it start?	After intestinal lining is injured by severe infection, medication, or disease.	Infancy and early childhood, very rare, especially in adults
How common is it?	Unknown, but considered over-diagnosed	Rare: 0.3-7.5 percent of children
Possible symptoms	Gas, abdominal bloating, pain (cramps), diarrhea	Variable and broad; intestinal, skin, respiratory, systemic (see table B-1)
Outlook	Temporary depending on the extent of the intestinal damage and whether the infant was dehydrated	Usually outgrown by age 5

Common Problems

Management	<p>Formula-fed Infants: Usually can be continued on milk-based formula; may need a lactose-free formula temporarily until symptoms resolve</p> <p>Children: Limited amounts of milk and milk products can be included in the diet. Drink small amounts of milk; drink milk with food or meals; eat yogurt with active cultures and most cheeses; try lactose-reduced milk and lactase enzyme preparations</p>	Strict avoidance of cow's milk and cow's milk protein may be needed
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Workbook Activity 18

Read the following publication in the workbook:
Common infant problems: Food Allergies. 2011. Texas Department of Health. Stock no. 13-127.



Workbook Activity 19

Allergy and Lactose Intolerance Case Study



This is the end of Section B and the end of the module. Go to the self-test questions on page 55 in the workbook.

Glossary

Allergen — A substance that is foreign to the body and can cause an allergic reaction in certain individuals.

Amino acids — The building blocks of proteins.

Anaphylactic reaction — A rare, but severe, allergic response that can be fatal.

Antibody — An immunoglobulin, a specialized immune protein, produced because of the introduction of an antigen into the body, and which possesses the remarkable ability to combine with the very antigen that triggered its production.

Arachidonic acid (ARA) — Special fats important for healthy infant growth and visual and mental development; found in breastmilk.

Aspirate — To inhale fluid into the lungs after vomiting.

Biliary atresia — Blockage in the tubes (ducts) that carry a liquid called bile from the liver to the gallbladder.

Carnitine — An amino acid that serves an important and specific role in the cell, can be synthesized from amino acids cysteine and lysine, and can be found added to infant formulas and in a diet that contains animal food sources.

Casein — The principle protein in cow's milk that form curds in the stomach, which is difficult to digest.

Cholestasis — A condition in which little or no bile is secreted or the flow of bile into the digestive tract is obstructed.

Colic — Periodic inconsolable crying in a healthy young infant, associated with sharp abdominal pain.

Constipation — The frequency or quantity of stools is reduced; may include symptoms of difficult passage, blood in stools, or abdominal pain.

Cystic fibrosis — A genetic disorder characterized by the dysfunction of the exocrine glands (sweat glands) and production of abnormally thick secretions that obstruct airways and pancreatic and other ducts.

Dehydration — Excessive loss of body water.

Glossary

Docosahexaenoic acid (DHA) — Special fats important for healthy infant growth and visual and mental development; found in breastmilk.

Diarrhea — A change in bowel movement which may be more frequent, more watery, or larger than usual.

Emulsifiers — Compounds that hold fat in water and prevent separation.

Enteropathy — Gastrointestinal disease.

Enterocolitis — Infection of the small intestine and colon.

Fluoride — A mineral essential to tooth and bone formation that can be toxic in excess amounts.

Fluorosis — A hypomineralization of the enamel surface of the tooth that develops during tooth formation; damage to the permanent teeth can range from white lines or spots to pitting and staining of the outer enamel layer.

Food hypersensitivity — A negative food reaction involving the immune system; also referred to as food allergy.

Food intolerance — A negative food reaction not involving the immune system.

Galactosemia — An inherited disorder characterized by a condition in which the body is unable to metabolize the simple sugar galactose. Milk (human or animal) cannot be tolerated in any form.

Gastroesophageal-reflux disease — Backward flow of the stomach contents into the esophagus; may result in poor growth, pain, or respiratory illness.

Glucose polymer — Polysaccharides composed of repeating glucose units. They can consist of branched or unbranched chains in any linkages.

Hydrolysis — An enzymatic reaction in which a compound is broken down by adding water.

Hypertonia — High skeletal muscle tone, muscle tightness.

Hypotonia — Low skeletal muscle tone, often called “floppy.”

Jaundice — Common condition in newborns in which high levels of bilirubin in the blood cause the infant’s skin and whites of the eyes to turn yellow.

Lactalbumin — An easy-to-digest protein found in human milk.

Lactase — An intestinal enzyme that breaks down lactose.

Lactoglobulin — The major protein in cow's-milk whey.

Lactose — The main sugar in the milk of mammals.

Lactose intolerance — Inability to digest lactose due to a lack of the enzyme lactase.

Meningitis — Inflammation of the meninges (tissue membranes that protect the brain and spinal cord), that is most commonly due to bacterial infection, but sometimes caused by viral or fungal infections. Symptoms include headache, stiff neck, fever, nausea, vomiting, and intolerance to light and sound, often followed by convulsions and delirium.

Methionine — An essential amino acid added to infant formulas to enhance the quality of the protein.

Necrotizing enterocolitis (NEC) — Inflammation or death of the gastrointestinal tract; potentially fatal disease associated with specific symptoms such as abdominal distention and tenderness, abnormal gastric residuals, and grossly bloody stools.

Nucleotides — The building blocks of DNA and RNA.

Oral-rehydration solution (ORS) — A drink made from a specific recipe of minerals, sugar, and water used to replace the minerals and water lost after dehydration.

Peptides — A molecule consisting of two or more amino acids which are smaller and may be easier to digest than proteins with larger amino acid.

Pica — A medical disorder characterized by an appetite for substances largely non-nutritive value (e.g. clay, coal, sand, soil, chalk, paper, etc.).

Prebiotic — Non-digestible food products that stimulate the growth or activity of bacteria already present in the digestive tract; may improve gastrointestinal health.

Probiotic — Food or concentrate of live organisms that contribute to a healthy microbial environment and suppress potential harmful microbes.

Prone — To lie face down; lying on the stomach.

Glossary

Rehydration — Restoring the fluid lost from a body due to diarrhea or vomiting.

Sepsis — Bacterial infection in the bloodstream or body tissues.

Short-bowel syndrome — A malabsorption syndrome resulting from major resections on the small bowel; characterized by diarrhea, steatorrhea (excessive amounts of fat in feces), and malnutrition.

Sorbitol — The alcohol form of sucrose (table sugar) that is absorbed more slowly than sucrose and inhibits the rise in blood glucose. Because of slow absorption, it can cause soft stools or diarrhea.

Soy-protein isolate — The protein portion of soy without the carbohydrate, or fat content, of natural soy products.

Spitting up — A mild form of gastroesophageal reflux that does not affect growth or health.

Sucrase — The intestinal enzyme that breaks down sucrose.

Supine — To lie face up on the back.

Taurine — An amino acid that serve important and specific in the cell, can be synthesized from amino acids cysteine and lysine, and can be found added to infant formulas and in a diet that contains animal.

Vomiting — The forceful expulsion of the contents of the stomach.

Whey — The proteins remaining in the watery fraction of milk after the curd and cream have been removed; contains lactalbumin.

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Section A Workbook Answers



Workbook Activity 1

1. Which standard milk based formula contains partially hydrolyzed whey protein?

Gerber Good Start Gentle

2. What is the whey to casein ratio of the formula you listed above?
100% whey

What is the whey to casein ratio of the current contract formula?

Similac Adv.= 48:52

How does the whey to casein ratio in these formulas differ from human milk?

Human milk has a casein to whey ratio of 80:20 and neither formulas are exactly like breast milk. The casein to whey ratio in the contract formula is close to 50:50 and the Good Start formula do not have any casein.

3. Look at the fat source for each formula. What fat source does the contract formula contain? How does this differ from the other formulas?

Similac Advance has high oleic safflower oil, soy and coconut oils and DHA/AHA.

All the other formulas have palm olein as the major fat source.

4. Compare the carbohydrate source for standard milk based formulas. How do the formulas differ from each other? How are the formulas similar?

The Gerber products contain corn maltodextrin and lactose as the CHO source and Enfamil,

Answer Key

Similac and store brands contain lactose. All formulas contain varying amounts of lactose and a prebiotic.

5. Standard milk-based formulas are sometimes considered the same or very similar to each other. What can you conclude from comparing the formulas in this chart?

Formulas are all standard milk-based formulas and are considered equivalent to each other however they do contain some different ingredients. Most infants should be able to tolerate any of these formulas. However, there are some infants that may be more sensitive to these different ingredients. This could be the reason they have a better tolerance for one formula over the other.



Workbook Activity 2

1. Which formulas contain added rice starch?

Enfamil AR and Similac for Spit Up

Which one of these formulas is 99% lactose free?

Similac for Spit Up

2. Which formula contains a probiotic?

Good Start Protect

3. Which formula is used for the treatment of acute diarrhea?

Similac Expert Care for Diarrhea

4. Which formulas are lactose free?

Similac for Spit Up, Similac Sensitive and Similac Total Comfort

5. Which formula contains partially hydrolyzed protein?

Good Start Protect, Enfamil Gentlease, Good Start Soothe and Similac Total Comfort

These formulas are considered standard formulas, but what would be an indication for using them over other standard milk based infant formulas?

None, necessarily. However, since the protein is partially hydrolyzed, it may be easier for the infant to digest.

6. The AAP has increased recommendations for Vitamin D for newborns. Which formula contains 400 IU of Vitamin D in 27 oz of formula?

Enfamil Newborn

How does this differ from other standard formulas?

The infant receives more Vitamin D in the first few months of life if they consume less than 32 oz. Note: As of September 2011, Abbott Labs has increased the Vitamin D content in Similac Advance to 75 IU's per 100 calories, which is similar to Enfamil Newborn.



Workbook Activity 3

1. List the names of the standard soy-based formulas.

Similac Soy Isomil, Enfamil Prosobee, and Good Start Soy

2. What is the protein source for these formulas?

Soy protein isolate for the Similac, Enfamil and store brands and partially hydrolyzed soy protein isolate for Good Start

3. Why would a soy-based formula be indicated for an infant?

Intolerance or allergy to milk protein



Workbook Activity 4

1. List the names of the protein hydrolysate infant formulas:

Nutramigen, Alimentum, Pregestimil

Answer Key

2. Which formula contains a probiotic?

Nutramigen

Do liquid forms of this formula contain the probiotic?

No

Why or why not?

The live cultures in the probiotic are not stable in liquid.

3. Which formula contains the most MCT (medium chain triglyceride) oil?

Pregestimil



Workbook Activity 5

1. List the names of the preterm infant formulas:

Enfacare, Neosure and Good Start Nourish

2. How does the calcium content differ in preterm infant formulas versus standard infant formula?

The calcium content is higher.

3. How does the calorie per ounce differ from standard infant formulas?

There are 22 calories per ounce in these formulas and standard infant formulas contain 20 calories per ounce.

4. How does the protein content differ from standard infant formula?

It is slightly higher.



Workbook Activity 6

1. List available toddler follow up formulas or milk drinks:

**Enfagrow Premium Toddler, Enfagrow Soy Toddler,
Similac Go and Grow, Similac Go and Grow Soy,
Gerber Graduates Soy and Gerber Graduates Gentle**

2. Compare the calcium content of toddler formulas and standard milk-based formula. How does it differ?

The calcium content is higher in the toddler formulas and milk drinks.

Refer back to Table A-5. How does the calcium content of toddler formulas differ from preterm infant formulas?

It is higher.

Answer Key

Section A - Answer Key

1. B
2. D
3. D
4. A
5. B
6. D
7. B
8. A
9. B
10. B
11. B
12. B
13. D
14. B
15. D
16. A

Answer Key



Workbook Activity 8: Constipation

Janie is 18 years old and a new mother for the first time. She is certifying her 1-month-old infant today at the WIC Clinic. Janie is concerned that her baby is constipated. She is currently on the standard milk based contract formula. Janie is not breastfeeding at this time. Janie asks if changing formulas will help her baby's constipation.

What additional information would you need to know?

How is she mixing the formula? What does she consider constipation? Are the infant's stools soft or hard? How often does the baby have a bowel movement? How much formula is the baby consuming?

Janie states her infant has a bowel movement every 2 to 3 days, he seems to struggle but the stools are fairly soft.

What recommendations could you offer to Janie in this situation?

Say something like "More than likely, your baby is having normal stools for his age. His intestinal system may still be a bit immature, however, consult with your doctor if you are still concerned." Do not offer any change in formula.

What recommendations would you offer if Janie had reported that her infant was having very hard dry stools every 4 to 5 days?

Refer to her health care provider for medical assessment. Do not offer any change in formula or other recommendations.



Workbook Activity 12: Diarrhea

Donna reports that she is mixing her 7-month-old baby's formula at half strength due to the baby having diarrhea. She previously has been tolerating the milk-based contract formula and consuming

baby foods. She has been having diarrhea since yesterday. Donna's mother told her to give the baby more juice and less formula until the diarrhea went away. Donna asks if she should switch her baby's formula today since she is in the clinic to pick up benefits.

What recommendations would you make to Donna regarding her infant's diarrhea?

Consult with your doctor to assess the baby's medical condition. In the meantime, do not change formula, do not give juice and do not dilute the baby's formula.



Workbook Activity 14: Colic

Rhonda, a new mom of a 2-week-old son, is in the clinic to add him to the WIC program. She looks exhausted and says that the baby has had severe colic. He has been crying nonstop. She is giving him formula and breastmilk.

Is there any additional information you would need to obtain?

How much formula and breastmilk are you providing? How is the breastfeeding going? Has the baby had any vomiting? Depending on answers, you may be able to determine some underlying problems such as not enough intake (infant hungry) or other breastfeeding issues.

What general advice could you offer to Rhonda regarding her infant's colic?

Provide handout with some techniques to try such as infant massage, soothing music and swaddling. Say something like, "Usually, colic resolves on its own but if his symptoms get any worse see your doctor."



Workbook Activity 16: Gastroesophageal Reflux

You are conducting a class today on Infant Nutrition. Amanda has a 2-month-old baby and she is worried that the baby spits up a lot. Amanda says she runs out of formula from WIC every month and

Answer Key

that her baby drinks about 40 ounces of formula every day. Amanda is bouncing the baby on her knee during the class after feeding her a bottle. The baby spits up and Amanda says “See, this is what she does all the time!”

What may be some reasons Amanda’s baby is spitting up?

She may be over feeding the baby. Bouncing the baby after feeding can also cause problems.



Workbook Activity 17: Vomiting

Tonia is in class today as well and she is also having trouble with her 4-month-old baby spitting up. She says she has tried four different formulas and the baby continues to spit up. She has tried two milk-based formulas and a lactose-free formula but the baby is vomiting all of these. Her friend had the same problem with her baby and adding cereal to the formula helped. Tonia wants to know if she can get cereal today with her WIC benefits.

How could you address Tonia’s concerns?

Tonia should be referred to her health care provider. A WIC registered dietitian could consult with Tonia about adding cereal to the formula, however, the infant is not eligible for infant cereal due to his age on this date.



Workbook Activity 19: Adverse Food Reactions

Linda states her 2-month-old baby has a rash and diarrhea on the current milk-based contract formula. Her older child had the same problems with milk as an infant. Do you think Linda’s baby is showing symptoms of an allergy or lactose intolerance?

Possible allergy due to the rash.

What are some other symptoms of food allergies?

Hives, eczema, congestion, vomiting, failure to thrive (see Table B.1)

Section B - Answer Key

1. E
2. D
3. E
4. B
5. A
6. C
7. A
8. D
9. D
10. B
11. B
12. A
13. A
14. A

Nutrition Services Section
Nutrition Education / Clinic Services Unit
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A companion publication, 13-174-1
Basic Infant Formula Module Workbook
is also available from DSHS.



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