

# First Steps Nutrition Modules

## Module 6 – Nutrition and the Young Infant

### *Introduction*

Early nutritional status is important to a child's growth, and to the development of motor and cognitive skills.

The Institute of Medicine's (IOM's) Nutrition Services in Perinatal Care, 2nd edition calls for several actions by health care providers that are related to nutrition. Many of these are within the scope of practice of the Registered Dietitian. (IOM, 1992)

The health care provider should:

- Offer or organize structured programs to provide information about infant feeding choices to pregnant women and their partners and to support breastfeeding
- Evaluate and manage the nutritional care of the infant:
  - Screen for nutrition-related problems, such as PKU, over- or under-feeding, inappropriate feeding or nutrient supplements, and abnormal patterns of growth
  - Measure, monitor, and assess infant growth
  - Assure the mother is getting accurate and appropriate breastfeeding support and breastfeeding is going well
  - Provide instructions for the safe preparation of infant formula, feeding instructions, and anticipatory guidance for the primary caregiver and others as appropriate
  - Address feeding practices to prevent the development of tooth decay in infants
  - Determine the need to adjust feeding strategies, formula (if used), and vitamin-mineral supplements
  - Adjust recommendations to treat food- and nutrition-related problems of the infant, such as overnutrition, undernutrition, anemia, and allergies
  - Consult with specialists concerning complex nutritional challenges and make referrals as necessary
- Provide for continuity of nutritional care – referral to and communications with outpatient and home health services, and parental support groups, as well as referral to local agencies with food and nutrition programs

This module reviews the process of nutrition assessment for the young infant. Nutrient needs are discussed, and interventions for some common nutrition-related problems are reviewed.

*Estimated time to complete this module: 60 minutes.*

## **Learning Objectives**

Participants will be able to:

- Describe basic nutrient needs during the first 2 months of life
- Identify risk factors during first 2 months of life and describe the potential complications and nutritional implications associated with each
- Complete a nutrition assessment for a young infant (including evaluation of anthropometrics, biochemical indicators, dietary intake, medical data, psycho-social issues)
- Develop an individualized intervention and education plan
- Refer clients to appropriate members of the MSS/ICM team and/or community providers, as appropriate

## Outline

### I. INTRODUCTION

### II. NUTRIENT NEEDS DURING THE FIRST TWO MONTHS OF LIFE

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- c. Fat
- d. Carbohydrate
- e. Water
- f. Minerals: iron, zinc
  - *Read more about iron and the older infant*
  - *Read more about whole milk and iron*
- g. Vitamins: vitamin K, vitamin B12, vitamin D
- h. Overall guidelines

### III. DIET-RELATED CONCERNS

- a. Breastfeeding
  - i. Benefits
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  - iii. Composition of breastmilk
  - iv. Initiating and continuing breastfeeding
  - v. Maternal diet
- b. Breastmilk and Infant Formulas
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  - ii. Commercial infant formula: standard, soy-based, protein hydrolysate, elemental, low-iron, premature and human milk fortifiers
  - iii. Cow's milk
    - *Read more about feeding selection, including baby-friendly hospital initiative*
- c. Formula preparation
- d. Common concerns
- e. Introduction of complementary foods – preliminary discussions with family
  - i. Developmental readiness
    - *What can I expect my baby to do as he grows?*
  - ii. Introduction of solid foods
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### IV. CONSIDERATIONS IN THE NUTRITIONAL ASSESSMENT

- a. Anthropometrics

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  - Interview Questions for Parents of Young Infants
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## V. NUTRITION QUESTIONNAIRE FOR INFANTS

## VI. REFERRAL RESOURCES

## VII. CASE EXAMPLES

## VIII. REFERENCES AND RESOURCES

## IX. QUIZ

## *Nutrient Needs During the First Two Months of Life*

This section reviews the nutrient needs of young infants and some general guidelines around nutrient intake.

In general the Dietary Reference Intakes (DRIs) for young infants (0-6 months) were set using information about average intake and composition of breastmilk by healthy, term infants. This information, intake of complementary foods, and some data about nutrient absorption and deficiency were used to set DRIs for older infants. The DRIs for older infants (7-12 months) are included in this section for comparison and also to aid in understanding of the recommendations.

This information is summarized in a table.

### ***Read more: about how we have learned about nutrient deficiencies in infancy***

*While most nutrient recommendations for young infants are based on the amounts and types of nutrients provided by breastmilk, some knowledge of thresholds for and effects of single nutrient deficiency in infants comes from a variety of “mistakes.”*

*An understanding of the effects of chloride deficiency comes from studies of infants who consumed formulas that were produced incorrectly, with low chloride content. Symptoms included growth failure, lethargy, irritability, anorexia, gastrointestinal symptoms, and weakness. Long-term studies (9 to 10 years later) indicated that the effects of early growth retardation had resolved, cognitive skills appeared normal, but some deficits in language skills were present in some children. (IOM, 2004)*

## **Energy**

In general, healthy infants are able to adjust their intakes to meet energy needs. Recommendations for energy intake were updated in 2002 and are about 15% lower than previous guidelines.

Recommendations are based on studies using doubly-labeled water. Although age, sex, length, and feeding method also influence energy needs, an equation using only weight was found to accurately predict total energy expenditure.

## **Protein**

Protein needs (per kilogram body weight) are highest during infancy because of needs for rapid growth. Some amino acids (tyrosine, cystine, taurine) may be essential for premature infants.

## **Fat and fatty acids**

Total fat provides about 55% of total energy intake for infants under 6 months of age; after the introduction of complementary foods, this decreases to about 40% for 7-12 month olds. The most common sources of fat in infant formulas are soybean, safflower, sunflower, coconut, and palm oils. The fatty acid composition of breastmilk varies, depending on the mother's diet.

Deficiency of n-6 fatty acids has been linked to skin lesions and poor growth in formula-fed infants. The AI for n-6 fatty acids is higher for infants and children than for adults – about 8% of total energy intake for 0-6 month olds, and 6% for 7-12 month olds. The primary source of n-6 fatty acids in infant formula is linoleic acid.

The AI for n-3 fatty acids is about 1% total energy intake for young infants, and slightly less for older infants. Breastmilk concentrations of n-3 fatty acids vary, depending on maternal diet. Most formula manufacturers in the US add docosahexaenoic acid (DHA) to infant formulas. Arachidonic acid (ARA) is also added; formulas supplemented with DHA but no ARA have been associated with growth delays.

## **Carbohydrate**

Carbohydrate intake of infants is estimated to be about 37 percent of total energy intake. The carbohydrate in human milk and milk protein-based formulas for term infants is almost exclusively lactose. Conventional infant formulas also contain sucrose or glucose polymers.

## **Water**

Infants have higher total body water content (per kg of body mass) than children and adults and higher rates of water turnover. In addition, a limited ability to sweat, excrete solutes, and express thirst make attention to fluid intake very important. As with most nutrients, recommendations for water intake are based on the amount consumed with an average intake of breastmilk.

Dehydration can result from improperly prepared formula, boiled formula, inadequate breastmilk intake, vomiting, and diarrhea. Symptoms of dehydration include decreased urination, concentrated urine (e.g., dark yellow), lack of tears, dry skin/mouth/tongue, lethargy or listlessness, sunken eyes, sunken fontanel.

Water intoxication can result from excessively dilute formula, water instead of milk or formula, and bottled water instead of electrolyte solution as treatment for diarrhea. Symptoms of water intoxication include hyponatremia, restlessness, nausea, vomiting, diarrhea, polyuria/oliguria, and seizures. (Trahms, 2008)

## **Minerals**

In general, recommendations for mineral intakes for young children are based on average intakes of breastmilk. Unless a special medical need changes an infant's ability to

metabolize a mineral or significantly affects overall intake, breastmilk and/or standard, iron-fortified infant formula should meet an infant's mineral needs.

## **Iron**

Iron deficiency anemia is associated with cognitive and motor impairments in infancy and into later childhood (Lozoff et al, 2006). For term infants whose mothers did not have iron deficiency anemia, iron stores are high at birth, and exogenous iron is needed sometime between 4 and 6 months of age. Iron is significantly more bioavailable in human milk (45-100%) than in infant formula (10%).

Both iron intake (amount of breastmilk and/or formula) and iron requirements are related to body size and growth rate. It is expected then, that the needs of most infants will be met if their overall intakes are primarily breastmilk or iron-fortified infant formula and are adequate to support appropriate growth. Iron needs of infants born prematurely may be higher, since the majority of iron accretion occurs during the last trimester of pregnancy.

### ***Read more: iron and the older infant***

*Unlike many nutrients, estimations of iron requirements for older infants involve a factorial approach, looking at the components of iron need, including the following, as well as the bioavailability of dietary iron:*

- *Basal losses (through feces, urine, and skin)*
- *Increase in hemoglobin mass*
- *Increase in tissue iron*
- *Increase in storage iron*

### ***Read more: whole milk and iron***

*Consumption of whole milk during infancy can contribute to iron-deficiency anemia:*

- *GI tract blood loss can occur when cow's milk is offered during infancy*
- *Cow's milk is low in iron, and the iron that is present has low bioavailability*

*The relatively high potential renal solute load of whole milk is associated with an increased risk for hypertonic dehydration for infants, especially during illness.*

*(Akers and Groh-Wargo 2005, Fomon and Ziegler 1999)*

## **Zinc**

Zinc absorption from breastmilk is highest (41%), zinc from cow's milk formula is more bioavailable (31%) than zinc in soy-based formulas (14%). Zinc concentration in human milk is unaffected by maternal diet and declines rapidly in the first six months of lactation. After the first 6 months, human milk is an inadequate source of zinc.

Growth delays have been seen in infants fed infant formulas with low amounts of zinc, and zinc supplementation has been found to improve growth in infants with failure to thrive.

## **Vitamins**

As with minerals, unless there are special circumstances, breastmilk and/or standard, iron-fortified infant formula should meet an infant's vitamin needs. Three vitamins of special concerns are discussed below.

### **Vitamin K**

Recommendations for vitamin K intake for infants 0-6 months old is based on the vitamin K content of breastmilk and also on the assumption that infants receive prophylactic vitamin K at birth. (IOM, 2001) Oral vitamin K is not recommended. It may not provide adequate stores in breastfed infants unless repeated doses are administered during the first 4 months of life. (AAP, 2005)

### **Vitamin B12**

Recommended intake levels for vitamin B12 are based on the assumption that the mother's B12 status is adequate. The breastmilk of women who are vegans or who have untreated pernicious anemia may be inadequate, and clinical signs of B12 deficiency may appear in the infant at about 4 months of age. It is recommended that infants of vegan mothers receive supplemental vitamin B12 from birth.

### **Vitamin D**

Vitamin D available to the infant during the first 6 months of life depends on the vitamin D status of the mother during pregnancy and the infant's diet and exposure to sunlight. Because of variations in exposure to sunlight (both regional and seasonal), the recommendations were developed with the assumption that infants do not receive any vitamin D from sunlight.

The American Academy of Pediatrics recommends that all breastfed infants receive 400 IU of vitamin D (oral) beginning soon after birth (Wagner et al, 2008).

## **Overall guidelines: Breastfed infant, formula-fed infant**

Intakes will vary from infant-to-infant and even from day-to-day. Some overall guidelines for evaluating an infant's intake are included in the assessment section of this module.

## *Diet-related Concerns*

### **Breastfeeding**

Over the past 25 years, research has repeatedly demonstrated the importance of breastmilk for infants. This is reflected in national and international initiatives to promote breastfeeding, including a Healthy People 2010 objective for 75% of mothers initiating breastfeeding, 50% of infants being breastfed by 6 months of age, and 25% at 1 year. It is estimated that rates in the US are around 74% infants ever breastfed, 43% breastfeeding at 6 months, and 23% breastfeeding at 1 year. (In Washington State, the rates are 86%, 58%, and 35% respectively). (CDC, 2010)

### **Benefits**

The benefits of breastfeeding are covered in Module 8, Breastfeeding Assessment and Support.

A statement from the IOM's Nutrition Services in Perinatal Care, 2nd edition summarizes many of the benefits of breastfeeding:

*“Exclusive breastfeeding is the preferred method of feeding normal infants throughout their first 4-6 months. Breastfeeding provides the infant with a clean supply of milk, in an amount that is responsive to the infant’s needs, and in a manner that promotes optimal interaction between the mother and infant. Human milk provides all essential nutrients in a form that is easily digested and absorbed and in amounts that allow normal growth and development. Moreover, human milk provides the infant with immunoglobulins and many other antiinfective substances, as well as anti-inflammatory substances, hormones, enzymes, and growth factors that appear to have important health-promoting effects.” (IOM, 1992)*

Risks of not breastfeeding and barriers to breastfeeding are also addressed in Module 8.

### **Contraindications**

Breastfeeding is contraindicated for a small number of infants, including:

- Infants who have a genetic metabolic disorder, such as galactosemia, where metabolism of galactose (and thus lactose) is impaired, or other disorders where the amount of protein ingested must be carefully limited
- Infants whose mothers have HIV infection
- Infants whose mothers have untreated active pulmonary tuberculosis
- Infants whose mothers take some medications, including radioactive isotopes, some antipsychosis medications (e.g., lithium), some antithyroid medications, a few

antibiotics and synthetic anticoagulants, and estrogen-containing oral contraceptives (these may inhibit milk production) (IOM, 1991; Story et al, 2002)

- Infants whose mothers have herpes simplex lesions on a breast (infant may feed from other breast if clear of lesions)
- Infants whose mothers use “street” drugs or abuse alcohol
- Infants whose mothers have HTLV-1 infection

Many maternal infections do not contraindicate breastfeeding. Breastfeeding is not necessarily contraindicated for mothers who have hepatitis A, B, or C. (Breastfeeding is generally considered to be safe for an infant whose mother who is hepatitis B-positive, if the infant is receiving the hepatitis B vaccine; breastfeeding should be stopped if the mother develops cracked nipples or open sores on her breast.) Cytomegalovirus is not a risk to fullterm infants, but may be a risk to an infant born prematurely. (Story et al, 2002; AAP, 2005)

### **Composition of breastmilk**

A general comparison of the nutrient compositions of breastmilk and infant formula is included below. The composition of breastmilk varies during the course of breastfeeding. For example, colostrum has more protein and less fat and lactose than mature milk, and secretory IgA concentrations gradually decline.

The mother and infant share the same environment, thus, the mother can provide specific antibodies to viruses and bacteria to which both mother and baby are exposed. Likewise, maternal diet and environment can transfer substances which are not beneficial to breastmilk. Recommendations for maternal practices are covered in Module 8, Breastfeeding Assessment and Support.

### **Initiating and continuing breastfeeding**

Supporting the initiation and continuation of breastfeeding is discussed in Module 8, Breastfeeding Assessment and Support. Many of the discussion points may be relevant to assessing the nutritional status of the young infant and helping the family as they develop a plan for feeding.

The Washington State WIC Nutrition Program provides breastfeeding support through education, promotion, and support, including classes, peer counselors and lactation consultants.

### **Maternal diet**

The nutrient needs of women during lactation are reviewed in Module 5, Nutrition and the Postpartum Period. In general (Story et al, 2002):

- Fat stores provide an adequate energy source during the first few weeks of lactation; extra fluids should be encouraged

- An increase in energy and water intake may be required to support breastfeeding after the first 6 weeks
- Most foods eaten by the mother are well-tolerated by breastfeeding infants; a few infants may exhibit symptoms of allergy or intolerance
- Caffeine and alcohol intake should be eliminated or restricted

## Breastmilk and Infant Formulas

The IOM, American Academy of Pediatrics (AAP), and many other national and international organizations recommend breastmilk as the first choice for nearly all infants. For families who cannot or choose not to provide breastmilk, however, commercial infant formulas are available.



The compositions of breastmilk and commercial infant formulas are discussed below. These are the only appropriate oral feedings for infants. Grain beverages (rice milk, almond milk, low protein soy milk) are not appropriate for infants and can lead to protein malnutrition (kwashiorkor). (Hattner, 2005)

### Human milk

In general, human milk is lower in protein than standard commercial infant formulas. The protein in human milk is better absorbed because of the protein structure (whey to casein ratio). Fat and minerals are also in forms that are better absorbed than from commercial formulas. In addition, human milk contains antibodies, essential fatty acids, growth factors, and cytokines that are not found in commercial infant formulas. (Story et al, 2002; AAP, 2005) The nutrient composition of human milk changes to meet the nutritional needs of the growing infant.

### Commercial infant formula

Commercial infant formulas are made from heat-treated nonfat cow's milk (or hydrolyzed soy protein) and are designed to provide nutrients in an easily absorbable form. The Food and Drug Administration regulates manufacturing practices and the general composition of infant formulas through the Infant Drug Act. This law requires that infant formulas provide nutrients in amounts that are consistent with Federal guidelines. A discussion of the recent addition of DHA and ARA to many infant formulas is included earlier in this module.

A list of formulas provided by the Washington State WIC Nutrition Program can be found online: <http://www.doh.wa.gov/cfh/wic/formula.htm>. Additional information can be found in Appendix S – Commercial Nutrition Products of *Nutrition Interventions for Children with Special Health Care Needs*. [link to <http://here.doh.wa.gov/materials/nutrition-interventions>]

Information about obtaining approval for therapeutic formulas and Health Recovery Services Administration (HRSA – formerly MAA) coverage for formulas that are not provided by WIC is also available online: <http://www.doh.wa.gov/cfh/wic/formula.htm>. Instructions for billing can be found at [http://hrsa.dshs.wa.gov/download/Billing\\_Instructions\\_Webpages/Medical\\_Nutrition\\_Therapy.html](http://hrsa.dshs.wa.gov/download/Billing_Instructions_Webpages/Medical_Nutrition_Therapy.html). Necessary forms include the WIC/MAA Medical Nutrition Information Form and the Expedited Prior Authorization form.

### **Standard**

Standard infant formulas are made from cow's milk protein (casein and whey), lactose (sometimes corn syrup solids), and a variety of vegetable oils. Standard infant formulas are appropriate for most infants who receive formula. Examples include Enfamil LIPIL (Mead Johnson) and Similac Advance (Abbott Nutrition). Store-brand formulas are also available; contact information for the manufacturer is generally found on the label.

### **Soy-based**

A number of formulas with soy as the protein source are available. They contain more total protein than standard formulas, because protein quality is not as high. Soy-based formulas are indicated for use with infants who have galactosemia, or non-breastfed infants with vegan diets. Soy-based formulas are not indicated for premature infants. Examples include Enfamil Prosoabee (Mead Johnson) and Similac Sensitive Soy (Abbott Nutrition). Store-brand formulas are also available; contact information for the manufacturer is generally found on the label.

### **Protein hydrolysate**

Some formulas are made from hydrolyzed casein, and thus their protein source is small peptides and amino acids, which are more easily absorbed. They are indicated for children with some specific gastrointestinal disorders (e.g., protein-induced enterocolitis, protein-induced proctocolitis, and food protein enteropathy). The fat sources for these formulas vary. Examples include Nutramigen (Mead Johnson), Similac Expert Care Alimentum (Abbott Nutrition), and Pregestimil (Mead Johnson).

Partial whey hydrolysate formulas are made from whey that is broken down into peptides. Examples include Good Start (Nestle).

### **Elemental**

Amino acid-based formulas are available for infants who have cow's milk protein or multiple food protein intolerance and cannot tolerate hydrolysate formulas, including infants with allergic eosinophilic esophagitis. Examples include Infant Neocate (Nutricia) and EleCare (Abbott Nutrition).

### **Low-iron**

There are no known medical conditions for which the use of low-iron formulas is indicated. According to the AAP Policy Statement, the primary treatment for iron overload disorders is chelation therapy. Medication doses can be adjusted to account for the iron in formula (AAP, 1999).

### **Premature formulas and human milk fortifiers**

Premature formulas and human milk fortifiers are formulated to meet the vitamin and mineral needs of premature infants. They are designed to be used in the hospital. Post-discharge formulas are also available. Use of these formulas requires monitoring. This is covered in Module 7 –Medical Nutrition Therapy for Specific Conditions – Infants. Post-discharge formulas include Similac Expert Care NeoSure (Abbott Nutrition) and Enfamil EnfaCare (Mead Johnson).

### **Cow's milk**

Unmodified cow's milk is inappropriate for infants. The curd that is produced is difficult to digest, less fat is absorbed than with human milk or commercial infant formula, and the renal solute load is higher and may pose a risk for young infants. This was covered previously in this module.

### **Goat's milk**

Goat's milk is not appropriate for infants. Its protein content is higher than human milk and infant formula, which puts an infant at risk for dehydration, and has a higher renal solute load. It is also deficient in folic acid and vitamin B6.

### ***Read more: feeding selection, including the baby-friendly hospital initiative***

*A recent review by the US Government Accountability Office (GAO) reports that infant formula marketing strategies can discourage breastfeeding, especially among low-income mothers. Some formula marketing materials include phrases like, "WIC-approved" about some formulas, implying that they are effective in treating colic. (US GAO, 2006) The full report is available at [www.gao.gov](http://www.gao.gov). (Search for GAO-06-282)*

*The World Health Organization (WHO) suggests changes to promote breastfeeding, "The Ten Steps to Successful Breastfeeding." These are included in the WHO Baby Friendly Hospital Initiative designation and also in the CDC Guide to Breastfeeding Intervention.*

### **Formula preparation**

A number of client-education materials have been developed to provide families with information about preparation of infant formula. A few are listed in the resource list. In general, it is recommended that families (FDA, 2009; Martin and Lewis, 1994; Akers and Groh-Wargo, 2005):

- Use safe handling techniques when preparing formula:
  - Wash hands with soap and hot water before preparing formula.
  - Sterilize bottles and nipples in a dishwasher or pot of boiling water; OR wash them in clean water and dish soap; use a bottle brush and wash nipples well if washing by hand; allow to air dry on a clean rack.
  - Clean the top of the formula can, if the formula is canned.
  - Use fresh water from the cold water tap (not hot) or distilled water, if using powdered formula or liquid concentrate. Let the water run for a short period of time first.
  - If using boiled water, cool first before mixing with powdered formula or liquid concentrate.
  - Have well water tested before using to prepare infant formula; use distilled water if the nitrite level is unknown. (The health department or Cooperative Extension service can identify resources for testing.)
- Mix powdered formula or liquid concentrate with the exact amount stated on the label, or prescribed by the health care provider
- Use safe handling techniques when storing formula:
  - Store prepared formula in the refrigerator for up to 24 hours
  - Store open cans of liquid concentrate or ready-to-feed formula in the refrigerator; use within 48 hours of opening
  - Store cans of powdered formula in a cool, dry place; use within 1 month of opening
- Warm bottles of formula (or expressed breastmilk) in a pot of hot water, not in the microwave; test the temperature of the formula before feeding
- If the formula is not used up within an hour, throw it away. Once a baby has nursed from a bottle, microorganisms are introduced into the formula.
- Mix up small amounts for each feeding (1-3 ounces), especially for newborns. This will help avoid over-feeding and waste.

Information about storage of breastmilk can be found in Module 8.

## **Common concerns**

### **Constipation**

Constipation refers to hard, dry stools that are painful or difficult to pass. Constipation in young infants can be caused by inadequate fluid intake (e.g., not enough formula or improperly prepared formula).

After the first few weeks of life, most formula-fed infants have at least 1 bowel movement each day. Older breastfed infants may go several days without a bowel movement. Signs of constipation can include the following:

- Signs of pain and discomfort with bowel movements
- Formed, hard stool
- Swollen belly

Recommendations for young infants include:

- Ensuring that the infant's intake is adequate (e.g., by evaluating number of wet diapers and adequacy of breastfeeding or amount of formula consumed)
- Ensuring that formula is prepared properly
- "Bicycling" with infant's legs or a gentle tummy massage

The amount of iron in infant formula is not enough to cause constipation, and generally, a switch to a different formula is not an effective treatment. Families should seek medical attention when they see blood in their infant's stool, if the infant has a fever or is vomiting, or if constipation does not improve within 2-3 days.

## **Gas**

Gas, and the resulting crankiness and crying, is a common concern of families. It is important for families to remember that it is a normal, usually temporary problem. Gas can result from normal digestion and from air that is swallowed during feeding, crying, and vigorous sucking on a pacifier.

Cues can include:

- Crying
- Pulling legs up and lying a curled position
- Abdominal bloating/distension

Suggestions for minimizing problems with gas include:

- Good positioning during feeding: far back on areola during breastfeeding or on wide base of bottle nipple, holding infant during feedings instead of propping the bottle
- Appropriate pacing of feedings
- Burping the infant midway through feeding and afterward; encourage burping at natural pauses to minimize feeding disruption
- Warm bath or warm compress on baby's tummy
- Tummy massage (use long strokes in a clockwise direction)
- "Bicycling" the infant's legs – lift knees by holding ankles
- Other soothing methods

A very small number of infants may be intolerant to specific components (usually protein) in formula or breastmilk. For these infants, gas is usually a minor problem and other symptoms include vomiting, diarrhea, or poor feeding. If families suspect an intolerance, encourage them to consult with a physician or dietitian who specializes in this field. Changes to the diet of a breastfeeding mother rarely make a difference in gas or fussiness.

Over-the-counter medications (e.g., Mylicon ® Gas relief drops – simethicone) are sometimes recommended. These medications have limited or unproven effectiveness, and families should talk with their child’s pediatrician before starting these medications.

## **Vomiting**

Vomiting is another common concern of families. It is important to understand the difference between a true problem with vomiting and “spitting up,” which may or may not be normal.

Vomiting is a forceful action where the stomach contents are forced up through the esophagus and out of the mouth. Repeated vomiting is usually caused by illness.

Spitting up occurs in about half of all infants and is normal. It generally occurs without warning and is usually not linked to signs of illness (e.g., fever, nausea, retching, diarrhea).

Spitting up is a problem when it is associated with slow weight gain (or weight loss) or gastroesophageal reflux and esophagitis. In these cases, families should seek medical attention to address the cause. Switching to a different brand or type of formula is not usually effective. For some infants, use of rice cereal to thicken formula may minimize problems with reflux. One commercially-available formula with added rice is also approved for participants in the WIC program.

Medical attention should also be sought when an infant:

- Has repeated episodes of vomiting
- Had a fever
- Vomits contains blood or bile
- Shows signs of dehydration
- Has abdominal distension

## **Introduction of complementary foods – preliminary discussions with family**

Recommendations for infant feeding generally support exclusive breastfeeding for the first 6 months of life and breastfeeding supplemented by complementary foods at least through 12 months of age. (AAP, 2005; James, 2005) It is important to look at the infant’s developmental readiness for solid foods; some infants show signs of readiness as early as 4 months of age, while others may not be ready until 8 months of age. (AAP,

2005) Evidence-based guidelines for the introduction of complementary foods have been published. These guidelines also include a summary of physical and eating skills, hunger and fullness cues, and appropriate food textures for children 0 to 24 months. (Butte, 2004) An AAP policy statement does not support the practice of delaying the introduction of foods that are considered to be highly allergenic, in individuals who are not at high risk for food allergy (Greer et al, 2008).

### Developmental readiness

Understanding infant development, relative to feeding skills can help the dietitian to make a more complete assessment of an infant's nutritional status and to develop effective interventions, when there are nutrition-related problems.

A discussion of an infant's cues that shows she is developmentally ready to begin solid foods can also be helpful to families. It will help them understand the rationale behind the recommendations and make plans for their infant's transition to solid foods.

A summary of developmental stages related to feeding is found in *Bright Futures in Practice: Nutrition*. **The ages outlined below are based on an infant's developmental age, and may not match her chronologic age.**



### What can I expect my baby to do as he grows?



*From birth to 1 month of age, your baby will:*

- Begin to develop the ability to start and stop sucking
- Wake up and fall asleep easily



*At about 3 to 4 months of age, your baby will:*

- Drool more
- Put his hand in his mouth a lot



*At 4 to 6 months of age, your baby will:*

- Bring objects to his mouth
- Begin to eat solid foods, such as iron-fortified infant cereals and pureed or soft fruits, vegetables, and meats
- Explore foods with his mouth



*At 7 to 9 months of age, your baby will:*

- Try to grasp foods, such as toast, crackers, and teething biscuits, with all fingers and pull them toward her palm
- Move food from one hand to the other



*At 9 to 11 months of age, your baby will:*

- Reach for pieces of food and pick them up between her thumb and forefinger
- Try to hold a cup
- Pick up and chew soft pieces of food

Resources related to the introduction of complementary foods are listed in the resource list.

### **Introduction of solid foods**

It is generally recommended that single-ingredient foods be introduced first, and that they be started one at a time, at 2- to 7-day intervals. Although many guidelines call for introducing foods in a specific order (e.g., vegetables, then fruit, then meat), no controlled studies are available to back up these recommendations. Meat and fortified foods provide many of the nutrients for which young toddlers are often at-risk of deficiency. (Butte, 2004; Krebs, 2007) Exposure to a variety of flavors early in life may help a child to accept a variety of new foods later in childhood.

### **Use of honey (botulism)**

Honey has been implicated as a source of spores that can cause botulism in infants. For this reason, honey (or foods that contain honey, including many graham crackers) should not be offered to infants under 1 year of age. There has been some controversy over the presence of botulism spores in corn syrup. The most recent recommendations indicate that the spores are no longer found in corn syrup, due to improved manufacturing processes. (However, there is no indication for use of corn syrup with most infants.) (Cox and Hinkle, 2002)

### **Continued development of a healthy feeding relationship**

The introduction of solid food provides more opportunities for families to help their infants develop healthy relationships with food and eating. Ellyn Satter describes the division of responsibility in this way: It is the parent's responsibility to offer developmentally-appropriate foods; it is the child's (or infant's) responsibility to control how much and what to eat. At each stage, this keeps the child in charge of the feeding/eating process and promotes a sense of trust between parent and child. (Satter, 2000)

## *Considerations in the Nutritional Assessment*

The publication *Bright Futures in Practice: Nutrition* includes lists of questions that health care providers can use to elicit nutrition-related information. Some of these lists are summarized at the end of this section. A screening questionnaire is also available. The Bright Futures materials are available online: <http://www.brightfutures.org>. The First Steps initial infant screening form also includes nutrition-related questions.

### **Anthropometrics**

Carefully measure the infant's length, weight, and head circumference, and plot the measurements, along with weight-for-length on the CDC growth charts. Detailed instructions for measurement technique and interpretation are published elsewhere. When measurement equipment is not available, obtain growth data from the infant's medical record.

Deviation from the expected pattern (i.e., changes in percentiles) should be evaluated. They may be normal, as the infant's growth begins to match his or her genetic potential, or they may indicate a nutrition-related problem. (Story et al, 2002; IOM, 1992)

### **Expected growth pattern**

Infants lose 5-8% of body weight during the first week of life. After that period, the rate of weight gain depends on the initial size of the infant, the feeding method (breast- or formula-fed), and other environmental and physiologic factors. Birthweight is generally regained in the first 2 weeks of life. (IOM, 1991; Trahms, 2008)

#### **Rule of Thumb** (Story et al, 2002)

In general, infants usually:

- Regain their birthweight by 10-14 days after birth
- Double their birthweight by 4-6 months, gaining about 5-7 ounces per week
- Triple their birthweight by 1 year, gaining about 3-5 ounces per week from 6 to 18 months

### **Growth charts**

The Centers for Disease Control and Prevention (CDC) published growth charts in 2000. These charts include longitudinal and cross-sectional growth data from a mix of breastfed and formula-fed infants, ages 0-36 months. Charts for 0-36 month olds include length-for-age, weight-for-age, head circumference-for-age, and weight-for-length.

In addition the World Health Organization (WHO) has released growth charts for infants and children (ages 0-5 years) who were primarily breastfed. The WHO Multicentre Growth Reference Study, conducted between 1997 and 2003, includes primary growth data from 8500 children from Brazil, Ghana, India, Norway, Oman, and the US. The charts, references, and training materials, including videos about measuring technique are available on the WHO website: <http://www.who.int/childgrowth/en/>. Charts for infants include length-for-age, weight-for-age, weight-for-length; charts are being developed for arm circumference, head circumference, and subscapular and triceps skinfold. Until WIC receives guidance from USDA, the program will continue to use the CDC charts.

Charts that describe incremental growth (e.g., weight gain over 1 month) are also available. These charts are based on data from formula-fed infants. They can be misleading, and should be used with caution; data are based on predicted values obtained from measurements at 3-month intervals. Thus, some of the short-term variation in infant growth is not depicted. (IOM, 1991; Roche, 1980)

Growth of infants born prematurely can be evaluated by adjusting for gestational age. In most cases, specialty growth charts for premature infants are not needed. (Sherry et al, 2003)

## **Biochemical indicators**

Unless an infant has a condition that requires biochemical monitoring, lab work is not generally indicated.

## **Dietary intake**

Obtain a feeding history, including how many times per day the infant is feeding and the length of each feeding (or how much formula is consumed). It can be helpful to ask how formula is prepared and how much formula is used (e.g., number of cans per day/week/month), especially when there are concerns about formula preparation, intake, or growth. Information about feeding behaviors can also be elicited during this part of the interview:

- What are the infant's hunger cues? (e.g., hand-to-mouth activity, rooting, pre-cry facial grimaces, fussing sounds, and crying)
- What cues does the infant give to indicate fullness? (e.g., turning head away from nipple, showing interest in things other than eating, closing mouth) Does the mother try to have the baby eat past fullness?
- Is feeding generally a pleasant experience, or is it stressful?
- Does the mother (or rest of the family) have any concerns about feeding?

- Does the mother hold the baby when bottle feeding?

Any barriers to the continuation of breastfeeding can also be identified. (IOM, 1992; Story et al, 2002)

Observing the mother breastfeeding her infant provides information about the infant’s ability to suck, as well as the mother’s comfort level, interaction with her infant, and the dyad’s responses to distractions in the environment. (Story et al, 2002)

Most infants who are bottle-fed can finish a bottle in 15-20 minutes. Evaluation by a feeding specialist is indicated if feeding consistently take longer than this. General guidelines for the number and volume of bottle feedings are listed in the table below.

<b>Expected Feeding Pattern of Bottle Feeding for a Typical Term Infant</b>		
<b>Age</b>	<b>Volume</b>	<b>Number of Bottles</b>
0 – 1 week	1-3 ounces	6-10 per day
1 week – 1 month	2-4 ounces	7-8 per day
1 month – 3 months	3-6 ounces	5-7 per day
3 months – 6 months	6-7 ounces	4-5 per day
Adapted from Akers and Groh-Wargo, 2005		

Table 6-1. Expected feeding pattern of bottle feeding for a typical term infant

**Rule of Thumb:** Although formula intake will vary among healthy infants, the following may provide a marker to identify inadequate or excessive intakes:

<b>Age of infant</b>	<b>Amount of formula (standard dilution) per day</b>
0-1 month	18-24 ounces
1-2 months	22-28 ounces
2-3 months	25-32 ounces
3-4 months	28-32 ounces
4-5 months	27-39 ounces
5-6 months	27-45 ounces
Reference: Nevin Folino N, ed. Pediatric Manual of Clinical Dietetics, 2nd edition. American Dietetic Association. 2003.	

Table 6-2. Approximate formula intakes, based on age

Like formula-fed infants, breastfed infants should be fed on demand. Most breastfed infants nurse 8-12 times per day. See Module 8 for more information.

### **Clinical and Medical Data**

The dietitian can evaluate the infant’s general appearance, including skin, hair, teeth, gums, tongue and eyes. Asking questions about the number of wet diapers and bowel movements can provide information about adequacy of the infant’s nutrient intake.

## **Infant elimination patterns**

The AAP guidelines include the following expectations for breastfed infants (AAP, 2005; AAP, 2004; Schrago et al, 2006):

- 3-5 days of age: 3-5 urines, 3-4 stools per day (stools changing from meconium to mustard yellow, mushy stool by day 3-4)
- 5-7 days of age: 4-6 urines, 3-6 stools per day

After several weeks, the number of bowel movements may decrease. Breastfed infants 6 weeks and older may have stools as infrequently as every 3 days. (Story et al, 2002) After the first few weeks of life, most formula-fed infants have at least 1 bowel movement each day.

## **Medical conditions**

Any acute or chronic conditions that the infant might have should also be incorporated into the nutrition assessment. Questions to consider include:

- How does the condition affect the infant's nutrient needs?
- How does the condition affect the infant's ability to nurse or take a bottle?
- Does the condition require any medications that might interact with nutrients, or affect intake or elimination patterns?
- Does the condition affect expectations for the infant's growth?

## **Psycho-social Issues**

Psycho-social issues can be identified during the interview and also by observing the parent-infant interaction. Does the parent appear affectionate? Comfortable? Distant? Anxious?) (Story et al, 2002) Barriers to breastfeeding can have a psycho-social basis. The clinician can help to develop a constructive plan of care by identifying the mother's strengths and the resources that are available to her. (IOM, 1992)

## **Interview Questions for Parents of Young Infants**

The *Bright Futures in Practice: Nutrition* guidelines offer some questions to ask during the interview process. Some general questions are summarized below. Questions specific to breastfeeding and formula-feeding, as well as to the age of the infant are compiled in a table. Questions and guidelines for the 4 month, 6 month, 9 month, and 12 month visits (plus early childhood, middle childhood, late childhood, and adolescence) are also available.

- How do you think feeding is going? Do you have any questions about feeding Shelley?
- How does Shelley let you know when she is hungry? How do you know when she has had enough to eat?

- How often is Shelley eating?
- Have you noticed changes in the way she eats?
- How do you feel about the way Shelley is growing?
- Are you concerned about having enough money to buy food or infant formula?
- What is the source of your drinking and cooking water? Do you use bottled or processed water?
- Do you smoke? Does anyone smoke in your house?
- What is the longest time Shelley has slept at one time?
- How much rest are you getting?
- How many wet diapers does Shelley have each day? Do you burp her during or after a feeding?
- Is anyone helping you feed Shelley?

### **Nutrition Counseling Messages for Parents of Young Infants**

In addition, *Bright Futures in Practice: Nutrition* includes age-specific nutrition counseling messages. General messages for families of young infants are summarized below. Messages specific to breastfeeding and formula-feeding, as well as to the age of the infant are compiled in a table. Messages for the 4 month, 6 month, 9 month, and 12 month visits (plus early childhood, middle childhood, late childhood, and adolescence) are also available.

- Feed your baby when she is hungry, typically 10 to 12 times in 24 hours. Signs of hunger include hand-to-mouth activity, rooting, pre-cry facial grimaces, fussing sounds, and crying.
- During the first two weeks, your baby should be awakened for feeding if he sleeps more than 4 hours at a time.
- Feed your baby until he seems full. Signs of fullness are turning his head away from the nipple, showing interest in things other than eating, and closing his mouth.
- Burp your baby at natural breaks (e.g., midway through or after a feeding) by gently rubbing or patting her back while holding her against your shoulder and chest or supporting her in a sitting position on the lap.
- Your baby may be distracted by lights and noise and may need help to focus on feeding. A calm, gentle approach, using repetitive movements such as rocking, patting, or stroking, is usually most helpful. Some babies may need to be swaddled or fed in a room with less light and noise.
- Babies should not be offered food other than breastmilk or infant formula until they can sit with support and have good control of the head and neck, at about 4 to 6 months.

## *Nutrition Questionnaire for Infants*

You may also download a printable version of this table.

The nutrition questionnaire for infants (Bright Futures in Practice: Nutrition) provides a useful starting point for identifying areas of nutrition concern and the need for additional screening. When reviewing the responses to the questionnaire, use the interpretive notes (included below) to identify areas of concern and determine follow-up questions or actions. Some of these questions are not applicable for young infants.

### **1. How would you describe feeding time with your baby? (Check all that apply)**

- Always pleasant
- Usually pleasant
- Sometimes pleasant
- Never pleasant

Feeding is crucial for the development of a healthy relationship between parents and their infant. A parent's responsiveness to an infant's cues of hunger and satiation and the close physical contact during feeding facilitate healthy social and emotional development.

### **2. How do you know when your baby is hungry or has had enough to eat?**

Signs of hunger include hand-to-mouth activity, rooting, pre-cry facial grimaces, fussing sounds, and crying. Signs of fullness are turning the head away from the nipple, showing interest in things other than eating, and closing the mouth.

### **3. What type of milk do you feed your baby? (Check all that apply)**

- Breastmilk
- Iron-fortified infant formula
- Low-iron infant formula
- Goat's milk
- Evaporated milk
- Whole milk
- Reduced-fat (2%) milk
- Low-fat (1%) milk
- Fat-free (skim)

Infants should be fed breastmilk or iron-fortified infant formula, even in infant cereal. If infants are weaned from breastmilk before 12 months, they should be fed iron-fortified infant formula rather than cow's milk. Cow's milk, goat's milk, and soy milk are not recommended during the first 12 months of life, and reduced-fat (2 percent), low-fat (1 percent), and fat-free (skim) milk are not recommended during the first 2 years of life.

#### **4. What types of things can your baby do? (Check all that apply)**

- Open mouth for breast or bottle
- Drink liquids
- Follow objects and sounds with eyes
- Put hand in mouth
- Sit with support
- Bring objects to mouth and bite them
- Hold bottle without support
- Drink from a cup that is held

Developmental readiness for eating different textures of food and the acquisition of self-feeding skills are important in establishing realistic feeding goals for infants.

#### **5. Does your baby eat solid foods? If so, which ones?**

By 4 to 6 months, infants need more nutrients than can be supplied by breastmilk or infant formula alone; they should gradually be introduced to solid foods when they are developmentally ready. After the infant has accepted iron-fortified infant cereal, then pureed or soft fruits, vegetables, and meats can be offered. Only one new food should be introduced at a time; parents should wait 7 or more days to see how the infant tolerates the food. (*Note: other recommendations suggest a 2-7 day interval between new foods for infants with no family history of food allergy.*)

Between 6 and 12 months, infants master chewing, swallowing, and manipulation of finger foods. They begin to use cups and utensils, and while they are experimenting with new tastes and textures, their sensory and perceptual development are stimulated.

#### **6. Does your baby drink juice? If so, how much?**

A reasonable amount of juice is no more than 4 to 6 oz per day when the infant is developmentally ready (6 months or older). Juice should be served in a cup, not a bottle. It should be offered in small amounts (more than 8 to 10 oz per day is excessive) because too much juice may reduce the infant's appetite for other foods and increases the risk of loose stools and diarrhea.

#### **7. Does your baby take a bottle to bed at night or carry a bottle around during the day?**

Infants permitted to suck on a bottle of any fluid that contains carbohydrates, including juice and milk, for prolonged periods are at risk for developing early childhood caries (baby bottle tooth decay). Infants should not be put to bed at night or at naptime with a bottle or allowed unlimited access to a bottle (i.e., permitting the infant to carry a bottle around whenever he wants).

**8. Do you add honey to your baby’s bottle or dip your baby’s pacifier in honey?**

Honey should not be added to food, water, or formula that is fed to infants because it can be a source of spores that cause botulism poisoning in infants. Processed foods containing honey should not be given.

**9. What is the source of the water your baby drinks?** Sources include public, well, commercially bottled, and home system–processed water.

Starting at 6 months, infants receiving breastmilk or infant formula prepared with water need fluoride supplementation if the water is severely deficient in fluoride. To assess fluoride levels, ask about all sources of water used by the family, including municipal, well, commercially bottled, and home system–processed water. In addition, find out whether any ready-to-feed infant formula used is manufactured with water that has little or no fluoride. Refer an infant who is not getting enough fluoride to a dentist or primary care health professional for follow-up.

**10. Do you have a working stove, oven, and refrigerator where you live?**

**11. Were there any days last month when your family didn’t have enough food to eat or enough money to buy food?**

If inadequate cooking or food-storage facilities adversely affect a family’s nutrient intake, refer the family to social services. If a family does not have adequate resources to obtain food, refer them to food assistance and nutrition programs such as WIC and the Food Stamp Program [in Washington, the program is called Washington Basic Food Program], or to a community food shelf or pantry [or food bank]. (See Tool K: Federal Food Assistance and Nutrition Programs.)

**12. What concerns or questions do you have about feeding your baby?**

Reprinted from Story M, Holt K, Sofka D, eds. 2002. Bright Futures in Practice: Nutrition, Second edition. Arlington, VA: National Center for Education in Maternal and Child Health. Available at <http://www.brightfutures.org/nutrition/index.html>.

## Referral Resources

When nutrition issues are beyond your scope of practice, consider referral, including to resources listed below:

- Other MSS/ICM team members  
See Module 1
- Special Supplemental Nutrition Program for Women, Infants and Children (WIC)  
<http://www.doh.wa.gov/cfh/WIC/>

This website also include information about authorized WIC formulas and procedures for getting non-standard formulas provided by Medicaid

- Medical assistance/Medicaid  
[http://hrsa.dshs.wa.gov/download/Billing\\_Instructions\\_Webpages/Medical\\_Nutrition\\_Therapy.html](http://hrsa.dshs.wa.gov/download/Billing_Instructions_Webpages/Medical_Nutrition_Therapy.html)
- Early Intervention  
<http://www1.dshs.wa.gov/iteip/>

*Infants and children with special health care needs who are enrolled in early intervention programs in their communities should have access to dietitians, occupational therapists, physical therapists, and speech and language pathologists with expertise in pediatrics who can address nutrition and feeding issues.*

*Early intervention services provide community-based interdisciplinary evaluations and therapy services for infants and children and children under age 3 years, with developmental delays. Services are provided in-home, or at a community-based center. Providers include dietitians, occupational therapist, physical therapists, and speech and language pathologists. Nutrition outcomes and objectives should be incorporated into the Individualized Family Service Plan (IFSP) for those children with feeding and nutrition issues. Information about early intervention in Washington State (also called the Infant Toddler Early Intervention Program – ITEIP) can be found at: <http://www1.dshs.wa.gov/iteip/>.*

- Children with Special Health Care Needs Nutrition Network  
<http://depts.washington.edu/cshcnut/nutnet>

*The CSHCN Nutrition Network in Washington State is a group of registered dietitians who provide nutrition services for children with special health care needs. Dietitians come from a variety of employment settings, including local health departments, community clinics, hospitals, early intervention centers and home health agencies.*

- Washington State Community Feeding Teams  
<http://depts.washington.edu/cshcnut/feeding>

*The Washington State Community Feeding Teams provide an interdisciplinary approach to address feeding/nutrition concerns for children with special health care needs in a comprehensive, cost-effective manner. They work directly with families to help parents/caregivers resolve important issues related to feeding and nutrition. Professionals that may be members of feeding teams include: dietitians, occupational therapists, speech therapists, physical therapists, public health nurses, school nurses, physicians, social workers, feeding behavior therapists and others.*

- Hospitals (tertiary or community)

## *Case Example: Cheyenne*

Cheyenne is a 6-week old infant. She is exclusively breastfed, and her mother plans to continue breastfeeding for at least 2 more months. Cheyenne spits up sometimes, so her mother has stopped drinking milk, in case she has a milk allergy. Cheyenne nurses every 2-3 hours, usually for about 15-30 minutes, depending on the time of day.

Cheyenne's rate of growth is appropriate – her birthweight was at about the 50th percentile, and her weight today is between the 50th and 75th percentiles. Length-for-age is around the 25th percentile, and weight-for-length is around the 90th percentile.

### **Do you have concerns about Cheyenne's nutrient intake? About her feeding pattern?**

Based on Cheyenne's growth pattern, it appears that her overall nutrient intake is adequate. The feeding pattern described by her mother is also appropriate for an infant Cheyenne's age.

### **What anticipatory guidance and/or nutrition education might you provide?**

Anticipatory guidance and nutrition education might include:

- encourage Cheyenne's mother to discuss the difference between protein intolerance and normal spitting up with Cheyenne's pediatrician
- ensuring an adequate calcium intake for Cheyenne's mother
- vitamin D supplement for Cheyenne
- preliminary discussion of introduction of solid foods
- discussion of hunger and satiety cues

### **Are any referrals indicated?**

If she is not already enrolled in the WIC program, a referral might be indicated. Also, the dietitian could make sure that Cheyenne has medical insurance.

## *Case Example: Ricky*

Ricky is a 6-week old infant who is receiving standard infant formula. His mother notes that he has been very fussy lately, so she is considering a switch to soy formula. Ricky takes about 4 ounces, 6 times per day. His mother is concerned because his weight has dropped from the 90th percentile at birth, to the 75-90th percentile at his last pediatrician visit. Ricky's length-for-age is between the 50th and 75th percentiles, and weight-for-length is at the 50th percentile.

### **Do you have concerns about Ricky's rate of growth?**

Ricky's growth is probably appropriate. This is a good opportunity for a discussion about infant growth rates with Ricky's mother. The dietitian could also recommend monitoring of Ricky's weight and length, to ensure that his growth pattern continues to be appropriate.

**Do you have concerns about Ricky's nutrient intake? About his feeding pattern?**

Ricky's intake and feeding pattern appear to be appropriate for an infant his age

**What anticipatory guidance and/or nutrition education might you provide?**

Anticipatory guidance and nutrition education might include:

- a discussion of the reason for switching formulas
- a discussion of causes of "fussiness"
- a preliminary discussion of introduction of solid food

## References and Resources

### References

- Akers S, Groh-Wargo S. Normal nutrition during infancy. In: Samour PQ, King K. Handbook of Pediatric Nutrition, 3rd ed. Sudbury MA: Jones and Bartlett Publishers. 2005.
- American Academy of Pediatrics, Subcommittee on Hyperbilirubinemia. Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation. *Pediatrics* 2004;114:297–316.
- American Academy of Pediatrics. Policy Statement: Breastfeeding and the use of human milk. *Pediatrics* 2005;115:496-506. online:  
<http://aappolicy.aappublications.org/cgi/content/abstract/pediatrics;115/2/496>
- American Academy of Pediatrics. Iron fortification of infant formulas. *Pediatrics* 1999;104(1):119-123.
- American Heart Association and American Academy of Pediatrics. Endorsed Policy Statement. Dietary recommendations for children and adolescents: a guide to practitioners. *Pediatrics* 2006;117(2):544-55.
- Butte N, Cobb K, Dwyer J, Graney L, Heird W, Rickard K. The start healthy feeding guidelines for infants and toddlers. *Journal of the American Dietetic Association*. 2004;104(3):442-454.
- Centers for Disease Control and Prevention. Division of Nutrition, Physical Activity and Obesity, National Center for Chronic Disease Prevention and Health Promotion. Pediatric Nutrition Surveillance System. Breastfeeding. Online:  
[http://www.cdc.gov/breastfeeding/data/NIS\\_data/index.htm](http://www.cdc.gov/breastfeeding/data/NIS_data/index.htm). Accessed 28 June 2010.
- Cox N, Hinkle R. Infant botulism. *Am Fam Physician*. 2002;65(7):1388-1392.
- Fomon SJ, Ziegler EE. Renal solute load and potential renal solute load in infancy. *Journal of Pediatrics*. 1999;134(10):11-14.
- Food and Drug Administration. Once Baby Arrives – Food Safety for Moms-to-Be. 2009. Online: <http://www.fda.gov/Food/ResourcesForYou/HealthEducators/ucm089629.htm>. Accessed 29 June 2010.
- Greer F, Sicherer S, Burks AW. Effects of early nutritional interventions on the development of atopic disease in infants and children: the role of maternal dietary restriction, breastfeeding, timing of complementary foods, and hydrolyzed formulas.

*Pediatrics*. 2008;121:183. Online:  
<http://aappolicy.aappublications.org/cgi/content/full/pediatrics;121/1/183>

Hattner JA. Part I: Human milk and pediatric formula update 2006. *Nutrition Focus*. 2005; 20(5).

Institute of Medicine. Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride. Food and Nutrition Board. Washington, DC: National Academy Press; 1997.

Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients). Food and Nutrition Board. Washington, DC: National Academy Press; 2002.

Institute of Medicine. Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline. Food and Nutrition Board. Washington, DC: National Academy Press; 1998.

Institute of Medicine. Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Molybdenum, Nickel, Silicon, Vanadium and Zinc. Food and Nutrition Board. Washington, DC: National Academy Press; 2001.

Institute of Medicine. Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids. Food and Nutrition Board. Washington, DC: National Academy Press; 2000.

Institute of Medicine. Dietary Reference Intakes: Applications in Dietary Assessment. Food and Nutrition Board. Washington, DC National Academy Press; 2000.

Institute of Medicine. Dietary Reference Intakes: Water, Potassium, Sodium, Chloride, and Sulfate. Food and Nutrition Board. Washington, DC National Academy Press; 2004.

Institute of Medicine. Nutrition During Lactation. Washington DC: National Academy Press. 1991.

Institute of Medicine. Nutrition Services in Perinatal Care, 2nd edition. Washington DC: National Academy Press. 1992.

James D, Dobson B. Position of the American Dietetic Association: Promoting and supporting breastfeeding. *J Am Diet Assoc*. 2005;105:810-818.

Krebs NF. Food choices to meet nutritional needs of breast-fed infants and toddlers on mixed diets. *J Nutr* 2007; 137:511S-517S.

Lozoff B, Jimenez E, Smith JB. Double burden of iron deficiency in infancy and low socioeconomic status. *Arch Pediatr Adolesc Med*. 2006;160:1108-1113.

National Network for Child Care - NNCC. Martin, HD, Lewis N. Guidelines for Bottlefeeding. 1994. Accessed 29 June 2010. Urbana-Champaign, IL: University of Illinois Cooperative Extension Service.  
<http://www.nncc.org/Nutrition/guide.bottlefed.html>

Roche AF, Himes JH. Incremental growth charts. *Am J Clin Nutr* 1980; 33:2041.

Satter E. *Child of Mine, Feeding with Love and Good Sense*. Bull Publishing. 2000.

Schrage LC, Reifsnider E, Insel K. The neonatal bowel output study: indicators of adequate breast milk intake in neonates. *Pediatric Nursing*. 2006;32(3):195-201.

Sherry B. et al Evaluation of and Recommendations for Growth References for Very Low Birth Weight (<1500 Grams) Infants in the United States. *Pediatrics*, 2003;111:750-758

Story M, Holt K, Sofka D, eds. 2002. *Bright Futures in Practice: Nutrition*, Second edition. Arlington, VA: National Center for Education in Maternal and Child Health.

Trahms CM. Nutrition during infancy. In: Krause's Food, Nutrition, and Diet Therapy, 12th ed. Mahan KL, Escott-Stump S, Eds. WB Saunders Company. 2008.

US GAO. Breastfeeding: Some Strategies Used to Market Infant Formula May Discourage Breastfeeding; State Contracts Should Better Protect Against Misuse of WIC Name GAO-06-282 February 8, 2006. Online:  
<http://www.gao.gov/docdb/lite/summary.php?rptno=GAO-06-282&accno=A46497>

US Preventive Services Task Force. Agency for Healthcare Research and Quality. Screening for Iron Deficiency Anemia. Topic Page. May 2006. Online:  
<http://www.ahrq.gov/clinic/uspstf/uspstfiron.htm>

US Department of Health and Human Services. *Healthy People 2010*. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office, November 2000.

Wagner CL, Greer FR, Section on Breastfeeding and Committee on Nutrition. Prevention of rickets and vitamin D deficiency in infants, children, and adolescents. *Pediatrics*. 2008;122:1142-1152.

Worthington-Roberts B, Williams SR. *Nutrition in Pregnancy and Lactation*, 6th ed. Brown & Benchmark Publishers. Dubuque, IA; 1997.

## **Resources**

### **Bright Futures**

<http://www.brightfutures.org>

The Bright Futures website includes links to the Bright Futures and Bright Futures in Practice series. Tools for practitioners, including publications, distance education, training tools, and materials for consumers, are also available.

**Child of Mine, Feeding with Love and Good Sense**

Child of Mine, Feeding with Love and Good Sense, by Ellyn Satter. (2000). Available in most libraries and bookstores (\$16.95). This book reviews the division of responsibility between parents and children – the parent’s responsibility is to offer a variety of safe foods in a nurturing environment, and the child’s responsibility is to decide how much and what to eat. The materials cover infancy through age 5 years.

**Infant Nutrition and Feeding: A Guide for Use in the WIC and CSF Programs**

[http://riley.nal.usda.gov/nal\\_display/index.php?info\\_center=12&tax\\_level=2&tax\\_subject=624&level3\\_id=0&level4\\_id=0&level5\\_id=0&topic\\_id=2625&&placement\\_default=0](http://riley.nal.usda.gov/nal_display/index.php?info_center=12&tax_level=2&tax_subject=624&level3_id=0&level4_id=0&level5_id=0&topic_id=2625&&placement_default=0)

Infant Nutrition and Feeding: A Guide for Use in the WIC and CSF Programs, is a reference for WIC and CSFP staff who provide nutrition education to the parents and guardians of infants. It provides an overview of topics related to infant nutrition and feeding and answers some common questions on feeding infants.

## Quiz

1. For infants under 6 months of age, total fat provides about \_\_\_\_% of total energy intake.
  - a. 25
  - b. 35
  - c. 55
  - d. 75
  
2. Iron deficiency anemia is associated with which of the following impairments in infants:
  - a. cognitive and motor
  - b. growth
  - c. all of the above
  - d. none of the above
  
3. Breastfeeding is always contraindicated when:
  - a. the mother is hepatitis B
  - b. the mother has cytomegalovirus
  - c. the mother has HTLV-1 infection
  - d. the infant has phenylketonuria
  
4. In general, human milk has \_\_\_\_\_ protein than standard commercial infant formulas.
  - a. more than
  - b. less than
  - c. the same amount of
  - d. the same whey to casein ratio
  - e. c and d
  
5. Well water:
  - a. should not be used to prepare infant formula
  - b. should be boiled for at least 15 minutes before being used to prepare infant formula
  - c. should be tested before being used to prepare infant formula
  - d. should be used to prepare formula from concentrate, but not from powder

6. Prepared formula can be stored in the refrigerator for up to \_\_\_\_ hours.
- 12
  - 24
  - 36
  - 48
7. Which of the following behaviors is developmentally appropriate for a 3-4 month old infant:
- puts his hand in his mouth a lot
  - brings objects to his mouth
  - moves objects from one hand to another
  - explores foods with his mouth
8. Although growth rates vary depending on feeding method and other environmental and physiologic factors, birthweight is usually regained in the first \_\_\_\_ week(s) of life:
- 1
  - 2
  - 3
  - 4
9. For a young infant, signs of hunger include:
- rooting
  - fussing sounds
  - hand-to-mouth activity
  - pulling legs up and lying in a curled position
  - a, b, and c
  - all of the above
10. A 4-week old infant who is taking about 3 ounces every 3 hours, and who takes about 30 minutes to finish a bottle should receive further assessment because:
- she should be taking more formula at each feeding
  - she should be feeding more frequently than every 3 hours
  - she should be feeding less frequently than every 3 hours
  - she should be taking less than 30 minutes to finish a bottle

11. The intake of a 6-week old infant who is consuming 24 ounces formula (standard dilution) per day is:

- a. excessive
- b. adequate
- c. inadequate

12. Like formula-fed infants, breastfed infant should be fed on demand. Most breastfed infants nurse \_\_\_\_\_ times per day.

- a. 2-3
- b. 5-7
- c. 8-12
- d. 14-16

13. AAP guidelines related to elimination patterns and evaluating adequacy of breastfeeding include the following expectations for an infant by 5-7 days of age:

- a. 2-3 urines, 1-2 stools per day, stools changing from meconium to mustard yellow
- b. 4-6 urines, 1-2 stools per day
- c. 4-6 urines, 3-6 stools per day
- d. 7-10 urines, 8-10 stools per day