

# First Steps Nutrition Modules

## Module 7 – Medical Nutrition Therapy for Specific Conditions – Infants

### ***Introduction***

In this module, some conditions that are common in early infancy are reviewed, along with some of the interventions that dietitians can recommend. It begins with a discussion of special health care needs in general and some community resources that are available for children with special health care needs.

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

### **Learning Objectives**

Participants will be able to:

- Identify some nutrition-related issues associated with some conditions that commonly occur during early infancy (prematurity, low birthweight, slow weight gain, allergies, over- and under-feeding related to feeding cues)
- Describe basic medical nutrition therapy for some conditions that commonly occur during early infancy
- Describe resources for infants with some conditions that commonly occur during early infancy

## **Outline**

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## Special Health Care Needs

### Definition and common nutrition-related concerns

Children with special health care needs are those "who have or are at increased risk for chronic physical, developmental, behavioral, or emotional conditions and who require health and related services of a type or amount beyond that required by children generally." (McPherson et al, 1998).

Children with special health care needs are at increased risk for nutrition-related health problems. Common problems include the following:

- Altered energy and nutrient needs
- Delayed or altered growth patterns
- Feeding delays or oral-motor dysfunction
- Elimination problems
- Medication-nutrient interactions
- Appetite disturbances
- Unusual food habits (e.g., pica, restrictive food choices, rumination)
- Early childhood caries, gum disease

### Screening parameters and criteria for referral

Young children with special health care needs have been found to be particularly vulnerable to nutrition problems. A screening project of infants and young children with developmental delays in the Massachusetts Early Head Start Program found that 92 percent of the children had at least one nutrition risk factor, and 67 percent met more than one of the criteria for referral to nutrition services. (Bayerl, 1993)

A table of nutrition-screening parameters and criteria for referral for children with special health care needs is found in Bright Futures in Practice: Nutrition. The criteria that might apply to young infants are listed below. The entire table is also available for download on the Bright Futures website.

<b>Nutrition-Screening Parameters and Criteria for Referral for Children and Adolescents with Special Health Care Needs</b>	
<b>Screening Data</b>	<b>Criteria for Referral to a Dietitian</b>
<b>Anthropometric</b>	
Birthweight (for infants and children <18 months)	Birthweight <1500 g Inappropriate growth or weight change
Weight-for-length	Weight-for-length <5th percentile Weight-for-length >95th percentile
Length	Length-for-age <5th percentile
<b>Biochemical</b>	

Hemoglobin	Hemoglobin <11 g/100 dL (or outside reference range for age)
Hematocrit	Hematocrit <34% (or outside reference range for age)
<b>Clinical/Medical</b>	
Medical condition known to affect nutrition (e.g., vomiting, reflux), elimination problems, medications, and appetite or dental problems	A diagnosis of heart disease, cancer, diabetes mellitus, HIV/AIDS, cerebral palsy, inborn error of metabolism, cleft lip and palate, malabsorption syndrome, cystic fibrosis, renal disease, or spina bifida  Recurring vomiting or reflux, chronic diarrhea or constipation, severe dental caries, early childhood caries, long-term use of medications that could affect nutrition, megavitamin use, or prolonged decrease in appetite, with weight loss or growth failure
<b>Diet/Feeding</b>	
Feeding method (e.g., mouth, tube, parenteral)	Tube feeding or parenteral nutrition
Therapeutic diet	Therapeutic diet
Feeding delays or problems	Inability to self-feed by age 2 years
Significant allergies	Limited diet because of food aversion or allergies
<b>Other</b>	
Parental or professional concern	Unresolved concerns regarding diet, nutrition, or growth
Adapted 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.	

Table 7-1. Nutrition-screening parameters and criteria for referral for children and adolescents with special health care needs

Medical nutrition therapy for some of these situations can be provided by most dietitians and dietitians with some pediatric nutrition training. For others, specialty care by a dietitian with specific training and/or who is able to follow the child on a long-term basis may be required.

## Resources

### Resource related to nutrition services

Resources for food assistance, special feeding equipment, and supplies for tube feedings or parenteral feedings vary from state to state. Selected resources in Washington State are list briefly below.

Nutrition services for children with special health care needs in Washington State are described on the following website:

<http://depts.washington.edu/cshcnut/nutserv/index.html>. Agencies and organizations include:

- **Title V Maternal and Child Health (MCH) program and Children with Special Health Care Needs (CSHCN) program**  
<http://www.doh.wa.gov/cfh/mch/cshcnhome2.htm>
- **Special Supplemental Nutrition Program for Women, Infants and Children (WIC)** <http://www.doh.wa.gov/cfh/WIC/>
- **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/index.html>

*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.*

More information about nutrition and children with special health care needs

Training is available for dietitians who wish to learn more about nutrition and special health care needs. In addition to traditional MCHB-sponsored training programs, several online curricula exist. (See the resource list at the end of this module for more information.)

- Children with Special Health Care Needs: Nutrition Care Handbook (PNPG/DDPD)  
Ordering information at: <http://www.eatright.org/Shop/Product.aspx?id=4907>
- Nutrition Interventions for CSHCN (WA DOH) - Available for download and ordering information at [http://www.doh.wa.gov/cfh/mch/CSHCN\\_publications.htm](http://www.doh.wa.gov/cfh/mch/CSHCN_publications.htm)
- MCHB Knowledge Path  
[http://www.mchlibrary.info/KnowledgePaths/kp\\_CSHCN.html](http://www.mchlibrary.info/KnowledgePaths/kp_CSHCN.html)

### **Case example: Michael**

Michael is a 2-month old who has trisomy 21 (Down syndrome). He has a cardiac defect that will need surgical repair when he is about 6 months old. He receives standard infant formula in a bottle. His family works hard to make sure he gets enough; sometimes feedings will last 45 minutes.

### **What are Michael's nutrition risk factors?**

Risk factors for Michael include: trisomy 21, difficult to get adequate intake, and length of feedings

### **What referrals might be warranted?**

Referrals to the following might be warranted:

- a dietitian (at a tertiary care facility and/or early intervention program) - the Washington State Nutrition Network for CSHCN might be a good resource to locate a dietitian
- other therapists, depending on Michael's skills - an early intervention program might be able to provide services

## ***Prematurity and Low Birthweight***

An in-depth discussion of the specific nutrition-related issues for infants who were born prematurely is beyond the scope of these modules. Some of the key issues are reviewed below. In addition, a number of resources are available for community providers who see premature infants. These are included at the end of this section.

### **Definition**

Premature infants are those who were born before 37 weeks gestational age. Further classification is made, based on the infant's birthweights:

- Small for gestational age (SGA) – birthweight less than the 10th percentile for gestational age
- Low birthweight (LBW) – birthweight less than 2500 grams (5 pounds 8 ounces)
- Very low birthweight (VLBW) – birthweight less than 1500 grams (3.3 pounds)
- Extremely low birthweight (ELBW) – birthweight less than 1000 grams (2.25 pounds)

### **Specific issues**

Prematurity is associated with a number of medical complications, many of which have long-term implications. Some of the more common medical conditions include the following:

- Bronchopulmonary dysplasia (BPD) – persistent chronic pulmonary problems. Some infants with BPD may need supplemental oxygen, mechanical ventilation, and multiple medications at home
- Intraventricular hemorrhage (IVH) – bleeding occurring in the brain
- Necrotizing enterocolitis – damage to the bowel wall due to ischemic injury, immaturity, and/or bacterial overgrowth; may result in need for surgical resection that may result in short bowel syndrome
- Patent ductus arteriosus (PDA) – an open blood vessel between the pulmonary artery and the descending aorta, which normally closes shortly after birth
- Retinopathy of prematurity (ROP) – changes in the retinal's blood vessels which may affect visual acuity and if unchecked, lead to retinal detachment and blindness

In addition to complex medical issues, a number of factors affect the health and needs of premature infants. They include: genetics, intrauterine environment, medical history, growth and nutrition history, current medical status, behavioral and neurological issues, and psychosocial and family issues. (Zerzan, 2005; Zerzan, 2010) The figure below depicts the interactions that affect feeding, growth, and development for the premature infant.

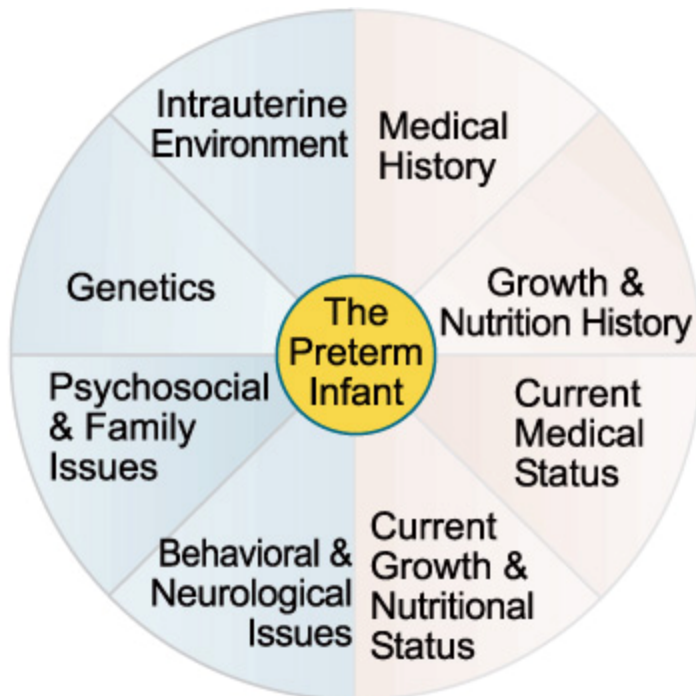


Figure 7-1. Interactions that affect feeding, growth and development for the premature infant

The goals of nutrition assessment for the premature infant include (Zerzan, 2005):

1. Ensure maintenance of growth and weight gain during periods of transition and to optimize growth during periods of stability
2. Provide guidance and support to parents regarding appropriate feeding methods (particularly during periods of transition)
3. Identify feeding problems and assist in resolution of these issues
4. Educate parents regarding goals for growth and feeding to “normalize” the feeding experience

To reach these goals, the dietitian must consider how the individual infant is affected by prematurity and associated primary and secondary medical conditions. Questions to ask include the following:

- What is the infant’s expected growth pattern? Influences include medical conditions and genetic potential, and percentiles, patterns of growth, weight gain, and velocity should be evaluated.
- Is the infant’s intake adequate to meet her needs for growth and development? Consider the influence of medical conditions and medications (e.g., lung disease, short gut, reflux, neurological impairments).
- Is the volume of breastmilk or formula adequate? Is it appropriate? Are vitamin and/or mineral supplements necessary?
  - Energy needs of preterm infants are often higher than for term infants (often 110-130 kcal/kg/d is needed to support growth)

- A formula-fed infant taking less than 1.5 ounces formula per pound (100-120 cc/kg/day) is at risk for dehydration. (Signs of dehydration are included in Module 6).
- In addition to supplemental vitamin D, a standard infant liquid multivitamin is recommended for breastfed and formula-fed infants until their intakes are 24-30 ounces per day and/or they weight 10-12 pounds
- Supplemental iron (2-4 mg/kg/day) is recommended, either from a supplement or from infant formula with iron (AAP 1999)
- Solid foods should not be introduced until the infant is developmentally ready. This is often around 4-6 months corrected age.
- Does the infant have problems that interfere with feeding? Consider nipple skills, coordination of suck-swallow-breathing, hunger and satiety cues (and parents' responses). Other feeding-related problems can include:
  - Low muscle tone
  - Immature maintenance of physiologic stability
  - Weak flexor muscle strength
  - Decreased strength and endurance
  - Physical abnormalities in the oral cavity
- Is the feeding method developmentally appropriate?

## Formulas

Breastmilk is the optimal feeding for most preterm infants. Human milk fortifiers and premature formulas may be needed to meet the vitamin and mineral needs of premature infants during the time that they are in the hospital. Use beyond the hospital can result in excessive intakes of vitamins A and D.

Post-discharge formulas are also available. These formulas typically provide 22 calories per ounce and have more protein, calcium, and phosphorus than standard infant formulas. Some recommendations call for use of these formulas to 1 year of age, however, the needs of the individual infant should be evaluated, and the best product selected. Soy formulas are contraindicated for preterm infants. (Zerzan, 2005)

## Collaboration

Infants are often followed by high risk follow-up clinics at tertiary care centers. These clinics may use a team approach that involves a developmental pediatrician, dietitian, and therapists, including physical, occupational, and/or speech therapists, all with experience with preterm infants. Other service providers can include public health nurses and early intervention therapists. Coordination of all of these “players” can be difficult, and good communication is critical.

## Resources

- Critical Elements of Care (CEC) – Low Birth Weight Neonatal Intensive Care Unit Graduate. Care guidelines and parent materials developed by the UW-CHDD and

Mary Bridge Children's Hospital & Health Center.

[http://www.medicalhome.org/diagnoses/lbw\\_cg\\_gc.cfm](http://www.medicalhome.org/diagnoses/lbw_cg_gc.cfm)

- Gaining and Growing Website. Information for community health professionals who work with premature infants. <http://staff.washington.edu/growing>
- Article: Intrauterine growth retardation and small for gestational age infants. Zerzan J. Intrauterine growth retardation and small for gestational age infants: Implications for growth, outcome, and nutrition management. *Nutrition Focus*. 2004; 19(4).  
Information about ordering back issues:  
[http://depts.washington.edu/chdd/ucedd/ctu\\_5/nutritionnews\\_5.html](http://depts.washington.edu/chdd/ucedd/ctu_5/nutritionnews_5.html)
- Article: Nutrition issues for the premature infant after hospital discharge. Zerzan J. Nutrition issues for the premature infant after hospital discharge. *Nutrition Focus*. 2005; 20(4). Information about ordering back issues:  
[http://depts.washington.edu/chdd/ucedd/ctu\\_5/nutritionnews\\_5.html](http://depts.washington.edu/chdd/ucedd/ctu_5/nutritionnews_5.html)
- Nutrition Interventions for CSHCN (WA DOH). Available for download and ordering information at [http://www.doh.wa.gov/cfh/mch/CSHCN\\_publications.htm](http://www.doh.wa.gov/cfh/mch/CSHCN_publications.htm)

### **Case Example: Juan**

Juan was born at 32 weeks gestation. He is now 2 months, corrected age (4 months chronologic). Juan had some medical complications and required gavage feedings and oxygen in the hospital. He was discharged on oral feedings, with post-discharge formula. He will be seen at a high-risk infant follow-up clinic in about 4 months.

#### **What are some short-term nutrition concerns? What resources might address these concerns?**

Short-term concerns for Juan include ensuring that his intake is adequate and appropriate:

- how long to continue to use post-discharge formula
- how to evaluate that he is getting enough

Potential resources include:

- community providers (e.g., WIC, early intervention dietitians, Nutrition Network members)
- the dietitian who cared for Juan while he was in the NICU
- the dietitian with the high-risk infant follow-up clinic

#### **What are some long-term nutrition concerns? What resources might address these concerns?**

Long-term concerns for Juan include ensuring that his intake is adequate and appropriate:

- adequacy and appropriateness of formula (type and amount)
- assessing developmental readiness for solid foods

Potential resources include:

- community providers (e.g., WIC, early intervention dietitians, Nutrition Network members)

- the dietitian who cared for Juan while he was in the NICU
- the dietitian with the high-risk infant follow-up clinic

## **Slow Weight Gain**

### **Definition**

Slow weight gain is identified as a risk factor by the MSS program. It is sometimes also referred to by the medical diagnosis “failure to thrive” or the term “failure to grow.” There are not universally-accepted criteria for slow weight gain or failure-to-thrive. Some suggest using one or more of the following indicators:

- Weight-for-age <3rd or <5th percentile
- Weight-for-length <3rd or <5th percentile
- Decreased weight gain velocity (weight-for-age falls more than 2 major percentiles over 3-6 months; for infants, some suggest using maximum weight percentile achieved between 4-8 weeks of age, not birthweight)
- Decrease of more than 2 standard deviations (weight-for-age or length-for-age) on growth chart over 3-6 month period
- Gomez and Waterlow criteria (% of median weight-for-age; % of median weight-for-height and length-for-age)

For young infants, however, these may not be appropriate. For example, growth problems in early infancy may have serious long-term consequences if not identified before 3-6 months of age.

Care should be taken when interpreting growth data and identifying slow weight gain. For example, the following two infants identified as having slow weight gain (based on the above criteria), but, may actually be growing appropriately:

An infant whose weight crosses percentile channels may have had inadequate in utero growth and may simply be demonstrating his genetic potential for growth. A complete assessment should include evaluation of in utero growth patterns.

The corrected weight-for-age of an infant who was born prematurely is below the 5th percentile, but this infant's rate of weight gain is adequate. A complete assessment should include evaluation of growth velocity.

Sorting through these issues makes evaluation of slow weight gain in a young infant particularly difficult. It may be more helpful, then, to ask whether or not an infant's growth pattern might be explained by one of the potential causes of slow weight gain.

### **Contributors to slow weight gain**

At a basic level, there are a finite number of explanations for inadequate weight gain. The reasons behind these “simple” causes can be quite complicated. Often a combination of factors contributes to an infant's overall growth problems.

**Inadequate Intake**

- Problems with breastfeeding (e.g., insufficient milk supply, inadequate let-down reflex, infrequent or short feedings, problems with latching on, weak and/or unsustained suck)
- Improperly prepared formula (over-dilute formulas are often indicated by polydipsia/polyuria; concentrated formulas are often indicated by early satiety, vomiting, diarrhea; cereal or other infant foods in formula displace protein and fat)
- Medical conditions that affect the child’s ability to consume an adequate amount of breastmilk or formula
- Impaired parent-child interaction (can be indicated by too-long or too-short feeding times)
- Psychosocial issues (e.g., lack of resources, parental depression, stress, social isolation)

**Increased Needs**


- Medications
- Chronic medical conditions (e.g., prematurity, short bowel syndrome, gastroesophageal reflux, bronchopulmonary dysplasia)
- Infections
- Losses, including vomiting, diarrhea, malabsorption

**Read more about the development of child-caregiver interactions.**

*Child-caregiver interactions are important throughout infancy. The focus of the interaction changes as the infant develops:*

**Homeostasis**

*Ages 0-3 months – During this stage, the focus is on homeostasis, stabilizing biological functions and organizing behavior*

<b>Parent Behavior</b>		<b>Effect on Infant</b>
<p><i>Respond to infant’s hunger cues:</i></p> <ul style="list-style-type: none"> <li>• <i>Feed the infant before prolonged crying</i></li> <li>• <i>Maintain eye contact during feeding</i></li> <li>• <i>Let the infant dictate amount, pace of feedings</i></li> <li>• <i>Stop feeding when infant refuses nipple or shows lack of interest</i></li> </ul>		<p><i>Modulate infant arousal</i></p> <p><i>Prevent tense or overly-aroused infant</i></p> <p><i>Help with mastery of basic feeding skills</i></p> <p><i>Prepare for attachment</i></p>

## Attachment

Ages 2-6 months – One task during these months is attachment, marked by distinct interactions with individual caregivers. Feeding is one important opportunity for social interaction and attachment.

<b>Parent Behavior</b>		<b>Effect on Infant</b>
Respond to infant's hunger cues	→	Strengthen social bond with parent
No engagement during feeding	→	Lack of pleasure with feeding Dysfunction and decreased appetite

Interactions are reciprocal, and cues are sometimes misinterpreted:

<b>Infant Behavior</b>		<b>Effect on Parent</b>
Infant pauses for social interaction	→	Parent interprets this as a sign of satiety and stops feeding

## Separation/Individuation

Ages 6-36 months – The infant begins to have control over his or her environment and develop a sense of self. The feeding relationship moves from a one-on-one relationship (infant and caregiver) to a social event, the family meal.

Adapted from Arvedson, 1997.

Observational scales for parent-child interactions have been developed and include the NCAST Feeding Scale (see <http://www.ncast.org> for information) and a tool developed by Chatoor, et al. (Chatoor, 1997)

## Evaluation and treatment

Treatment of slow weight gain begins with a complete evaluation:

- Medical history and physical to identify medical causes and contributors
- Psychosocial evaluation
- Diet history: Intake, evaluation of breastfeeding, formula preparation
- Feeding history

The goals of medical nutrition therapy for growth problems are straightforward. Again, identifying strategies to meet these goals is often more complicated and requires an individualized (and often concrete) plan.

- Achieve rate of weight gain and weight-for-length that is appropriate for individual infant
- Provide adequate amounts of macro- and micro-nutrients

Catch-up growth is defined as a rate of growth that is faster than expected and is seen when adequate energy and protein is provided to a child who has stunted growth because of a nutritional insult. Catch-up growth can require energy and protein intakes greater than the DRI. Some strategies for achieving catch-up growth include:

- Identify and treat medical contributors to slow weight gain
- Address psychosocial issues that contribute to growth problems
- Evaluate and provide support around breastfeeding
- Increase the energy density of breastmilk or formula, for example:
  - concentrating to 22 or 24 calories per ounce – monitor for signs of intolerance (vomiting, diarrhea)
  - then, fortifying with carbohydrate, fat, or protein “modular” products

Whichever interventions are used, the plan should include guidelines for monitoring the infant’s response and re-evaluating.

### **Read more: Concentrating / Fortifying feedings**

*Concentrating infant formula or fortifying expressed breastmilk is a common practice for increasing an infant's nutrient intake. While this is helpful for some infants, problems can arise when formulas are prepared improperly or there is not careful monitoring.*

*Risks associated with concentrated or fortified feedings can include (Oregon PNPG):*

- *dehydration due to excessive renal solute load (see below)*
- *hypervitaminosis*
- *intestinal blood loss*
- *allergenic properties*
- *improper nutrient composition*
- *improper bone mineralization*
- *insufficient fluid intake*

*Renal solute load is the amount of nitrogenous waste and minerals that must be excreted by the kidneys. When renal solute load exceeds the capacity of the kidneys, dehydration can lead to serious complications, including neurologic deterioration. Acute illness (especially febrile), increased water losses, and medical conditions can decrease an infant's ability to concentrate urine and excrete solutes.*

*Potential renal solute load (PRSL) is the concentration of solute provided by diet (if none were used for new tissue or lost through non-renal routes). Human milk has a PRSL of about 14 mOsm/100 kcal. Infant formulas typically have PRSL of 20-26 mOsm/100 kcal.*

*It has been suggested that an upper limit of 30-35 mOsm/100 kcal be used to decrease an infant's risk of hypertonic dehydration. (Fomon and Ziegler, 1999)*

*The Oregon Pediatric Nutrition Practice Group, Oregon Dietetic Association has developed a resource: [Selecting and Concentrating Infant Formula: guidelines for](#)*

healthcare professionals. 2005. Ordering information can be found at:  
<http://www.eatrightoregon.org/pnpg/resources.htm>

## **Collaboration**

Many of the strategies for treatment will require collaboration with other health care providers, especially when problems are significant. A team approach, whether formal (e.g., at a center with an inter- or multi-disciplinary team) or informal (e.g., community health providers working with the same family) is ideal. Collaboration between the dietitian, primary care provider, public health nurse, social worker or mental health care provider, therapists, and family is needed. In-home visits are often more effective than conventional “clinic-based” interventions alone. (Wright, 1998)

## **Resources**

### **Nutrition Interventions for CSHCN (WA DOH)**

Available for download and ordering information at  
[http://www.doh.wa.gov/cfh/mch/CSHCN\\_publications.htm](http://www.doh.wa.gov/cfh/mch/CSHCN_publications.htm)

### **Failure to Thrive and Pediatric Undernutrition: A transdisciplinary approach**

Failure to Thrive and Pediatric Undernutrition: A transdisciplinary approach. (1999).  
Kessler DB and Dawson P. Brookes Publishing. This book explores failure-to-thrive and pediatric undernutrition from a multidisciplinary perspective.

<http://www.brookespublishing.com>

## Food Allergies

An allergy is an immune response to a specific protein; a food allergy is an immune response to a specific protein in a food. Symptoms can include hives, eczema, vomiting, diarrhea, abdominal pain, or swelling of the lips, tongue, and face and can occur immediately after the food is ingested or up to 72 hours later. Because the digestive and immune systems of infants are immature, food allergies are especially prevalent in infants and children. While many infants “outgrow” allergies, allergies can be lifelong for some individuals.

Diagnosis of a food allergy requires a medical history, diet history, and physical examination. Immunologic testing, such as skin tests, RAST, and elimination diets and challenges, are often performed.

### Treatment

The goal of treatment of a food allergy is to remove the food from the infant’s diet while ensuring that the diet is nutritionally adequate. Because allergens can be transferred through breastmilk, treatment may require that the breastfeeding mother eliminate foods from her food pattern. For infants who are formula-fed, treatment may involve a switch to a different formula.

Some food allergies that are common among infants are listed in the table below.

<b>Allergen (Common symptoms)</b>	<b>Foods breastfeeding mother should avoid and nutrients that may be at risk when the foods are eliminated</b>	<b>Infant formulas that are not appropriate</b>	<b>Infant formulas that might be indicated</b>
Cow’s milk	Milk, butter, cream, cheese, yogurt, casein, lactalbumin, whey  Calcium, vitamin D, protein, vitamin A, riboflavin	Standard infant formulas; soy based formulas*	Soy formulas*, casein hydrolysate, amino acid based
Wheat	Bread, baked goods, cereals pasta, malted products, sauces, processed meat;	None	

	bran, farina, durum  Iron, thiamin, riboflavin, niacin		
Eggs	Eggs, baked goods, mayonnaise, casseroles, pasta, sauces; albumin, surumi, lethicin  Not a primary source of nutrients, but eggs contain vitamin B12, riboflavin, biotin, pantothenic acid, selenium	None	
Soy	Soy, processed grains, processed meats, sauces, soups, miso  Not a primary source of nutrients, but soy contains thiamin, riboflavin, pyridoxine, folate, iron, zinc, magnesium	Soy formulas	Standard infant formulas, casein hydrolysate, amino acid based
<p>* Appropriateness of soy formulas for cow's milk intolerance depends on the type of intolerance. Soy formulas are appropriate for most infants with documented IgE-mediated allergy to cow's milk protein. However, infants with cow's milk protein induced enteropathy or enterocolitis are often sensitive to soy as well, so the AAP recommendation for these conditions is for a formula that is made from hydrolyzed protein or synthetic amino acids (AAP, 1998)</p>			
<p>References:</p> <p>American Academy of Pediatrics. Soy protein-based formulas: recommendations for use in infant feedings. Pediatrics 1998;101(1):148-153.</p> <p>Koerner CB, Hays TL. Nutrition basis in food allergy. Immunology and Allergy Clinics of North America. 1999;19(3):583-603.</p>			

Table 7-2. Food allergies that are common among infants

## Counseling

- Nutrition education for a food allergy should include a discussion about the following:

- Reading labels – help families to identify which ingredients to avoid and encourage them to read labels each time they buy a food, as ingredients can change frequently; new legislation may make this easier. See <http://www.cfsan.fda.gov/~dms/alrgact.html>.
- Avoiding cross-contamination – cross-contact of a “safe” food with an allergen is common, and can occur at places like the deli, where meats and cheese are sliced on the same equipment; help families to understand how cross-contamination can occur and to identify some strategies to avoid it
- Ensuring nutritional adequacy – when a food (or food group) is eliminated from an individual’s food pattern, nutrient deficiency can occur; work with the individual to identify nutrients at risk and to substitute foods to provide missing nutrients

***Read more about the Food Allergen Labeling and Consumer Protection Act.***

*The Food Allergen Labeling and Consumer Protection Act of 2004 (PL 108-282) requires food manufacturers to clearly label some ingredients (milk, egg, fish, shellfish, tree nuts, wheat, peanuts, and soybeans) in one of 3 ways:*

- *List the allergen on the ingredient list*
- *Use the word “contains” followed by the name of the allergen*
- *Clarify technical terms, for example: casein (milk) on the ingredient list*

*Highly refined oils derived from allergenic foods are exempt. The full text of the legislation is online: <http://www.cfsan.fda.gov/~dms/alrgact.html>.*

**Collaboration**

Collaboration with other health care providers is important in the management of food allergies. Other providers who might be involved include allergists, and physicians with GI clinics. Some clinics have associated dietitians; others do not. If a child is in a day care setting, coordination with his care providers is also necessary.

**Prevention**

When there is a family history of food allergy (e.g., both parents, one parent and one sibling, or one sibling), an infant is at increased risk for developing a food allergy. Some infant feeding practices are thought to decrease the risk of developing a food allergy or delay the onset of symptoms:

- Exclusive breastfeeding for a minimum of 6 months is recommended.
- If the infant has symptoms of a food allergy, the breastfeeding mother should eliminate those foods from her food pattern.
- Some groups recommend that nursing mothers of at-risk infants eliminate peanuts and tree nuts from diets, and consider eliminating cow’s milk and fish. (Butte 2004,

AAP 2000) Other recent papers suggest that maternal elimination diets are not effective in preventing allergies. (Palmer 2006, Greer et al, 2008)

- If infant formula is used, some recommendations call for the use of formulas made with extensively hydrolyzed casein or partially hydrolyzed whey.
- Introduction of solid foods should be delayed until the infant is 6 months old, and the progression of solid foods might go more slowly (e.g., 1 new, single-ingredient food every 2-7 days) than if there was no history of food allergy.
- Foods that are most allergenic should be delayed: cow's milk until at least 1 year of age; eggs until 2 years; and peanuts, other nuts, fish, and shellfish until 3 years of age; families should be encouraged to discuss this with their pediatrician.

## **Resources**

### **American Academy of Allergy Asthma and Immunology**

<http://www.aaaai.org>

### **The Food Allergy and Anaphylaxis Network**

<http://www.foodallergy.org>

### **International Food Information Council**

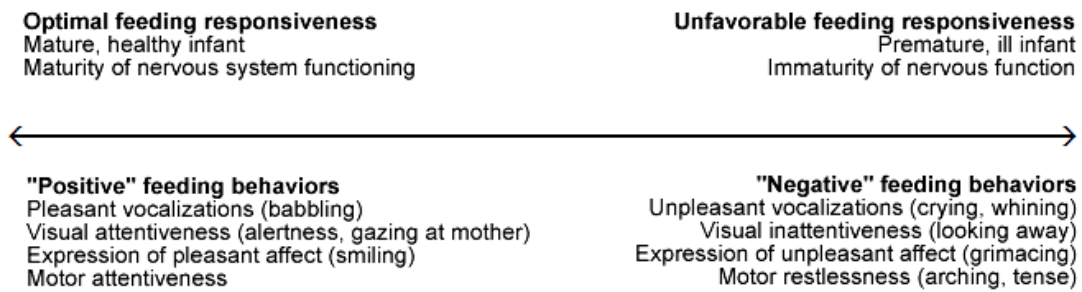
<http://ific.org>

## Over- and Under- Feeding Related to feeding cues

Maternal (or parent) responses to infants' feeding cues are important in the short-term (will the infant get the nourishment she needs?) and in the long-term (will eating be a positive experience and healthy responses to hunger and satiety reinforced?). Both overfeeding and underfeeding can result when a caregiver misinterprets an infant's cues.

### Continuum of infant feeding responses

Mentro et al (2002) describe a continuum of infant feeding responses and describes examples of model, borderline, related, and contrary cases. (See Figure)



**Figure: Continuum of infant feeding responsiveness**

Reproduced with permission from Mentro AM, Steward DK, Garvin BJ. Infant feeding responsiveness: a conceptual analysis. *Journal of Advanced Nursing*. 2002; 37(2):208-216.

### Model case: Julie

Julie is a healthy female infant of 3 months. After awakening from a long morning nap, she is wide-eyed and alert. Her mother picks her up from the crib, and Julie's body rests comfortably in her arms. She is offered a bottle, and eagerly sucks on the nipple when it is offered, prompting her mother to exclaim, "My, aren't you hungry!" Upon hearing her mother's voice, Julie directs her gaze toward her mother's face and begins to smile. Her body remains relaxed, and she does not attempt to turn away from her mother while receiving the bottle. When her mother pauses to burp her, Julie babbles happily.

Julie reacts to the feeding attempt of her mother, demonstrating positive visual, affective, vocal, and motor behaviours attributed to feeding responsiveness. She is awake and alert, makes eye contact with her mother, sucks eagerly on her bottle, maintains a relaxed posture, and makes pleasant vocalizations.

### Borderline case: Daniel

(A borderline case contains some, but not all, of the concept's critical attributes)

Daniel is a 6-month-old infant. Wide-eyed and alert, he is placed in his father's arms. He gazes at his father's face and reaches for his glasses while smiling and making happy babbling sounds. When his father offers Daniel a bottle, he arches his back, turns his head away, and makes repeated upward movements with his arms. When his father removes the bottle, he continues to reach for his father's glasses, making happy squeals and kicking his feet.

This scenario represents a borderline case because not all the defining attributes are present. Although Daniel is revealing appropriate visual, affective and vocal behaviours, as evidenced by alertness, gazing at his father, smiling, and happy vocalizations, he is not exhibiting motor feeding behaviours. He does not attempt to move away from his father; however, he refuses to open his mouth and moves his arms and legs. Daniel is not responding to the feeding but is rather interested in playing with his father's glasses.

**Related case: Brian**

(A related case is one that is related to the concept, but does not have the critical attributes)

Brian is an 8-month-old healthy infant playing on the floor with his mother. He reaches for a nearby bottle, which is far from his reach. As he points at the bottle, his mother rolls a red car across the floor, which catches his eye. Brian grabs the car and begins to play with it, banging it loudly on the floor. When the telephone rings in a nearby room, his mother runs to answer it, leaving him alone. He drops the car and begins to cry loudly upon his mother's departure.

This is an example of the concept of attachment. (See "Read More" earlier in this module.) Although it is similar in some regards to the concept of responsiveness, it does not have the same defining attributes. The scenario is not a feeding interaction, and the caregiver makes no attempts to feed the infant. Therefore, no visual, affective, vocal, and motor feeding reactions are elicited.

**Contrary case: Sarah**

(A contrary case provides a clear example of what the concept is not)

Sarah is a 4-month-old infant girl with a diagnosis of failure to thrive. She is in the lower 5th percentile for body weight, and is crying loudly in her mother's arms despite the soothing attempts of her mother. Four hours have passed since her last feeding. Thinking that she may be hungry, her mother offers her a bottle. When Sarah's mother tries to place the nipple in her mouth, she refuses to accept it, and instead screams loudly, arches her back, and faces away from her mother. Exasperated, her mother removes the bottle and returns her to her crib.

The above example illustrates what infant feeding responsiveness is not. Although Sarah may be hungry, she reacts poorly to her mother's feeding attempts. Her behaviours of crying, refusal to suck the nipple, and arching and facing away from her mother are

interpreted as lack of interest in feeding. Because Sarah is not exhibiting motor, visual, affective, or vocal attentiveness to her mother, optimal feeding responsiveness is not occurring.

## **Assessment and treatment**

Problems reading cues of hunger and satiety, and of interactions in general can be identified during the interview process and also during a feeding observation. Some of the questions in the Bright Futures in Practice: Nutrition guidelines will help to identify these types of problems. Formal evaluation tools are also available and some are listed in the resources section. (Many of these tools require special training for use and interpretation.)

To help families to learn to read their infants' cues, provide information about what types of behavior often indicate hunger or satiety, along suggestions for appropriate responses from a parent. Consultation from a mental health professional or other provider (e.g., public health nurse) with experience in parent-infant interaction may be required.

## **Resources**

### **NCAST Feeding Scale**

This scale is used with infants birth to 1 year of age. (See <http://www.ncast.org> for information)

### **Observational scale for mother infant interaction**

Chatoor I, Getson P, Menvielle E, Brasseau C, O'Donnell R, Rivera Y, Mrazek DA. A feeding scale for research and clinical practice to assess mother-infant interactions in the first three years of life. *Infant Mental Health Journal* 1997;18(1):76-91.

### **Nutrition Interventions for CSHCN (WA DOH)**

Available for download and ordering information at [http://www.doh.wa.gov/cfh/mch/CSHCN\\_publications.htm](http://www.doh.wa.gov/cfh/mch/CSHCN_publications.htm)

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## **Resources**

### **Special Health Care Needs**

#### **Nutrition Interventions for CSHCN (WA DOH)**

Available for download and ordering information at [http://www.doh.wa.gov/cfh/mch/CSHCN\\_publications.htm](http://www.doh.wa.gov/cfh/mch/CSHCN_publications.htm). Includes chapters about failure to thrive, prematurity and low birthweight, food allergies, and feeding skills.

#### **Children with Special Health Care Needs: Nutrition Care Handbook (PNPG/DDPD)**

Ordering information at:

[http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/shop\\_1292\\_ENU\\_HTML.htm](http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/shop_1292_ENU_HTML.htm)

#### **MCHB Knowledge Path**

[http://www.mchlibrary.info/KnowledgePaths/kp\\_CSHCN.html](http://www.mchlibrary.info/KnowledgePaths/kp_CSHCN.html)

**Title V Maternal and Child Health (MCH) program and Children with Special Health Care Needs (CSHCN) program**

<http://www.doh.wa.gov/cfh/mch/cshcnhome2.htm>

**Special Supplemental Nutrition Program for Women, Infants and Children (WIC)**

<http://www.doh.wa.gov/cfh/WIC/>

**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/>

**Children with Special Health Care Needs Nutrition Network**

<http://depts.washington.edu/cshcnut/nutnet>

**Washington State Community Feeding Teams**

<http://depts.washington.edu/cshcnut/feeding>

**Training Opportunities - CSHCN**

**MCH Nutrition Training Programs** - Funded by the federal Maternal and Child Health Bureau, these training programs provide short- and long-term training opportunities.

General information at: [http://nutrition.mchtraining.net/Training Programs](http://nutrition.mchtraining.net/Training_Programs) at [http://nutrition.mchtraining.net/index.php?option=com\\_content&task=category&sectionid=3&id=23&Itemid=25](http://nutrition.mchtraining.net/index.php?option=com_content&task=category&sectionid=3&id=23&Itemid=25)

**Nutrition for Children with Special Health Care Needs** - Self-study (six 1-hour modules) and Group-study (four 1-hour modules) are available online:

<http://depts.washington.edu/pwdlearn>

**Failure to Thrive**

**Failure to Thrive and Pediatric Undernutrition: A transdisciplinary approach**

Failure to Thrive and Pediatric Undernutrition: A transdisciplinary approach. (1999). Kessler DB and Dawson P. Brookes Publishing. This book explores failure-to-thrive and pediatric undernutrition from a multidisciplinary perspective.

<http://www.brookespublishing.com>

**Prematurity**

**Critical Elements of Care (CEC) – Low Birth Weight Neonatal Intensive Care Unit Graduate**

Care guidelines and parent materials developed by the UW-CHDD and Mary Bridge Children's Hospital & Health Center.

[http://www.medicalhome.org/diagnoses/lbw\\_cg\\_gc.cfm](http://www.medicalhome.org/diagnoses/lbw_cg_gc.cfm)

### **Gaining and Growing Website**

Information for community health professionals who work with premature infants.

<http://staff.washington.edu/growing>

### **Article: Intrauterine growth retardation and small for gestational age infants**

Zerzan J. Intrauterine growth retardation and small for gestational age infants:

Implications for growth, outcome, and nutrition management. Nutrition Focus. 2004;

19(4). Information about ordering back issues:

[http://depts.washington.edu/chdd/ucedd/ctu\\_5/nutritionnews\\_5.html](http://depts.washington.edu/chdd/ucedd/ctu_5/nutritionnews_5.html)

### **Article: Nutrition issues for the premature infant after hospital discharge**

Zerzan J. Nutrition issues for the premature infant after hospital discharge. Nutrition

Focus. 2005; 20(4). Information about ordering back issues:

[http://depts.washington.edu/chdd/ucedd/ctu\\_5/nutritionnews\\_5.html](http://depts.washington.edu/chdd/ucedd/ctu_5/nutritionnews_5.html)

## **Food Allergies**

### **American Academy of Allergy Asthma and Immunology**

<http://www.aaaai.org>

### **The Food Allergy and Anaphylaxis Network**

<http://www.foodallergy.org>

### **International Food Information Council**

<http://ific.org>

## **Feeding Relationship**

### **NCAST Feeding Scale**

This scale is used with infants birth to 1 year of age. (See <http://www.ncast.org> for information)

### **Observational scale for mother infant interaction**

Chatoor I, Getson P, Menvielle E, Brasseau C, O'Donnell R, Rivera Y, Mrazek DA. A feeding scale for research and clinical practice to assess mother-infant interactions in the first three years of life. Infant Mental Health Journal 1997;18(1):76-91.

### **Child of Mine: Feeding with Love and Good Sense**

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

## Quiz

1. According to the Bright Futures in Practice: Nutrition guidelines, which of the following indicates the need for referral to a dietitian:
  - a. birthweight <1500 g
  - b. recurring vomiting or reflux
  - c. limited diet because of aversions or allergies
  - d. all of the above
  
2. Premature infants are defined as those who:
  - a. were born before 40 weeks gestational age
  - b. were born before 37 weeks gestational age
  - c. have birthweights less than 2500 grams
  - d. have birthweights less than 1500 grams
  
3. The goals of nutrition assessment for the premature infant include all of the following EXCEPT:
  - a. maintain growth at the 50th percentile for age
  - b. provide guidance and support to parents regarding appropriate feeding methods
  - c. identify feeding problems and assist in resolution of these issues
  - d. educate parents regarding goals for growth and feeding to “normalize” the feeding experience
  
4. A formula-fed infant taking less than \_\_\_\_ ounces formula per pound is at risk for dehydration.
  - a. 1.5
  - b. 2.5
  - c. 3.5
  - d. 4.5
  
5. Premature formulas are designed to meet the needs of premature infants during the time they are in the hospital. Use beyond this time can result in:
  - a. inadequate energy intakes
  - b. inadequate protein intakes
  - c. excessive intakes of vitamins A and D

d. excessive intakes of calcium and phosphorus

6. Improperly prepared formula can be one contributor to slow weight gain. Over-dilute formulas are often indicated by:

- a. vomiting
- b. diarrhea
- c. early satiety
- d. polydipsia/polyuria

7. Catch-up growth is defined as rate of growth that:

- a. results in weight-for-age at or above the 50th percentile
- b. is similar to the growth rate of the infant's sibling(s)
- c. crosses two percentile channels within 1-2 months
- d. is faster than expected for age

8. Which of the following is appropriate for an individual with an allergy to cow's milk:

- a. lactalbumin
- b. whey
- c. casein hydrolysate formula
- d. standard infant formula

9. Which of the following nutrients may be at risk when foods that contain wheat are eliminated:

- a. iron
- b. protein
- c. calcium
- d. pantothenic acid

10. Some feeding practices are thought to decrease the risk of developing a food allergy or delay the onset of symptoms. These include:

- a. avoidance of shellfish until 1 year of age
- b. maternal elimination of foods that contain wheat
- c. exclusive breastfeeding for a minimum of 9 months
- d. introduction of solid foods delayed until the infant is 6 months of age

11. Which of the following is NOT a positive feeding behavior:

- a. pleasant vocalizations (babbling)
- b. motor attentiveness (relaxed posture)
- c. motor restlessness (arching, tense)
- d. expression of pleasant affect (smiling)