

Nutrition Guideline

Healthy Infants and Young Children

Introduction of Complementary Foods

Applicable to: Nurses, Physicians and Other Health Professionals

Recommendations

- Around six months of age, infants are physiologically and developmentally ready for new foods, textures and methods of feeding.
- Introduce nutrient-rich complementary foods at around six months while continuing to breastfeed to meet the infant's increasing nutritional requirements and developmental needs.
- Iron-rich foods such as meats, meat alternatives or iron-fortified infant cereal, are recommended as the first foods to prevent iron-deficiency.
- Introduce complementary foods one at a time and wait two days between any new foods to allow for the identification of any food that may cause a reaction.
- Offer 2-3 oz of water at a time in an open cup starting at about six months as complementary foods are being introduced.
- There is no evidence of a benefit to introducing complementary foods in any specific sequence other than as needed to meet nutrient needs.
- Texture progression from pureed food to finger foods take place in the second six months of life:
 - Pureed, smooth, or mashed foods should be introduced as an infant's first texture.
 - Between 6 – 7 months, infants should progress from pureed to minced and/or soft diced foods.
 - It is important to progress to lumpy textures quickly and ensure that the infant is eating minced, diced and/or cut up foods by nine months of age.

Health Benefits

This guideline will assist health professionals who provide information to the public on the introduction of complementary (solid) foods for full term infants. For information on introducing complementary foods to infants born at <37 weeks, refer to the *Nutrition Guideline: [4.2 Introduction of Complementary Foods for Preterm Infants](#)*.

The recommendations found within this guideline may provide infant benefits such as:

- Reduced risk of iron-deficiency
- Prevention of feeding difficulties
- Adequate intake of nutrients
- Methods to support developmental abilities/oral motor skills

In spring of 2014, Health Canada released a revised online resource, "*Nutrition for Healthy Term Infants: Recommendations from Six – 24 Months*"; a joint statement of Health Canada, Canadian Paediatric Society, Dietitians of Canada, and Breastfeeding Committee of Canada. Alberta Health Services (AHS) has adopted these national guidelines with the exception of the recommendations noted below around allergies, vitamin D, texture progression, sugar sweetened beverages and fruit juices and sample feeding amounts. Health professionals should continue to follow AHS recommendations as listed in this guideline.

Notice, May 2019: There has been a practice change regarding the recommendation for the introduction of commonly allergenic foods for infants. Please see the [Introduction of Commonly Allergenic Foods for Infants](#) practice change notice. This Nutrition Guideline is being updated to reflect these changes.

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Key Questions

Why wait until six months of age to introduce solid foods?

- Exclusive breastfeeding can provide all of an infant's energy needs up to six months of age.¹ Breastmilk is the optimal milk for infants and is recommended for up to two years and beyond.² Infants who are not exclusively breastfed should receive a commercial cow milk-based infant formula. Breastmilk or infant formula continues to be an important source of nutrition for infants as complementary foods are introduced.² For more information on infant formulas, refer to the [Infant Formulas for Healthy Term Infants – Compendium](#).
- Infants are developmentally ready for solid foods at around six months of age.² The addition of nutrient-rich complementary foods to the breastfed or formula fed infant diet at about six months of age will meet infants' increasing nutritional and developmental requirements.
- Feeding solid foods too early may result in: decreased breastmilk production, under-nutrition (associated with decreased milk consumption) or feeding problems.³ The tongue-extrusion or protrusion reflex (an automatic response in infants to force the tongue outward when the lips are touched) diminishes by six months aiding in the acceptance of solids. If solid foods are introduced while the tongue-protrusion reflex is still strong, the infant may reject the spoon. The parent might then feel that the infant is rejecting the food, when in fact he is rejecting the hard object in his mouth.⁴ Even after six months solids are often approached with in-out tongue movements so some food will be pushed out of the mouth.⁵ Some tongue protrusion often persists even after the introduction of complementary foods, gradually disappearing with the progression of textures; in term infants this tongue movement may persist until nine months.⁶
- Delaying introduction of complementary foods until six months for exclusively breastfed infants may protect against gastrointestinal infections.⁷
- Infants who are exclusively breastfed for 3 – 4 months and then fed complementary foods with continued breastfeeding to six months do not grow any faster than healthy term infants who are exclusively breastfed for six months.⁸

What are the signs that an infant is ready for solid foods?

A typically developing infant will display certain signs of readiness for solids at around six months of age:⁹

- Sits up with little help
- Has good head/neck control (is able to turn his head away if does not want to eat)
- Opens mouth when food is offered

If infant is older than six months and not demonstrating readiness as described, a referral to an Occupational Therapist (OT) or Speech Language Pathologist (SLP) should be made.

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Are there any risks to delaying introduction of solids past age six months?

At around six months of age, breastfeeding should still be the main source of nutrition but it is no longer sufficient to meet all of the older infant's nutrient needs. Energy and nutrient dense foods are needed to complement breastfeeding. Delaying the introduction of solids past six months has potential risks such as:²

- Iron-deficiency: At about six months, an infant's iron stores are depleted.¹⁰ The risk of iron-deficiency increases from 6 – 12 months. Iron-deficiency occurs on a continuum and symptoms, including pallor, poor appetite, irritability and growth faltering (failure to thrive) and development are often not apparent until a deficiency is severe.¹¹ Iron-rich foods as the first complementary foods will reduce the risk of iron-deficiency.² Iron-rich foods include meats, meat alternatives and iron-fortified infant cereals.²
- Other nutrient deficiencies.
- Development of feeding problems, including reliance on fluids, refusal to progress to textured foods,² diminished motor skills development and diminished acceptance of new foods.⁴
- Growth faltering ("failure to thrive" or growth that is below what is appropriate for a child's age and gender).^{11,12}

At an infant's meal time, is it best to offer breastmilk / formula before offering solids?

There is no scientific evidence stating whether the breast / bottle or a new complementary food should be offered first at a feeding. It is important to follow the infant's cues. For example, if the infant is content and interested in trying a new food, offer it first and offer the breast or bottle second. On the other hand, if the infant is not used to complementary foods, is upset or very hungry, offer the breast or bottle first. This may calm the infant and increase interest in trying a new food.

Breastmilk or infant formula will still be the main source of nutrition in the second six months of life. It has been estimated that the energy contribution from complementary feedings for infants 6 – 8 months of age is about one fifth of the total requirement.^{1,13} By 9 – 11 months, complementary feedings contribute just under half of the estimated energy requirement.

Is there a particular order to introduce foods?

Other than iron-rich foods as the first foods, there is no evidence of a benefit to introducing complementary foods in any specific sequence.² Soon after introducing iron-rich foods, vegetables and fruit can be added as the vitamin C they contain helps the infant absorb iron. Milk products such as cheese and yogurt can be introduced after six months, once the infant is eating iron-rich foods each day.

Introducing complementary foods one at a time and waiting two days between any new foods helps to identify whether or not a specific food causes an allergic reaction. A reaction may indicate either an allergy or food intolerance. Symptoms of allergy may be evident anywhere from minutes to days after eating and may include vomiting, abdominal pain, diarrhea, blood in stools, failure to thrive, skin symptoms (rash or hives), upper and lower airway symptoms (prolonged stuffy or runny nose, asthma) and anaphylaxis.¹⁴

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Should introduction of highly allergenic foods be delayed?

There is a lack of evidence for all infants that delaying the introduction of any food beyond six months of age will help to prevent an allergy. Therefore, any complementary food, except for honey, can be introduced to infants around six months of age, as long as the texture is appropriate. This includes commonly allergenic foods such as egg whites, peanuts, wheat, milk products such as cheese and yogurt, tree nuts and seafood. Accumulating observational evidence has suggested that delaying the introduction of certain foods does not prevent food allergy; rather, it may actually promote allergy development. However, inducing tolerance by introducing solid foods at 4 – 6 months of age is currently under investigation and cannot be recommended at this time.¹⁵

For more information on preventing allergies, refer to the *Nutrition Guideline: Healthy Infants and Young Children: [9.1 Allergy Prevention](#)*.

Note: *The national guideline only provide recommendations for common food allergens. Health professionals should continue to follow current Nutrition Services, Population and Public Health (NS, PPH) allergy recommendations as infants may develop an allergy to other non-commonly allergenic foods, especially if those foods are introduced earlier than six months of age.¹⁶*

When should you give an infant water?

Offer 2 – 3 oz. of water at about six months once complementary foods have been introduced. Offer water in an open cup to help develop mature drinking skills.

For more information on water for infants refer to the *Nutrition Guideline: [6.1 Water](#)*.

What other fluids can be offered to an infant after six months of age?

In addition to breastmilk on demand, small amounts of water may be introduced as a beverage, in an open cup after six months of age. Infants who are not breastfed should receive infant formula.² Water should not replace the intake of breastmilk or infant formula in the first 12 months of age. After one year of age water should be used to quench thirst between meals and snacks. No other fluids are required.

Vegetables and fruits should be emphasized instead of juice as juice has been associated with dental decay, can displace breastmilk and nutrient dense foods, and lacks the fibre of whole vegetables and fruit.² If juice is provided, only 100% vegetable or fruit juice should be offered² and limited to ½ cup (125 mL) per day. Diluting juice with water and providing throughout the day is not recommended as it allows a child to get accustomed to drinking sweet liquids and prolongs the amount of time teeth are exposed to sugar (which can negatively impact oral health).

Beverages containing caffeine or sugar substitutes should not be offered to young children.² Sweetened beverages, such as pop, fruit drinks, punches and sports drinks have high sugar content and lack vitamins and minerals and should be avoided.²

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Note: The national guideline may be interpreted as offering sweetened beverages as acceptable, as long as it is limited to 175 ml daily. Sweetened beverages should be avoided as they have too much sugar and too few nutrients for healthy growth. NS, PPH advises health professionals that 100% juice is not needed but, if provided, should be limited to 125 mL per day.

When can cow's milk be introduced?

As pasteurized, 3.25% (homogenized) milk is not a good source of iron it is not recommended as the main milk source before 9 – 12 months of age. It is important the infant is eating iron-rich foods daily before 3.25% milk is offered to reduce the risk of iron-deficiency.^{17,18} After 1 year old age, offer 2 cups (500mL) of 3.25% milk.² Breastfed infants can continue to get all their milk from breastmilk. Infants who are being fed soy-based commercial formula because they cannot be given cow milk-based infant formula for cultural, religious or health reasons should receive a soy follow up formulas until two years of age.² Soy, rice, almond, coconut and other plant-based beverages (fortified or non-fortified) are not appropriate alternatives to breastmilk, 3.25% milk or infant formula in the first two years of life as they are generally lower in protein, fat, calories and iron. If a plant based beverage is being offered occasionally as a complementary food, in addition to breastmilk, infant formula or 3.25% milk as the main milk source, then it should be an unflavoured, full fat, fortified soy beverage.²

For more information on plant based beverages refer to the *Nutrition Guideline: [6.3 Plant-Based Beverages](#)*.

When should infants drink from an open cup?

Around six months water can be offered in an open cup.² Drinking from a training cup or a sippy cup occurs by sucking; therefore these cups do not support the development of mature drinking skills. When an infant is offered an open cup they will need help and practice. An open cup is the most appropriate choice to encourage skill development.² By 12 – 14 months of age infants should be drinking from a cup and weaned from the bottle.

Note: The national guideline recommends full transition from bottle to cup by no later than 18 months. NS, PPH recommend continuing with the current recommendations of by 12 – 14 months infants should be drinking from an open cup and weaned from the bottle. This allows for consistent messaging with all of our AHS resources.

Why are the guidelines not more specific about the amounts of food to be offered for infants at different ages?

Infants and children will differ in the amounts of food they eat. Each child is unique and progresses at a different rate with respect to size, growth, metabolism and activity level. The most important point is that iron-rich complementary foods be introduced around six months of age to meet the child's developmental and nutritional needs. Between 6 – 12 months the infant should be offered iron-rich foods 1 – 3 times per day. Start with a small amount of food (1 – 3 tsp [5 – 15 mL]) and offer more based on infants hunger cues. From 12 – 24 months of age, iron-rich foods should be offered at each meal. By 12 months of age children should be eating foods from all four food groups.

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What are the roles in a healthy feeding relationship?

The feeding relationship (also known as “responsive feeding” or responding to hunger and satiety cues) refers to the different roles that parents and children have in the development of healthy eating skills.⁹ Specific roles within the feeding relationship are listed in Table 1. The feeding relationship should be encouraged to avoid under- or overfeeding and to promote healthy eating skills. This means that the parent responds in a prompt, emotionally supportive, developmentally appropriate manner to the child’s hunger and fullness cues.²

Table 1. Roles in Healthy Feeding Relationship⁹

Parents Role	Infant/Childs Role
<p><i>What:</i></p> <ul style="list-style-type: none"> • Offer a variety of healthy foods from <i>Eating Well with Canada’s Food Guide</i>. • Offer all member of the family the same foods (with alterations to make texture appropriate for infants). 	<p><i>How much & Whether :</i></p> <ul style="list-style-type: none"> • Infants and children decide how much and whether to eat the foods offered by the parent. • Do not try to force a child to eat; do not use food to bribe, punish or reward. • Children’s appetites will change from day to day; trust a child’s appetite.
<p><i>When:</i></p> <p>Between 6 – 9 months:</p> <ul style="list-style-type: none"> • Offer complementary foods based on hunger cues and appetite. More guidance is in the Q & A below. • Continue to breastfeed or formula feed on demand. <p>At 9 – 12 months and older:</p> <ul style="list-style-type: none"> • Offer food every 2 – 3 hours in the form of regular meals and snacks. • Infants and children have small stomachs. They need the opportunity to eat often. • In between meals and snacks do not provide foods, only offer water. • Continue to breastfeed or formula feed on demand. 	
<p><i>Where:</i></p> <ul style="list-style-type: none"> • Eat together as a family, sitting down at a table. Eating as a family will allow for role modeling of healthy behaviours. • Limit distractions to help the child to listen to their internal hunger and fullness cues. • Don’t combine eating with other activities such as reading or watching TV. 	

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How often food should be offered to an infant?

An infant's appetite will vary from day to day. The frequency of feeding should be based on hunger and fullness cues:²

- From 6 – 7 months: parents may start with offering infants complementary foods once each day and progress to three times each day depending on hunger cues and appetite.
- From 8 – 9 months: solid foods may be offered 3 – 5 times each day.
- By 10 – 12 months of age, infants can be fed on a regular schedule of three meals and 2 – 3 snacks each day.

Note: The national guideline recommends 2 – 3 feedings and 1 – 2 snacks are offered as early as 6 – 8 months. This may be confusing, especially at 6 – 8 months, when parents should focus on being responsive to their infant's hunger cues and adjusting the amounts and frequency accordingly. NS, PPH advise health professionals to place the emphasis on responsive feeding/healthy feeding relationship.

Should parents be encouraged to make homemade infant food?

Parents should be encouraged to prepare homemade infant food when possible. Making homemade infant food allows parents to offer their infant foods the whole family is eating. Preparing food at home also allows parents to control the texture and ingredients used (no added salt or sugar). Commercial infant foods have a different and less varied texture than those prepared at home.^{19,20} If sodium (salt) or sugar is to be added to family foods, advise parents to remove the infant's portion of food first.

Food can be made texture appropriate with regular kitchen tools such as a blender, potato masher, cheese grater, knife and fork. Hard foods (e.g. carrots, broccoli) will require cooking (steaming or microwaving) prior to blending / mashing / cutting. Advise parents not to make large quantities of one given food/texture as infants quickly progress through textures and food may be wasted.

How can parents prevent foodborne illness?

Parents should be aware of proper food safety and handling techniques when preparing infant food.² Food safety and handling techniques include:

- **Separate** – raw/ready to eat foods should not come in contact with foods which need to be cooked to avoid cross contamination. Parents should use separate plates and utensils for raw and cooked meat products (beef, poultry, pork, fish, seafood, etc).²¹
- **Clean** – utensils which have come in contact with raw meat products should be cleaned before contacting ready to serve foods. All vegetables and fruits should be washed prior to consuming. If you use a reusable grocery bag make sure to launder it often.²¹
- **Cook** – all meat products should be cooked to a safe internal temperature. The temperature can be checked with a food thermometer, inserted into the thickest part of the meat.
- **Temperature** – a key message within this concept is 'keep hot foods hot and cold foods cold'.²¹ Foods and leftovers should be refrigerated within two hours of being at room temperature.²¹

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Do infants need commercial infant cereal?

Commercial iron-fortified infant cereals should be offered to meet an infant's higher iron requirements¹⁰ after six months of age. Homemade infant cereals are not recommended as they do not provide the iron needed for an infant's growth and development. It is not practical or safe for a parent to attempt to add iron to homemade cereal; iron deficiency and toxicity are both serious concerns.

In addition to cereals, meat and meat alternatives can help meet an infant's iron needs. The bioavailability of iron from animal sources (beef, chicken, pork, etc) is higher compared to that of meat alternatives and iron-fortified infant cereal. Although the bioavailability of iron is higher from animal sources, it is unlikely that an infant will meet their iron requirements without the addition of an iron-fortified infant cereal.²² Thus, meat and meat alternatives should be offered to support iron intake and add variety to the infant's diet and iron-fortified infant cereal should be included as a routine part of an infant's diet to ensure adequate intake of iron.

Iron will continue to be an important nutrient into the second year of life.² Iron-fortified infant cereal can continue to be offered, either as a cereal or added to other foods (such as baked goods), from 12 – 24 months to support iron requirements.

Do any foods need to be avoided for infants?

Honey should not be provided to children under one year of age due to risk of botulism.² This includes honey which has been pasteurized, added to baked goods or other foods.

Hard foods, small and round foods, and smooth and sticky foods can block a young child's airway and cause choking. Foods which are not safe and should not be provided to children younger than four years include: hard candies, gum, popcorn, marshmallows, whole nuts or seeds, fish with bones and any snacks served on toothpicks or skewers.² Other foods which can be made safer by modifying them (e.g. raw carrots and hard fruits that are grated and grapes or cherries chopped or cut lengthwise) may be offered to children younger than four years.²

It is safest to avoid offering fish that are high in mercury such as fresh or frozen tuna, shark, swordfish, escolar, marlin or orange roughy to infants and young children. If these types of fish are offered, parents should limit to no more than 40 g per month (just over half a Food Guide Serving) for infants 6 to 12 months of age, and no more than 75 g per month (one Food Guide Serving) for children 1 to 4 years of age. When choosing canned tuna, canned "light" tuna should be chosen over canned "white" (albacore) tuna as canned "light" tuna contains less mercury.²³ Various species can be labelled as "light" tuna including skipjack, yellowfin, and tongol.

As fish are a good source of protein and omega-3 fats, which help with brain and eye development, Canada's Food Guide recommends two 75 g (2.5 oz) servings of low mercury fish per week for everyone ages 2 and up. Children under 2 years of age can work up to this amount. Healthy fish choices include anchovy, capelin, hake, herring, Atlantic mackerel, pollock (Boston bluefish), salmon (farmed and wild), smelt, rainbow trout, shrimp, clam, mussel and oyster.²³

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How should texture progression occur when introducing complementary foods?

The developmental readiness for complementary foods can vary among infants. Important feeding behaviours such as chewing, self-feeding with fingers or a spoon and independently drinking from a cup or bottle begins during the second six months of life. At around six months of age parents should introduce complementary foods in a pureed or mashed texture. Infants do not need to stay on this texture for long. Parents should progress textures quickly to soft minced or diced by following their infant's cues / abilities. Usually infants will progress to these textures between 7 – 9 months of age. By eight months most infants can be picking up foods with their fingers and self-feeding. Parents should receive anticipatory guidance that infants require more complex textures (e.g. minced, diced) by nine months of age to prevent feeding difficulties in older children and to ensure adequate intake of nutritious foods.²⁴ Throughout 6 – 12 months continue to offer infant opportunities to eat with both their fingers and from a spoon as these are both important skills to master.²⁵

Gagging is a natural reflex infants may experience when learning to chew and swallow new foods and should also be discussed with parents.² Gagging is not the same as choking and should not delay texture progression or be a signal that the child should regress to a 'simpler' texture. Often parents report a child choked, but when the situation is described it turns out the child actually gagged. Parents may benefit from first aid and CPR training to feel prepared if a choking incident does occur.

Note: The national guideline may be interpreted as including finger foods from 6 months of age. The references used by the authors of these guidelines do not seem to support their statement as it is worded. NS, PPH encourages health professionals to provide messages within this guideline for consistency, more clarity and direction.

Should a baby-led weaning approach be followed when introducing solids?

Baby-led weaning is the concept of introducing finger foods as the first complementary foods for infants, skipping pureed, mashed and minced textures and spoon feeding.²⁶

Claims made about baby-led weaning include a reduction in picky eating and allowing an infant to self-regulate his/her intake, which may lead to a lower body mass index (BMI).^{27,28} Published studies on baby-led weaning are either observational studies which contain small sample sizes, or self-reported data.^{29,30,31} In all cases, there has been no long term follow-up. Some potential concerns with baby-led weaning have been raised, such as increased risk of choking, iron-deficiency³² and inadequate energy intake.³³

Parents following baby-led weaning typically offer complementary food around six months (following recommendation) rather than introducing earlier. Although following the age recommendation is a positive, infants introduced to finger foods at six months with baby-led weaning may not actually reach out for them and/or ingest them until later depending on their development.³⁴ One study which evaluated when infants reached out for food showed that only around half (56%, 340 infants) reached for finger foods by six months of age. Almost all infants reached out for food by eight months (94%, 566 infants). Based on this study it seems unreasonable to assume that all infants would be developmentally ready for finger foods when introducing complementary foods. The primary concern with offering foods which would not be consumed is the risk of iron-deficiency and inadequate energy intake.

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At this time, based on the lack of high quality evidence and potential concerns within existing evidence regarding baby-led weaning, the practice cannot be recommended as a public health practice. Parents considering baby-led weaning should be advised of the potential risks (choking, iron-deficiency and inadequate energy intake) so they can make an informed decision.

Although baby-led weaning focuses on the infant self-feeding rather than spoon feeding, many parents who self identify as following baby-led weaning may actually still offer some foods on a spoon. Therefore, it can be helpful to find out what parents plan on doing if they mention they are going to follow baby-led weaning for introducing complementary foods. There are aspects of baby-led weaning which parents find attractive.³⁵ These aspects can be emphasized as positives in a conversation regarding baby-led weaning:

- Including their infant in family meals.
- Offering their infant foods, in a modified texture, which the family is eating.
- Respecting their infant's hunger and fullness cues.
- Progressing from finely minced or mashed to larger minced or diced/cut up textures by following their infants cues/abilities.

Are retort pouches and mesh feeding bags helpful for introducing complementary foods?

Squeezable food pouches, also called retort pouches, and mesh feeding bags encourage infants to suck, rather than chew food. Learning to eat with a spoon is an important milestone for infants and facilitates the transition from sucking to chewing and biting.^{25,36} Some infants who are cautious eaters may also benefit from “seeing” the colour and texture of the food on the spoon. Thus, if parents choose to use the retort pouches, it is recommended that they squeeze the contents onto a spoon before feeding their child.²⁵

Many of the oral skills infants learn between 6 – 10 months of age are texture dependent, emerging only if the child is given a variety of textures.³⁷ Offering complementary foods in a mesh bag does not expose the child to a variety of textures. Constantly sucking or biting on the mesh bag also exposes the baby's teeth to the natural sugars present in the foods. Similar to sucking on a bottle or a sippy cup, this can greatly increase the risk of tooth decay.

Is a vitamin D supplement necessary for the infants who are receiving formula or eating solid foods?

Alberta Health Services recommends all infants and children be given 400 IU supplemental vitamin D daily. This is based first on the assumption that all infants and children in Alberta would be considered at risk of vitamin D deficiency, and secondly that sun exposure in Alberta is neither a reliable nor a safe way to meet vitamin D requirements.

For more information, refer to the *Nutrition Guideline*: [5.2 Vitamin D](#).

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Are there any handouts on the introduction of complementary foods for healthy infants and children that I can use with my clients?

For infant nutrition resources visit Nutrition Education Materials at <http://www.albertahealthservices.ca/nutrition/Page11115.aspx> and click on **Infants**

For more information related to healthy infants and children see [Healthy Parents Healthy Children](#).

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Nutrition Guideline
Healthy Infants and Young Children
Introduction of Complementary Foods

Applicable to: Nurses, Physicians and Other Health Professionals

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