Introduction to Solids

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Section 7: Introduction to Solids

Aim: Encourage and support continued breastfeeding and age-appropriate introduction of solids to infants from around six months of age, not earlier than four months.

Key points

<table>
<thead>
<tr>
<th>Table 1: Key points</th>
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<tbody>
<tr>
<td>• From around 6 months, infants should be offered a range of foods of an appropriate texture and consistency for their developmental stage.</td>
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<tr>
<td>• First foods should be iron-rich and an increasing range and quantity of foods should be introduced so that by 12 months the infant is consuming a wide variety of family foods.</td>
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<td>• Breast milk or infant formula should be continued while introducing solids, with other drinks, except cooled boiled water, avoided until the infant is 12 months old.¹</td>
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<td>• There is little evidence that delaying the introduction of complementary solid foods beyond 6 months reduces the risk of allergy. There is emerging evidence that delaying introduction of foods may actually increase the risk of developing food allergy.</td>
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<tr>
<td>• There is insufficient evidence that delaying the introduction of potentially allergenic foods will prevent food allergy, including for those infants that have siblings with food allergy.</td>
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Overview

Learning to eat is a skill that requires practice. At around the age of six months, infants are physiologically and developmentally ready for new foods, textures and modes of feeding and they need far more nutrients than can be provided by breast milk or formula. Delaying the introduction of solid foods beyond this age may increase the risk of developing allergic syndromes.¹

Nutritional, physiological and developmental factors determine the appropriate nutrient content, energy density, texture and timing of solid foods introduced. The aim is to match appropriate food with the developmental and behavioural cues of the infant. Even at this early age, a variety of food should be offered to ensure an adequate supply of energy and nutrients.

There is no universal model of introducing solids to older infants, but a growing number of studies provide guiding principles which are outlined in this section. Some of the key points for introducing solid foods are:

• As long as iron-rich foods are included in first foods, foods can be introduced in any order and at a rate that suits the infant.
A variety of solid foods are required for good nutrition and to help the infant to accept a range of flavours.

The texture of foods should be suitable to the infant’s stage of development, progressing from pureed to lumpy to family food during the 6-12 month period.

Solid foods should be of acceptable taste without added sugar, honey or salt.1 Solid foods are not a solution to early settling and sleep problems. Introducing solids to an infant’s diet does not mean ‘weaning’ or stopping breastfeeding. The phrase ‘introduction of solids’ is preferable to ‘weaning’ as it more accurately conveys the idea that the process does not involve cessation of breastfeeding. It is recommended that breastfeeding be continued until 12 months of age and beyond, as long as the mother and child desire.1

Appropriate complementary feeding is:

- **Timely.** Foods are introduced when infants are showing developmental signs of readiness for solids, and when energy and nutrients needs exceed what can be provided through exclusive and frequent breastfeeding.

- **Adequate.** Provide nutritious foods with sufficient energy, protein, and nutrients to meet a growing child’s nutritional needs, particularly iron and zinc.

- **Safe.** Foods are hygienically stored and prepared, and fed with clean hands using clean utensils.

- **Properly fed.** Foods offered are consistent with the child’s signals of appetite and satiety, and that the meal frequency and feeding methods are suitable for age, i.e. actively encourage the child to consume sufficient food using fingers, spoon or self-feeding (not through bottles or teats).2

**Recommendations for practice**

The following points provide key messages to share with families and caregivers.

- Continue breastfeeding as often as the infant desires for at least 12 months for optimal nutrient and immunological benefits, and to maintain milk supply with the introduction of solid foods.

- Start introducing complementary foods around 6 months, depending on infant developmental milestones. Introducing solids before 4 months (17 weeks) of age can be detrimental and is therefore not recommended, even for pre-term infants. Introducing solids too late (after 26 weeks) can also cause problems and is not recommended.3

- Reassure parents that eating solid foods is a learning process – and with learning any new skill, it takes time and will be a messy process.

- Encourage sensitive care giving, responsive feeding and following baby’s behavioural cues.

- Aim for a variety of complementary foods – meat, fish, poultry, cereals, fruit and vegetables.
Seek medical or specialist advice if the infant’s appetite, growth or developmental milestones are impaired and further assessment is required.

Infants eating a balanced and varied diet do not usually require nutritional supplements. Exceptions to this may include low birth weight infants or infants with mothers known to have nutrient deficiencies which are being treated with supplements, such as Vitamin D.

Meals are to be enjoyed. Parents who model enjoyment of good dietary practices set the scene for good nutrition throughout childhood and beyond.

Reduce the risk of infection. Attention to food hygiene is very important when preparing and storing foods for infants and children.

Pre-term infants should be guided by a paediatrician.

**Background**

Infancy is the period of rapid growth and development. Continued growth and development through good nutrition is important to protect the infant against morbidity and mortality. Appropriate growth during infancy protects against stunting at one extreme and obesity on the other. There is increasing evidence of the importance of growth and nutrition in relation to obesity rates and cognitive development. Appropriate early growth and development also protects against the development of chronic disease in adulthood and influences on future bone mass.4,5

Maintenance of positive energy and nutrient balance is critical in achieving and sustaining normal growth and development. By around six months of age, breast milk (or infant formula) alone no longer provide sufficient nutrients and energy for growth and development. Between 6 and 12 months, breast milk continues to be a major source of bioavailable nutrients.1

The word ‘weaning’ is often used to describe the introduction of solid foods. This can be confusing as this term is also used to describe the introduction of non-milk drinks or even infant formula that may be introduced as complete reliance on breast milk ceases. Due to this confusion, and use of ‘weaning’ in various contexts in the literature, this document will use the same terminology as the *Australian Infant Feeding Guidelines*, which is ‘introduction to solid foods’.1

**International picture and guidelines**

Poor breastfeeding and complementary feeding practices are widespread. Worldwide, it is estimated that about 35% of infants are exclusively breastfed for the first six months of life, the majority receiving some other food or fluid in the early months.6

The World Health Organization global recommendations for appropriate feeding of infants and young children are detailed in Table 2, however the main points are:

- Breastfeeding should start early, within one hour after birth.
- Breastfeeding should be exclusive for six months.
- Appropriate complementary feeding should start at around six months with continued breastfeeding up to two years and beyond.2,6
Table 2: WHO guiding principles on complementary feeding

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. Duration of exclusive breastfeeding and age of introduction of</td>
<td>Practice exclusive breastfeeding from birth to six months of age, and introduce complementary foods at around six months of age while continuing to breastfeed.</td>
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<tr>
<td>complementary foods</td>
<td></td>
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<tr>
<td>2. Maintenance of breastfeeding:</td>
<td>Continue frequent, on-demand breastfeeding until two years or beyond.</td>
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| 3. Responsive feeding:                                                   | Practice responsive feeding, applying the principles of psycho-social care. Specifically:  
  - Feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues.  
  - Feed slowly and patiently, and encourage children to eat, but do not force them.  
  - If children refuse many foods, experiment with different combinations, tastes, textures and methods of encouragement.  
  - Minimize distractions during meals if the child loses interest easily.  
  - Remember that feeding times are periods of learning and love – talk to children during feeding, with eye to eye contact.                                                                                                                                                                                                                                                                                                        |
| 4. Safe preparation and storage of complementary foods:                 | Practice good hygiene and proper handling by:  
  - Washing caregivers’ and children’s hands before food preparation and eating.  
  - Storing foods safely and serving foods immediately after preparation.  
  - Using clean utensils to prepare and serve food.  
  - Using clean cups and bowls when feeding children.  
  - Avoiding the use of feeding bottles, which are difficult to keep clean.                                                                                                                                                                                                                                                                                                                                                      |
| 5. Amount of complementary food needed:                                 | Start at six months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding.                                                                                                                                                                                                                                                                                                                                                     |
| 6. Food Consistency:                                                    | Gradually increase food texture and variety as the infant gets older, adapting to the infant’s requirements and abilities. Infants can eat pureed, mashed and semi-solid foods beginning at six months. By eight months most infants can also eat ‘finger foods’. By 12 months, most children can eat the same types of foods consumed by the rest of the family (keeping in mind the need for nutrient-dense foods, as explained in 8. below). Avoid foods that may cause choking (i.e., items that have a shape and/or consistency that may cause them to become lodged in the trachea, such as nuts, grapes, raw carrots.) |
| 7. Meal frequency and energy density:                                   | Increase the number of times that the child is fed complementary foods as he gets older. The appropriate number of feedings depends on the energy density of the foods and the usual amounts consumed at each feeding. For an average healthy breastfed infant, meals of complementary foods should be provided 2-3 times per day at 6-8 months of age and 3-4 times per day at 9-11 and 12-24 months of age. Additional nutritious snacks such as a piece of fruit or bread or chapatti with nut paste may be offered 1-2 times per day, as desired. Snacks are defined as foods eaten between meals, usually self-fed, convenient and easy to prepare. If energy density or amount of food per meal is low, or the child is no longer breastfed, more frequent meals may be required. |
| 8. Nutrient content of complementary foods:                             | Feed a variety of foods to ensure that nutrient needs are met. Meat, poultry, fish and eggs should be eaten daily, or as often as possible, to meet zinc and iron needs. Vegetarian diets cannot meet nutrient needs at this age unless nutrient... |
supplements or fortified products are used (see 9. below). Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content. Avoid giving drinks with low nutrient value, such as tea, coffee and sugary drinks such as soft drinks. Limit the amount of juice offered so as to avoid displacing more nutrient-rich foods.

9. **Use of vitamin-mineral supplements or fortified products for infant and mother**: Use fortified complementary goods or vitamin-mineral supplements for the infant only as medically indicated. In some populations, breastfeeding mothers may also need vitamin-mineral supplements or fortified products, both for their own health and to ensure normal concentrations of certain nutrients (particularly vitamins) in their breast milk.

10. **Feeding during and after illness**: Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, varied, appetizing, favourite foods. After illness, give food more often than usual and encourage the child to eat more.

**Australian infant feeding practices**

According to the 2010 Australian National Infant Feeding Survey\(^7\), the median age of introducing solids is 4.7 months. The average age for introducing cow's milk was 10.3 months, although some culturally and linguistically different groups introduced it earlier. The groups most likely to introduce solid foods before four months were very young mothers, first-time mothers and mothers speaking languages other than English. The survey also found that 35.3% of infants age 4 months and 91.5% of those aged 6 months had received soft/semi-solid food in the previous 24 hours (See Figure 1).\(^7\)

![Figure 1: Proportion of children who had received soft/semi-solid food in the last 24 hours, by current age](image)

**Successful introduction of solids**

For successful introduction of solids, it is also important to consider:

- *Infant growth, physical and social development*. Birth weight doubles by 6 months, trebles by the end of the first year, and length increases by 50%. Growth is not always steady, but can occur in spurts. This means that appetite and hunger can be unpredictable. Day to day variations on the child’s interest in food and the amount eaten is normal and should only be a concern if their health and growth are compromised.\(^8\)
Cultural factors can influence the age when solids are introduced. Different traditions about what foods to introduce first and how these foods are prepared should be recognised and explored. Assist newly arrived families who may have difficulties accessing traditional foods and cooking equipment. They may also be without family support or community networks to help ensure the infant or child’s diet is nutritionally appropriate.¹

The importance of the parent/carer. Children learn to eat by watching other people. Parental food habits influence the child’s developing food habits. Parents/carers can therefore foster healthy eating habits and attitudes.⁸

Ensuring that mealtimes are happy, relaxed and fun is important. Infants and toddlers love to explore new foods by seeing, touching and smelling as well as tasting it. Encouraging infants to self-feed from about 7-8 months is a good way to promote exploration, discovery and confidence. Learning to eat is just that – it takes practice for both the parents and the child, and can and does get messy.

Communication and partnership with parents. Positive encouragement of the parents and their infant is vital. A family-partnership approach that helps explore and normalise common behaviours and help problem solve is encouraged.

Appropriate introduction of solids or complementary feeding is²:

- **Timely.** Foods are introduced when infants are showing developmental signs of readiness for solids, and when energy and nutrients needs exceed what can be provided through exclusive breastfeeding.
- **Adequate.** Provide nutritious foods with sufficient energy, protein, and nutrients to meet a growing child’s nutritional needs, particularly iron and zinc.
- **Safe.** Foods are hygienically stored and prepared, and fed with clean hands using clean utensils.
- **Properly fed.** Foods offered are consistent with the child’s signals of appetite and satiety, and that the meal frequency and feeding methods are suitable for age, i.e. actively encourage the child to consume sufficient food using fingers, spoon or self-feeding (not through bottles or teats).

**Timeliness of introducing solids**

Breast milk or infant formula provides sufficient nutrients for most infants until around six months. At around six months, the addition of solid foods is required to meet the infant’s increasing nutritional and developmental needs. This age is also an appropriate time for most infants to begin to adapt to different foods, food textures and modes of feeding.

By around 6 months of age most infants are able to adapt to different foods, food textures and modes of feeding.¹ This age has been identified as a time when:

- **Appetite and nutritional requirements** are no longer satisfied by breast milk or infant formula alone.
Stores of several nutrients – for example, iron and zinc – are often falling in exclusively milk-fed infants (both breast and formula), with iron status a particular concern after 6 months.

Feeding behaviour has progressed from sucking to biting (most infants are chewing by 7–9 months and can manage finger foods at 8 months).

The tongue-extrusion reflex has disappeared and the infant’s increasing ability to sit without support allows greater manipulation of food before swallowing, so that thicker foods can be managed.

The digestive system has matured and the infant is able to digest starches.

Most infants have developed an interest in their environment, which prompts a willingness to accept new textures and flavours – it is useful to exploit this exploratory phase by gradually introducing new food tastes and textures.

A recent study found that infants adjust more quickly to solids introduced at around 6 months. It also concluded that the younger the infant was at the time solid foods were introduced, the longer it took to establish the new pattern.¹

Problems with incorrect timing

Timing the introduction of solids correctly is extremely important, and problems may arise if solids are introduced too early or too late. Foods provide a variety of stimulants to infants and many important milestones are reached through meal times and eating. Solids should not be offered to infants before the age of 4 months, and should not be delayed much beyond the age of 6 months.

Too early

The following problems may arise if solids are introduced too early:

- Reduced maternal milk production as a result of the infant spending less time on the breast. Extreme cases may result in under nutrition.

- Development of food allergies.

- Rejection of the spoon if the tongue-extrusion reflex is still strong. Early introduction of solids does not result in earlier loss of this reflex.

- Exposure to pathogens in foods, increasing the risk of diarrhoeal diseases and other problems in the infant.

Too late

The following problems may arise if solids are introduced too late:

- Micronutrient deficiencies (e.g. iron, zinc) can develop as breast milk alone can no longer meet dietary requirements.

- Developmental delay of motor skills such as chewing, and an unwillingness to accept new tastes and textures, fussy eating and/or feeding difficulties.

- Impairment of important developmental milestones, such as, gross and fine motor skills, oral motor skills and the infant may be unwilling to accept new tastes and textures.
• **Impaired growth** as breast milk alone is insufficient to meet energy (kilojoules) and nutrient needs after 6 months.

• **Compromised immune protection.**

• **Possible development of food allergies.**

**What foods should be introduced?**

There is no universal model of feeding infants aged over 6 months. Cultural, social and medical factors can influence the age at which solids are introduced and different cultures have their own traditions about what food is most suitable to begin with. Culturally-appropriate foods and preparation methods should be encouraged when they are nutritionally adequate.¹

**First foods**

The introduction of solid foods at around 6 months should start with iron-containing foods, including iron-enriched infant cereals, pureed meat, poultry and fish (all sources of haem iron), or cooked tofu and legumes. Vegetables, fruits, and dairy products such as full-fat yoghurt, cheese and custard can then be added. Other than recommending the use of iron-rich first foods, *there are no recommendations on the order* in which foods should be introduced or the number of new foods that can be introduced at a time.

*Slow introduction of solid foods is not necessary.* Nutrient content is the most important factor including adequate amounts of iron and zinc, fat, protein, vitamins and other essential minerals. Introduced foods should be of high nutrient density and include a variety of foods from each of the five food groups. Fruit and vegetable purees should be varied even at this early age to ensure adequate energy and nutrient supply.¹

*Nutrient content is the most important factor* when including adequate amounts of iron and zinc, fat, protein, vitamins and other essential minerals. Introduced foods should be of high nutrient density and include a variety of foods from each of the five food groups. Fruit and vegetable purees should be varied even at this early stage to ensure adequate energy and nutrient supply.¹

**Healthy foods in the first 12 months**

An increasing variety and quantity of foods should be offered as the infant moves towards 12 months of age to ensure adequate energy and nutrient supply. The variety offered may assist in enjoying a broader range of foods in later life. A detailed chart of developmental stages and suitable foods can be found in Appendix A.

Food offered should be an appropriate texture and consistency for the infant’s developmental stage:

- From 6 months of age, infants should be offered purees and then mashed and lumpy foods, progressing to minced and chopped foods.
- By 8 months most infants can manage ‘finger foods’.
By 12 months, infants can have nutritious choices from the foods eaten by the rest of the family and should be consuming a wide variety of foods.

Increasing and varying food texture is essential for oral motor development. An infant will quickly learn to manage foods of different textures and will accept food that is mashed with a fork or minced. Encouraging the infant to chew is important. Infants not given ‘lumpy’ textured food until after 10 months have greater feeding difficulties at 15 months than those introduced to lumpy food before 6 months or between 6 and 9 months of age.¹

Learning to eat is a skill that requires practice. Infants may spit out and gag on solids when they are first introduced, but they will soon learn to swallow. The gradual introduction of solid foods allows an infant to become used to different foods, textures and modes of feeding.

- Infants eating a balanced, varied diet do not usually require nutritional supplements. Low birth weight infants are an exception to this.¹
- Salt, sugar or other flavourings should not be added to infant’s food as babies are more sensitive to taste. Salt in particular can be a problem as the kidneys are immature and unable to excrete excess salt.¹

Adequacy and proper feeding

Energy requirements

The following table (Table 3) presents estimated energy requirements (EER) contributing from complementary foods. This is only a guide and it is important not to be overly prescriptive about the amount of complementary foods to be consumed, recognising that each child’s needs will vary due to differences in breast milk intake and variability in growth rate. Furthermore, children recovering from illness or living in environments where energy expenditure is high may require more energy than the average quantities listed here.⁹

Table 3: Estimated energy requirements (EER) per day⁶,¹⁰

<table>
<thead>
<tr>
<th>Age</th>
<th>EER from complementary foods, assuming ‘average’ breast milk intake is maintained.</th>
<th>Total EER</th>
<th>Fluid requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-8 months</td>
<td>800 kJ/day</td>
<td>2500 – 2700 kJ/day</td>
<td>0.8 L/day</td>
</tr>
<tr>
<td>9-11 months</td>
<td>1300 kJ/day</td>
<td>2800 – 3100 kJ/day</td>
<td>0.8 L/day</td>
</tr>
<tr>
<td>12-23 months</td>
<td>2300 kJ/day</td>
<td>3200 – 3500 kJ/day</td>
<td>1.0 L/day</td>
</tr>
</tbody>
</table>

When complementary food is introduced, a child tends to breastfeed less often and their intake of breast milk decreases, therefore the food displaces breast milk. If complementary food is more energy diluted than breast milk, the child’s total energy intake may be less than it was with exclusive breastfeeding.⁶

Feeding practice

- Babies are all individuals and learn to eat at different rates. Not all babies the same age eat the same amount of foods.
Learning to eat is just that – a new skill that needs lots of practise. Be prepared for a mess, it’s all part of learning to eat.

Patience and persistence may be required. Food may be spat out at first when learning to eat new textures. Foods that are refused may need to be re-offered many times to allow the infant to familiarise themselves with the taste and texture.\(^\text{11}\)

Parents should stay calm if an infant gags on food and encourage the child to relax, have a cough and then safely swallow. Infants have a very sensitive gag reflex, a normal reaction in response to new textures and tastes. This is a safety mechanism to prevent them choking on foods which they are not yet skilled to eat. Infants need to learn to control this reflex and may gag quite a bit as they learn to eat solid foods. They may also gag if they are full, don’t like the food given, or if the breast milk or formula is flowing too quickly.\(^\text{12}\) Parents may panic and mistake gagging for choking. The easiest way to tell the difference between the two is that gagging is noisy (with lots of coughing and spluttering), and choking is silent as the child is unable to cough, cry or speak. Learn emergency first aid to manage choking.

**Mealtime environment**

- Create a relaxed atmosphere. Mealtimes should be fun, relaxed and happy. Relax and enjoy this stage of the infant’s development. Establishing a mealtime readiness routine may help prepare infants for meals. Remember that feeding times are periods of learning and love – parents should talk to children during feeding, with eye-to-eye contact.\(^\text{1, 9}\)

- Feeding bottles should be used only for breast milk or infant formula. ‘Comfort sucking’ on a bottle can become a habit that is hard to reverse. Feeding cups or lidded cups are preferred for water and liquids other than breast milk or formula from six months of age.\(^\text{11, 12}\)

**Infant preferences and appetite/satiety\(^\text{12}\)**

- Observe and learn when the infant is interested in eating, when he is hungry or full, and allow him to decide how much to eat.

- Parents/caregivers decide ‘what’ food to eat and the child decides ‘how much’ to eat. Never force feed an infant. Allow them to eat to appetite.

- Cues that the child is full include: closing his mouth tightly, turning away from food offered, pushing his tongue out, spitting out food, losing interest or becoming easily distracted, pushing food away, gagging or crying.

- Be aware of the infant’s reaction to the eating environment and the temperature, taste and texture of new foods. Feeding engages all the senses and infants have varied sensitivities and tolerances to different sensations.

- Care should be taken to choose foods of a texture that is suitable for the child’s age and stage of development. Small, hard pieces of food, such as nuts and seeds, should be avoided as they can be inhaled and cause choking.\(^\text{6}\)
- Seek advice if the infant’s appetite, growth or developmental milestones are impaired and further assessment is required.

**Meal preparation and food safety**

- Infants and toddlers should always be supervised while they are eating.
- Attention to food hygiene is very important when preparing and storing foods for infants and children to reduce the risk of infection.\(^6\)
- Try adapting family meals rather than preparing separate meals, i.e. puree meats and vegetables.\(^1\)
- Meals can also be prepared in bulk, i.e. freeze casseroles in small containers for convenience.

Refer to ‘Safety’ section for more information.

**Safety**

**Prevent choking**

Hard, small and round, smooth and sticky solid foods are not recommended for infants and young children as they can cause choking and aspiration. Popcorn, nuts, seeds, hard lollies and corn chips are not suitable. Infants and toddlers should always be supervised while they are eating.\(^1\)

Tips to help prevent choking:

- Remove small bones and gristle from meat, fish or poultry.
- Remove skins from sausages or frankfurts.
- Start with soft, mashed textures at around 6 months of age and progress to chopped and finger foods as the child’s eating skills develop (around 8-9 months). Cook and mash hard fruits and vegetables, e.g. peas, beans, carrots and apple, initially then reduce cooking time or extent of mash as eating skills progress. For example, offering thinly sliced apple to practice biting skills is appropriate for an average 8-9 month old.
- Check that small, round foods like grapes are well chewed.

**Unsuitable food/beverages and foods**

A number of foods are hazardous to an infant or need to be offered with care. Infants and children are highly susceptible to food borne illness as their developing immune systems are unable to fight infection as effectively as adults. Attention to hygiene is very important when preparing foods for infants and children.\(^1\)

The following **foods should not be offered to infants and young children** due to their potential to cause **serious food borne illness**.\(^1\)

- **Honey.** Infants are particularly susceptible to the spores of *Clostridium botulinum* that can be found in honey. The bacterium can produce toxins in an infant’s intestines resulting in serious illness known as infantile botulism. Honey and foods containing honey are not recommended to children under **12 months of age**.
- **Raw or partially cooked eggs and egg products.** To prevent salmonella poisoning, all eggs and egg products offered to infants should be well cooked.

- **Raw or uncooked meat** (particularly minced meat), poultry, fish and shellfish.

- **Unpasteurised milk and products made from unpasteurised milk** such as raw milk cheese.

Other foods that are **not suitable for infants**, or should be used with care, include the following:

- **Tea** contains tannins and other compounds that bind minerals (e.g. iron) and impair the body’s ability to absorb them. In addition, sugar is often added to tea, which increases the risk of dental caries. Excessive tea intake may also displace intake of other nutrient-dense foods in the diet.

- **Whole nuts and seeds** are not suitable for small children because of the risk of inhalation and choking. Peanut paste is acceptable, should be treated as any other food and can be introduced at around 6 months of age.

- **Coffee, cola drinks, soft drinks, cordials, energy drinks** have low nutrient density, high in sugar, cause tooth decay and can displace other nutritious foods in the diet. Caffeine is not suitable for children.

- **Reduced fat milks** are not recommended for children under the age of two years. Infants and young children are in a period of rapid growth, and milk is a major energy source during this time. When children reach two years of age, reduced-fat dairy products are suitable.

- **Fruit juices** made from squeezed fruit contain the same nutrients present in the whole fruit, but no dietary fibre. Fruit juice offers no nutritional benefits to infants and should not be introduced before twelve months of age. Consumption of juice may displace and reduce an infant’s nutrient intake from breast milk. Whole fruit is recommended after six months rather than juice.

Dilute fruit juice with water to reduce sweetness. Juice should not be given in a bottle or easily transportable covered cup that allows the infant to drink it throughout the day. Infants should not be given juice at bedtime. For children aged 1 to 6 years, fruit juice intake should be limited to about 125ml (½ cup) in a day.

Excessive juice consumption by young children has been linked with:

- gastrointestinal symptoms
- failure to gain weight
- decreased appetite
- loose stools
- increased risk of dental caries.

Children should be encouraged to eat fresh fruit to meet their recommended daily fruit intake.
Food safety

Food safety is especially important for storing and preparing foods for infants and children due to their increased susceptibility to food borne illness. Utensils and high chairs should be thoroughly cleaned before feeding times. Avoid inappropriate feeding practices such as sharing spoons and other utensils, or tasting infants food with shared utensils.1

Food storage

Foods need to be stored properly to retain nutrient value, freshness, aroma, texture and to keep them safe.

- Always read the food label for storage instructions.
- Storage areas should be clean. Foods should be stored away from harmful substances.
- Milk and infant formula should be stored on shelving at the back of the fridge. Storage in the fridge door may not provide a consistent low temperature.
- Raw foods should be stored away from ready-to-eat foods to avoid cross contamination.
- In the fridge, cooked foods should be covered and stored on a shelf above uncooked foods.
- Leftovers should be used the next day at the latest or stored in the freezer.
- Canned foods and foods sealed in glass jars should be stored in a cool place.
- When opening vacuum-sealed jars, listen for a popping sound, which shows that the jar’s seal was intact. This is very important with baby food. If there is no ‘pop’, the food should not be used.1
- If only serving a small quantity of food, transfer the required amount to a separate container to feed, and store leftovers in the fridge.

Food preparation

Food preparation and hygiene is very important when preparing infant foods. The main causes of food borne illnesses in Australia are:

- inadequate cooking
- improper holding temperatures
- contaminated equipment
- unsafe food sources
- poor personal hygiene.1

The following steps should be followed to ensure safe food preparation

- Before preparing food, thoroughly wash hands under running water and dry using a clean towel or paper towel.
- Use a different chopping board and utensils when preparing foods to be eaten raw and foods for cooking.
Always use different utensils for raw meat and vegetables.

Do not place cooked food on plates that have held raw meat, poultry or seafood.

Foods should be thawed in the refrigerator or under cold water or in the microwave oven using the defrost setting.

Fruits and vegetables should be washed thoroughly under running water before peeling and cutting.

Rolled and/or stuffed meats, poultry, pork, sausages and mince should always be cooked all the way through until the juices run clear when the meat is pierced.

When using a microwave to cook, rotate and stir the food so that it cooks evenly.

When reheating food, heat it until it is steaming hot. When heating pre-prepared frozen or refrigerated dinners, follow the instructions.

All work surfaces, crockery, cutlery, cooking utensils and other equipment should be thoroughly cleaned to remove any food or other residue.

Vegetarian diets

An infant’s nutritional needs for growth and development may be met by a well-planned vegetarian diet. Vegetarian diets do not provide sufficient iron or zinc to meet the needs of an infant or young child aged 6-13 months without the use of iron-fortified cereals, milks or other foods. Vegetarian mothers should be advised to breastfeed their infants for as long as possible, up to two years or more.\(^1\)\(^{14}\)

The different categories of vegetarians include:

- Lacto-ovo vegetarian: includes dairy products and eggs in the diet but excludes animal flesh.
- Lacto vegetarian: includes dairy products in the diet but excludes eggs and animal flesh.
- Vegan: consumes plant foods only. Vegan diets are not usually recommended for children as they are very low in vitamin B\(_{12}\) and iron.

Care needs to be taken with a plant-based diet to ensure that supplies of iron and zinc are adequate. This is an important issue because iron is critical for neurocognitive development.

For infants on a vegan diet:

- For infants who are not breastfed or are partially breastfed, a commercial soy-based infant formula during the first 2 years of life is recommended (dietetic advice is recommended).
- After dietary assessment, infants may require nutritional supplement, especially iron and B\(_{12}\).\(^1\)

Guidelines for the introduction of solid foods are the same for vegetarian and non-vegetarian infants. Infants 6 months and older should receive iron from complementary foods high in iron such as iron-fortified infant cereal and protein-rich
foods such as tofu (soy bean curd), cottage cheese, dairy or soy yoghurt, cooked eggs and pureed legumes (eg. beans, split peas, chickpeas, and lentils). Other sources of iron include wholemeal bread, dark green vegetables and fortified breakfast cereals. Include a vitamin C-rich food as part of every meal to increase the infant’s iron absorption.  

Later, around 7-10 months, foods such as cubed tofu, cheese or soy cheese and bite size pieces of soy burgers can be started. Commercial full-fat, fortified soy milk or pasteurised cow’s milk can be used as a primary beverage starting at age 1 year or older for a child who is growing normally and eating a wide variety of foods. Foods that are rich in energy and nutrients, such as legume spreads, nut and seed pastes (peanut, hummus, tahini) tofu and mashed avocado should be used when the infant is starting solids. Dietary fat should not be restricted in children younger than 2 years.  

The advice and support of a Dietitian may be required for infants following a restrictive vegetarian diet.  

Commercial baby foods  

Commercial baby foods can provide a convenient option for travelling or emergency situations. However, these products are not suitable for frequent use as they are generally a uniform texture. It is important that infants are introduced to coarser textures and individual flavours of foods.  

Read information on the packaging, including the ingredients list, nutrition information panel and check expiry dates.  

Food allergy and adverse reactions to foods  

Adverse reactions to foods include food allergies and food intolerances and are illustrated in the algorithm below in Figure 2.  

Food allergy is an abnormal immune-mediated reaction to ingested food, resulting in clinical symptoms. Food allergies are classified as IgE mediated, non IgE mediated, or mixed IgE and non-IgE mediated.  

Food intolerance can result in similar clinical reactions to food allergy, but the reaction is not mediated by the immune system. These reactions can be caused by a lack of enzymes (metabolic, for example lactose intolerance), food chemicals (pharmacologic, for example caffeine), or by toxins in foods.
Figure 2: Adverse reactions to foods

Prevalence and natural history

In Australia, 10% of infants under 12 months have challenge-proven IgE-mediated food allergy. The incidence of food allergy in children under 5 years of age is around 4 to 8%. While any food can cause an allergic reaction, around 90% of food allergic reactions are caused by nine allergens, these being egg, milk, peanut, tree nuts, sesame, fish, crustaceans, wheat and soy.

Around 85% of children with allergy to cows milk, egg, soy and wheat will outgrow their allergy sometime in childhood. Allergies to peanut, tree nuts, sesame, fish and shellfish tend to persist into adulthood.

The prevalence of food intolerance in children is unknown.

Symptoms of adverse food reactions

IgE-mediated food allergy

IgE mediated reactions are usually of rapid onset and, in infants and children, usually occur within 30 minutes of ingestion of the causative food. The reactions result from the release of histamine and other inflammatory mediators which are released from mast cells when allergens bind to IgE antibodies on the mast cells.

Symptoms are classed as mild to moderate, or as anaphylaxis which is severe and requires immediate treatment with adrenaline and emergency medical aid.

Mild to moderate symptoms include:

- swelling of lips, face, eyes
- hives or welts
- tingling mouth
- abdominal pain, vomiting
- eczema or rashes.

Anaphylaxis is defined by any one of the following which may occur in isolation or in conjunction with the mild to moderate symptoms listed above.

- difficult/noisy breathing
swelling of tongue
swelling/tightness in throat
difficulty talking and/or hoarse voice
wheeze or persistent cough
persistent dizziness or collapse
pale and floppy in young children.

Non IgE-mediated food allergy

Non IgE mediated food allergy usually results in symptoms 2-24 hours after ingestion. These reactions are the result of an immune response that results in delayed inflammation in the skin or gastrointestinal tract. Symptoms include delayed eczema; delayed vomiting and diarrhoea; loose, frequent bowel actions, blood or mucus in stools; irritability and unsettledness in infants and include conditions such as eczema, proctocolitis, food protein induced enteropathy and food protein induced enterocolitis (FPIES), a condition characterised by profuse vomiting 2-4 hours after ingestion of the causative food and resulting in hypovolemic shock.

Some allergic syndromes are classified as ‘mixed IgE and non IgE mediated’ and include oesinophilic oesophagitis and eczema.

For more information refer to the ASCIA Health Professional Information Paper: Nutritional Management of Food Allergy (2013) for further details on symptoms and causative foods for the various allergic syndromes.


Food intolerance

Food intolerance and food allergy are commonly confused because food intolerance can result in similar symptoms to food allergy. The important distinction is that the symptoms of food intolerance are not a result of an immune mediated reaction.

Most other food intolerances are:

- Metabolic – such as lactose intolerance which is the result of an enzyme deficiency and can cause bloating and diarrhoea.
- Pharmacological – reactions to components in food such as caffeine, monosodium glutamate and naturally occurring food chemicals such as salicylates and amines.
- Reactions to toxins in foods (such as scombroid fish toxin).
- The result of an unclear reaction, such as reactions to sulphite preservative.

The exception to this is coeliac disease, which is an immune mediated intolerance to the dietary protein gluten.

As there are no reliable skin or blood tests to diagnose food intolerance (apart from coeliac disease), it is imperative in the infant or young child to have the diagnosis of...
food allergy and the risk of anaphylaxis medically confirmed before proceeding to investigate whether symptoms are due to a possible food intolerance. 19

Diagnosis

If an infant or child has symptoms suggestive of an adverse food reaction, the child should be referred via medical practitioner to a specialist paediatric allergist or immunologist for diagnosis.

Diagnosis of IgE mediated food allergy involves taking a detailed medical and dietary history, which is used in conjunction with validated allergy tests, including skin testing and Serum Specific IgE testing (formerly known as RAST). These tests are usually positive for IgE mediated food allergy. It should be noted that only allergists and immunologists are qualified to interpret these tests to inform the diagnosis of food allergy.

Non IgE mediated food allergy is diagnosed by exclusion of IgE mediated diagnosis, and dietary elimination with or without an oral food challenge to confirm the diagnosis. Elimination diets should only be undertaken with the supervision of the child’s medical practitioner and a dietitian, to ensure nutritional adequacy of the diet and appropriate development of feeding practices.

Food intolerances are also diagnosed by elimination and challenge and should be supervised by a medical practitioner and dietitian. Highly restrictive diets can adversely affect nutritional status and affect feeding development. It is important to exclude the presence of true food allergy or other underlying medical conditions that could be responsible for symptoms in the infant or child prior to undertaking exclusion diets for the investigation of food intolerance.

There are a number of tests conducted by alternative health practitioners that claim to diagnose food allergy. These include IgG testing, Vega testing and cytotoxic testing. More information on unorthodox allergy tests can be found at the ASCIA website. 19

Management of diagnosed food allergy

Food allergies are managed with complete avoidance of single or multiple food allergens that cause reactions. Families with allergic children need medical and health professionals to provide individualised advice and support regarding

- emergency action plans
- environmental controls
- allergen avoidance education to ensure the child’s diet is nutritionally adequate for growth and developmental needs, and
- monitor/optimise treatment of asthma and eczema. 19

All children with suspected or diagnosed food allergy should be referred to a paediatric allergist or immunologist for accurate diagnosis of their condition, and for appropriate follow up of their condition. 19 The Expert Panel of the National Institute of Allergy and Infectious Diseases (NIAID) recommends nutritional counselling and regular growth monitoring for all children with FA15, therefore a referral to an Accredited Practising Dietitian is advisable. Poor growth and poor nutritional status
in children on long term exclusion diets have been documented. Feeding disorders in children with food allergy are common.20

Risk factors for developing a food allergy
There is no reliable test to predict who is at risk of developing food allergies. However, children are at higher risk of having food allergy if:

- A parent or sibling has current allergic disease, or a history of allergic disease (this includes food allergy, asthma, eczema, allergic rhinitis).15
- The child has moderate to severe atopic dermatitis, the risk is higher if the infant developed early onset severe eczema (within the first 3 months of life).15

Other factors that are currently under investigation for their role in the development of food allergy include ethnicity, exposure to cigarette smoke and other environmental factors; the role of dietary nutrients including vitamin D, gut microbiota and the role of probiotics and prebiotics; and omega 3 and omega 6 long chain polyunsaturated fatty acids.

A recommendation for the role of breastfeeding and infant formula, and the timing of solids, in the prevention of food allergy is outlined in the section below.

Prevention of food allergy and infant feeding advice for high risk infants21
The development of allergic diseases is complex and not well understood. When providing allergy-related advice to parents, consider and discuss the individual child’s allergy risk as well as other factors such as breastfeeding practice and milk supply, infant growth and developmental milestones, food safety, perceived allergy risk and parental concerns.

For the general population, the National Health and Medical Research (NHMRC) Infant Feeding Guidelines1 to introduce solids at around six months, with continued breastfeeding is recommended. This is based on ensuring nutrition adequacy and preventing infections.

For children at high risk of developing food allergy, the following should be taken into account:

- There is some evidence that introducing solid foods before 4 months of age increases the risk of food allergy.
- There is little evidence that delaying the introduction of complementary solid foods beyond 6 months reduces the risk of allergy. There is emerging evidence that delaying introduction of foods may actually increase the risk of developing food allergy.
- There is insufficient evidence that delaying the introduction of potentially allergenic foods will prevent food allergy, including for those infants that have siblings with food allergy.
- More research is needed to determine the optimal time to start complementary solid foods. Many experts across Europe, Australia and North America recommend introducing complementary solid foods from around 4-6 months, particularly for infants at risk of developing food allergy.
There is some evidence that hydrolysed formula may reduce the risk of allergic disease in high risk infants. Hydrolysed formula is usually labelled ‘HA’ formula and has been processed to break down some of the allergenic proteins that cause symptoms in cow’s milk allergic children. They are different to extensively hydrolysed formula and amino acid formula and should only be recommended for allergy prevention in high risk children who are not breastfed.

Practical advice for infant feeding of children at high risk of allergy

Below is a summary of the recommendations from the Australasian Society of Clinical Immunology and Allergy (ASCIA) Infant Feeding Advice reviewed in September 2010. The change from previous ASCIA guidelines is based on some emerging studies suggesting that avoiding allergenic foods does not appear to reduce allergies, and may even be associated with an increased risk. Note that further research is ongoing in this area.

Infant feeding and allergy

- Breastfeeding for at least 6 months and is encouraged for as long as the mother and infant wish to continue.
- Exclusion of allergenic foods from the maternal diet during breastfeeding or pregnancy has not been shown to prevent allergies.
- Infants are unlikely to develop a new allergy to any milk that is already tolerated, if it is given regularly.
- Breast milk or an appropriate infant formula should remain the main source of milk until 12 months of age, although cow’s milk can be used in cooking or with other foods.
- If the infant is fed formula and not yet introduced to solids, a hydrolysed cow’s milk (HA) formula may be used. This type of formula is not suitable for diagnosed cow’s milk allergy. Soy milk and goat milk are not recommended for allergy prevention.

Introduction to solid foods for high risk infants

- From 4-6 months, when the child is ready, consider introducing a new food every 2-3 days, according to what the family usually eats.
- Give one new food at a time so that reactions can be clearly identified. If a food is tolerated, continue to give this as part of a varied diet.
- Breastfeeding during the period that foods are first introduced may help prevent the development of allergy to those foods.
- There are no particular allergenic foods that need to be avoided.

Even if all the above measures are followed, there is still a chance that high risk children will develop allergies. If an adverse reaction occurs:

- The suspected food should be avoided until assessed by a medical practitioner; referral to a specialist allergist or immunologist may be necessary.
Continue to introduce other new foods.

Note: Minor redness around the mouth from citrus, berries and tomatoes is common and is usually due to contact irritation not food allergy.²¹

**Related policies, procedures and guidelines**

3.4.1 Growth in childhood

**References**


Resources for professionals

- Australasian Society of Clinical Immunology and Allergy – www.allergy.org.au
  - For health professional e-training; Health professional information papers; position statements, Dietary avoidance information for consumers
- Allergy Down Under - http://allergy.net.au/ - resources for health professionals on food allergy, food intolerance and coeliac disease
- Meerilinga Taste Bubs resources - www.meerilinga.org.au/ (although this resource was updated in May 2013, it does not reflect all of the messages in the NHMRC Infant Feeding Guidelines released in 2012).

Resources for families

- Allergy & Anaphylaxis Australia - a national patient support group www.allergyfacts.org.au
- Anaphylaxis Australia – a national patient support group www.allergyfacts.org.au
- Publication of Child and Adolescent Community Health (CACH), Department of Health – Baby’s First Foods
• Raising Children’s website – a non-profit organisation providing infant feeding articles and recipes [www.raisingchildren.net.au](http://www.raisingchildren.net.au)

• Dietetics services
  - Princess Margaret Hospital for Children, Nutrition and Dietetics
    Department Phone: (08) 9340 8440
  - To find a dietitian in your local health service or hospital:
  - To find a private practice dietitian near you:
### Appendix A: Developmental stage and feeding guide

(Note: Guide only. Each child is different so foods introduced at each stage may vary in type, texture and amount tolerated. The table shows the types of foods that can be consumed and swallowed successfully; it does not necessarily show when they should be offered. Refer to a child health nurse, dietitian or doctor for more information.)

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Developmental reflexes and skills</th>
<th>Tolerated food textures</th>
<th>Amount</th>
<th>Examples of suitable food</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 6</td>
<td>Suckling, sucking and swallowing</td>
<td>Liquids</td>
<td>As desired</td>
<td>▪ Breast milk or infant formula only</td>
<td>Breastfeed on demand according to infant’s hunger. Follow instructions on packaging, if formula fed.</td>
</tr>
<tr>
<td>First foods from around 6 months</td>
<td>Starting to chew and bite</td>
<td>Start with thick porridge, well mashed foods.</td>
<td>Breast milk or formula remains the predominant source of nutrients (Breast milk can provide one half or more of a child’s energy needs).</td>
<td>Foods can be introduced in any order provided iron-rich nutritious foods are started first. Mix each of the following examples with a little breast milk, formula or cooled, boiled water to the smooth consistency: ▪ Cereal eg. Iron fortified cereal, e.g. rice ▪ Iron rich foods such as meat, liver, chicken, fish, eggs, legumes, lentils and dark green leafy vegetables. Liquids ▪ Encourage water as the preferred drink. ▪ Boil and cool any tap water given to an infant. Plain bottled water can be used but it is not necessary. ▪ Lidded sip cups should be used for fluids other than breast milk. ▪ Cow’s milk as a drink is NOT recommended for infants until 12 months of age. ▪ Ensure other liquids do not displace breast milk or formula feeds.</td>
<td>There is no particular order that foods should be introduced, but iron-rich foods should be introduced first to prevent anaemia. Start with a soft but firm infant-sized plastic teaspoon or finger feed. Gradually increase the texture, quantities, variety and frequency of feeds offered according to the baby’s appetite and texture tolerance. Small quantities of food can be frozen in ice cube trays, stored in airtight containers and thawed as needed.</td>
</tr>
<tr>
<td>Age (months)</td>
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<tr>
<td>Other nutritious foods to be introduced before 12 months.</td>
<td>Clearing spoon with lips Biting and chewing (with or without teeth) Lateral movements of tongue and movement of food to teeth Pincer grip control of fingers to pick up spoon and finger foods. Start to teach self-feeding with finger foods.</td>
<td>Progression from mashed, chopped and finger foods Interested in an extended range of foods and textures Note: chewing minced and chopped foods help develop baby's oral motor skills and mouth strength. Always supervise the child when eating to prevent choking. Avoid hard foods such as popcorn and lollies.</td>
<td>Continue to increase amount and variety of solid foods to appetite. As the infant grows, solid foods should provide an increasing proportion of the energy intake and should be offered before breast milk/formula. From 9-11 months the infant may have 3-4 small meals per day and 1-2 snacks. Increase the amount to about ½ of a 250ml cup at each meal. Establish meals before introducing nutritious snacks. Total breast milk/formula intake reduces as solid food intake increases. About 3-4 breastfeeds or 600ml infant formula/day is adequate. Nutrient content and food texture are important determinants of foods selected.</td>
<td>Solid foods should provide an increasing proportion of the energy intake to meet nutrient needs during this period of rapid growth. Offer: • Cooked or raw vegetables (e.g. carrot, potato, tomato), fruit (e.g. apple, banana, melon) • whole egg • cereals (e.g. wheat, oats), bread, pasta, toast fingers and rusks • nut pastes • dairy foods such as full-fat cheese, custards and yoghurt. From about 8 months, offer finger foods such as avocado, pieces of soft pear/apple, cooked baby carrots and cooked pasta noodles to encourage self-feeding. Encourage water as the preferred drink • Dilute juice with water (50:50) • Cow’s milk as a drink is not recommended for infants until 12 months of age.</td>
<td>Encourage self-feeding from about 7 to 8 months. Reassure parents/carers that this could be messy. Family mealtimes encourage social interactions and help the child become used to eating like the rest of the family. Children learn to eat by watching other people. Encourage good role modelling.</td>
</tr>
</tbody>
</table>

Note: Guide only. Each child is different so foods introduced at each stage may vary in type, texture and amount tolerated. The table shows the types of foods that can be consumed and swallowed successfully; it does not necessarily show when they should be offered. Refer to a child health nurse, dietitian or doctor for more information.
## Introduction to Solids

### Table: Developmental reflexes and skills, Tolerated food textures, Amount, Examples of suitable food, How

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Developmental reflexes and skills</th>
<th>Tolerated food textures</th>
<th>Amount</th>
<th>Examples of suitable food</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 12 months</td>
<td>Rotary chewing movement</td>
<td>Full range of food textures. Toddlers enjoy salad textures.</td>
<td>A guide for 9-11 month old infant is 3-4 small meals per day and 1-2 snacks. Increase the amount to about ¼ to a full 250ml cup at each meal.</td>
<td>Keep offering a variety of nutritious family foods from all food groups.</td>
<td>Always supervise eating and avoid foods that may cause choking.</td>
</tr>
<tr>
<td></td>
<td>Jaw stability</td>
<td>Encourage self feeding and drinking from a cup.</td>
<td>Allow the child to self regulate according to appetite.</td>
<td>Breast milk can be continued or replace with plain pasteurised milk (limit to 600ml/day) and dairy products. Dairy requirements would be less if still breastfeeding.</td>
<td>Avoid low fat diets. Use good oils such as canola, olive and sunflower in cooking.</td>
</tr>
<tr>
<td></td>
<td>Assisted self-feeding</td>
<td>Stop bottle feeding.</td>
<td>Establish meals before introducing nutritious snacks.</td>
<td>Encourage water as the preferred drink and limit or avoid sweet drinks such as juice, cordial and soft drinks.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drinking independently</td>
<td></td>
<td>Continue breastfeeding as long as desired. Children wean at varied ages and should be a gradual and gentle process.</td>
<td>Limit salt, sugar and high-fat foods.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>At 12 months, about half the baby’s nutrition may come from food and half from breast milk/formula. About 3-4 breastfeeds or 500-600ml of infant formula (from a cup) is adequate.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Guide only. Each child is different so foods introduced at each stage may vary in type, texture and amount tolerated. The table shows the types of foods that can be consumed and swallowed successfully; it does not necessarily show when they should be offered. Refer to a child health nurse, dietitian or doctor for more information.