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EAT FOR HEALTH

Infant Feeding Guidelines

Information for health workers

WORKING TO BUILD A HEALTHY AUSTRALIA

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Disclaimer

This document is a general guide to appropriate practice, to be followed subject to the clinician's judgement and patient's preference in each individual case.

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Infant Feeding Sub Committee of the Dietary Guidelines Working Committee

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- Professor Amanda Lee, Dietary Guidelines Working Committee Chair
- Professor Peter Davies
- Professor Dorothy Mackerras (as at end March 2011)
- Dr Rosemary Stanton

NHMRC Project Team

- Cathy Connor
- Emma Breen
- Tanja Farmer
- Tess Winslade
- Bronwyn Battisson

Department of Health and Ageing Project Team

- Jacinta McDonald
- Erica Nixon
- Marina Dron
- Rosalind Knox
- Fiona Styles

Technical Writers

- Professor Colin Binns,* Curtin University
- Professor Jane Scott, Flinders University
- Professor David Forbes, University of Western Australia
- Katie Hewitt (Research Officer)
- Maria Pasalich (Research Officer)

** Professor Binns is Deputy Chair of the Dietary Guidelines Working Committee*

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Summary

The World Health Organization (WHO) states that 'breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants'.[1] Breastfeeding is beneficial to infants, mothers, families and society, and is viewed as the biological and social norm for infant and young child feeding.[2]

Exclusive breastfeeding ensures that the infant receives the full nutritional and other advantages of breast milk, including developmental benefits and protection against infection and some chronic diseases. In Australia, it is recommended that infants are exclusively breastfed until around 6 months of age when solid foods are introduced, and that breastfeeding is continued until 12 months of age and beyond, for as long as the mother and child desire. While Australia's breastfeeding initiation rate is currently high at 96%, only 15% of infants are exclusively breastfed to around 6 months.[3] Health workers have a vital role in supporting breastfeeding, along with governments, industry and the whole community.

The majority of mothers can successfully breastfeed their infants. While mothers may encounter difficulties with initiating and establishing breastfeeding, usually these can be overcome with support and encouragement from health workers, family and community organisations. Appropriate and effective positioning at the breast and correct attachment and milking action are the keys to successful breastfeeding. Antenatal education on positioning and attachment technique is recommended, together with initiating breastfeeding soon after birth and providing continuing postnatal support and guidance. Health workers can provide invaluable help by offering factual information and empathetic support, demonstrating practical skills, and discussing strategies for problem solving.

There are very few contraindications for breastfeeding. Tobacco and moderate alcohol use, most medications and most maternal illnesses are not indications for discontinuing breastfeeding. Many mothers can continue to breastfeed if they return to work. While exclusive breastfeeding is ideal, any amount of breast milk is beneficial to the infant and mother. If mothers express and store breast milk, it is important that they follow correct procedures to ensure food safety and hygiene.

Formula feeding

If an infant is not breastfed or is partially breastfed, commercial infant formulas should be used as an alternative to breast milk until 12 months of age. Health workers should provide families with all of the information and support that they need to prepare, store and use feeds correctly.

Introducing solids

At around the age of 6 months, infants are physiologically and developmentally ready for new foods, textures and modes of feeding and need 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.

By 12 months of age, a variety of nutritious foods from the five food groups is recommended, as described in the *Australian Dietary Guidelines*.[4] Healthy eating in the second year of life builds on nutritious practices established in infancy. It provides the energy and nutrients needed for growth and development, develops a sense of taste and an acceptance and enjoyment of different family foods, and instils attitudes and practices that can form the basis for lifelong health-promoting eating patterns.

Fluids other than breast milk or infant formula

Exclusively breastfed infants do not require additional fluids up to 6 months of age. For formula-fed infants, cooled boiled tap water may be used if additional fluids are needed.[5] Cow's milk is associated with iron deficiency in infants under 12 months but pasteurised full cream cow's milk is an excellent source of nutrients in a mixed diet in the second year of life. Fruit juice is not necessary or recommended for infants under 12 months of age.[6] Sweetened drinks are associated with dental caries. Tea, herbal teas and other drinks are of no known benefit to an infant and could possibly be harmful.

Summary of advice

Advice for health workers

Breastfeeding

- Encourage, support and promote exclusive breastfeeding to around 6 months of age and explain that infants do not require fluids other than breast milk for the first 6 months.
- While breastfeeding is recommended for 6 to 12 months and beyond, any breastfeeding is beneficial to the infant and mother.
- Advise women to continue breastfeeding with appropriate complementary foods until 12 months of age and beyond, for as long as the mother and child desire.
- Inform parents of the benefits of breastfeeding and the risks of not breastfeeding when a change from breastfeeding is being considered.
- Support the principles of the Baby Friendly Hospital Initiative.
- Encourage community-based services supporting breastfeeding families – such services are increasingly important as the length of hospital stays decrease.
- Encourage the mother to use expressed breast milk when away from the infant and breastfeed when mother and infant are together.
- Encourage support in the community and workplace for flexible work schedules, suitable environments for breastfeeding, expressing breast milk, storage of expressed breast milk and child care. Promote the use of paid parental leave schemes and lactation break entitlements.
- Provide antenatal information and counselling about the benefits and practical aspects of breastfeeding and the risks of not breastfeeding to all potential mothers, fathers and primary carers.
- Provide postnatal breastfeeding support information.
- When discussing breastfeeding with women, pay particular attention to the importance of correct positioning and attachment when breastfeeding.
- To avoid unnecessary intervention, inform parents about the wide variation in normal bowel function in infants who are breastfed. If parents are concerned, they should consult a relevant health professional.
- An infant with suspected dehydration should be assessed by a medical practitioner.
- Take steps to identify breastfeeding difficulties by asking appropriate questions during any health-related visits with the mother. Manage those difficulties if appropriately qualified, or refer to an appropriately qualified health professional for management (e.g. lactation consultant).
- Ensure that any dietary modification or pharmacological intervention for managing excessive crying is safe and does not result in nutritional deficiencies.

Breastfeeding in specific situations

- At present, breastfeeding is contraindicated when a mother is known to be HIV positive (specialist advice is needed for each individual case).
- Most prescription drugs and medicines are compatible with breastfeeding, but each case should be specifically assessed by a health professional.
- Statins are a commonly used class of pharmaceuticals that should not generally be used during pregnancy or breastfeeding.
- Encourage mothers, fathers, primary carers and other household members who smoke to stop or reduce smoking and to avoid exposing the infant to tobacco smoke. Even if parents persist with smoking, breastfeeding remains the best choice.
- Advise mothers that not drinking alcohol is the safest option. For women who choose to drink, provide advice on the recommended maximum intake level (e.g. two standard drinks or less in any one day) and the optimal timing of breastfeeding in relation to intake.
- Encourage and support mothers to avoid illicit drugs (specialist advice is needed for each individual).

Prelacteal feeds

- If supplementary feeding is needed in hospital, it should only be given for specific medical indications and with the mother's agreement.

Infant formula

- Educate parents on the importance of correctly preparing infant formula and following the instructions carefully, including using the correct scoop and not overfilling or underfilling the scoop.
- Check that infant formula is being prepared according to instructions (i.e. to the correct concentration).

Health worker responsibilities

- Continue to implement the WHO Code and be aware of health professional obligations under the MAIF Agreement.

Advice for parents

Pacifiers

- A pacifier (dummy) may be offered, while placing infant in back-to-sleep-position, no earlier than 4 weeks of age and after breastfeeding has been established.

Dental caries

- Do not dip pacifiers or bottle teats in sugar, jam, honey or other sugary substance.
- Do not put anything in an infant's mouth if it has been in someone else's mouth to avoid spreading bacteria that cause tooth decay.
- Fluoride supplementation is not recommended.
- For children between the ages of 6 and 24 months who are living in areas where the household water supply is not fluoridated, further advice should be sought from a local dentist.

Bottle-feeding

- Put an infant to bed without a bottle or take the bottle away when the infant has finished feeding. Do not let the infant keep sucking on the bottle.
- Avoid leaving an infant unattended with a bottle containing liquids (i.e. no bottle propping).
- Bottle-feeding according to need is appropriate – information on formula packages recommending certain amounts for various ages is a guide only and does not necessarily suit every infant.
- A cup can be introduced at around 6 months, to teach infants the skill of sipping drinks from a cup.
- Use cow's milk-based infant formulas until 12 months of age (all infant formulas available in Australia are iron-fortified).
- Special formulas may be used under medical supervision for infants who cannot take cow's milk-based products for specific medical, cultural or religious reasons.
- Soy or goat's milk-based formulas are not suitable alternatives for infants with allergies to cow's milk-based formulas.

Introducing solid foods

- Introducing solid foods at around 6 months is necessary to meet the infant's increasing nutritional and developmental needs.
- 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 normal textures during the 6–12 month period.
- Solid foods should be of acceptable taste without added sugar, honey or salt.
- From 12 months of age and beyond, toddlers should be consuming family foods consistent with the *Australian Dietary Guidelines*.[4]
- Iron-fortified foods and meat or iron-rich alternatives should continue to be offered.
- Special complementary foods or milks for toddlers are not required for healthy children.
- Milk and water should be offered in a cup rather than a feeding bottle.
- Consumption of nutrient-poor foods with high levels of fat/ saturated fat, sugar, and/or salt (e.g. cakes, biscuits, confectionery and potato chips) should be avoided or limited.
- If food choices are restricted for medical reasons, the advice of a dietitian or appropriate health professional should be sought to ensure that the dietary intake meets nutrient and energy needs.
- 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 vital for neurocognitive development.
- Mothers who follow a vegan diet should breastfeed their infants for as long as possible, 2 years or more is desirable. For infants being fed a vegan diet 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 on vegan diets may require nutritional supplements, especially iron and vitamin B_{12}.

Foods that should be avoided

- Avoid giving whole nuts and similar hard foods to young children aged less than 3 years to reduce the risk of choking.
- To prevent botulism, do not feed honey to infants aged under 12 months.
- Unmodified milk from animal sources should not be given as a main drink before 12 months.
- Unpasteurised milk should not be used.
- Cow's milk should not be given as the main drink to infants under 12 months.
- Pasteurised cow's milk is an excellent source of protein, calcium and other nutrients and may be introduced as a drink at around 12 months of age and be continued throughout the second year of life, and beyond.
- Due to potential dangers associated with feeding goat's milk to infants, its use is not recommended.
- Low-fat and reduced-fat milks are not recommended in the first 2 years of life.
- Soy (except soy follow-on formula) and other nutritionally incomplete plant-based milks (e.g. rice, oat, coconut or almond milk) are inappropriate alternatives to breast milk or formula in the first 12 months.
- Fortified soy drink or calcium-enriched rice and oat beverages can be used after 12 months under health professional supervision, as long as a full-fat variety is used and other sources of protein and vitamin B_{12} are included in the diet.
- Fruit juice is not necessary or recommended for infants under 12 months.
- Do not offer infants tea, herbal teas, coffee or sugar-sweetened drinks (soft drinks, cordials).

Introduction

Australia has a long and successful history of caring for mothers and infants, through the establishment more than a century ago of a network of community health nurses, midwives and general practitioners (GPs). Improving health, health care and nutrition is reflected in the decline of infant mortality, from 104 deaths per 1,000 live births at the time of Federation in 1901 to 4 deaths per 1,000 live births in 2008.[7]

During the 1950s and 1960s, breastfeeding rates declined in many countries. Recognition of the potential for detrimental effects on health led to breastfeeding being prioritised as one of the most important health initiatives. Australia has been successful in increasing breastfeeding rates over the last few decades. Among the Organisation for Economic Co-operation and Development (OECD) countries, Australia is just above average for the percentage of infants ever breastfed.[8] In 2010, 96% of Australian infants received some breast milk, up from 92% in 2004.[3,15]

Context for these Guidelines

The first edition of the *Infant Feeding Guidelines for Health Workers* was developed by the Infant Nutrition Panel of the National Health and Medical Research Council (NHMRC) and published in 1996. The impetus to develop the guidelines came from:

- demand from health workers for additional information on infant feeding, to supplement the NHMRC *Dietary Guidelines for Children and Adolescents*
- Australia's response to supporting the WHO *International code of marketing of breast-milk substitutes* (the WHO Code),[9] which was formulated in 1981 in response to concerns over the widespread promotion of infant formula throughout the world, and in recognition of the increased risks of morbidity and mortality in infants who are not breastfed.

The WHO Code, as approved by the World Health Assembly (WHA), is not legally binding unless individual nations enact relevant legislation. Australia stated at the WHA:

> *in voting for the adoption of this Code, Australia made an international commitment to take action to give effect to its aims and principles and accepted responsibility for their implementation as appropriate to social and legislative frameworks in this country.*[10]

- Supplementary resolutions passed by the WHA have urged countries to strengthen their commitment to the WHO Code and the joint WHO–UNICEF Baby Friendly Hospital Initiative (BFHI) (which promotes breastfeeding initiation in hospitals) and reiterated the need for compliance with the WHO Code.

In addition to the NHMRC *Infant Feeding Guidelines for Health Workers,* measures to implement the WHO Code in Australia are:

- the *Marketing in Australia of Infant Formulas: Manufacturers and Importers Agreement 1992* (MAIF Agreement) – a voluntary, self-regulatory code of conduct between manufacturers and importers of infant formula in Australia which aims to protect and promote breastfeeding and ensure the proper use of breast-milk substitutes when they are necessary
- inclusion in the Food Standards Australia New Zealand (FSANZ) Code (FSANZ Code) of mandatory labelling and composition provisions for infant formula, consistent with the WHO Code.

The first edition of the NHMRC *Infant Feeding Guidelines for Health Workers* aimed 'to help all health workers understand how the WHO Code and the MAIF Agreement affect their work in both breastfeeding and using infant formula'.

Need for the Guidelines

Australia has been successful in increasing breastfeeding rates over the last few decades, but there is still considerable room for improvement.

- While the initiation rate of breastfeeding is over 90%, rates of any breastfeeding decline to around 50% at 6 months and only around 25% of women breastfeed for 12 months.[11,15]
- Only a small proportion of women exclusively breastfeed to 6 months. The 2001 Australian National Health Survey reported that at 25 weeks, around 65% of infants were regularly receiving solid food.[12] The 2010 Australian National Infant Feeding Study found that the median age for introducing solids was 4.7 months.[3]

From a public health perspective, achieving further improvements in both the type and duration of breastfeeding offers considerable benefits for maternal, infant, child, and life course health for Australians.

Process used to develop the revised Guidelines

These revised Guidelines were developed by the Infant Feeding Subcommittee of the Dietary Guidelines Working Committee. The process used is outlined in Appendix A of these Guidelines and in Appendix B of the *Australian Dietary Guidelines*.[4] The grading of evidence statements is outlined in Appendix B of these Guidelines.

A consultation draft was disseminated with the aim of gathering input from a wide range of experts, stakeholders and consumer representatives, and the Guidelines were revised accordingly.

Application of the Guidelines

Purpose

The purpose of this document is to support optimum infant nutrition by providing a review of the evidence and clear guidance on infant feeding for health workers. Guidance is based on evidence from the *Australian Dietary Guidelines* literature review and additional reviews specific to infant feeding.

Scope

These Guidelines are relevant to healthy, term infants of normal birth weight (>2,500 g). Although many of the principles of infant feeding described here can be applied to low birth weight infants, specific medical advice is recommended.

Intended audience

The Guidelines are intended for use by all health workers, defined here as any professional or non-professional person working in a component of a health care system (this includes voluntary workers). The Guidelines will be of particular interest to midwives, lactation consultants, maternal and child health nurses, community health nurses, GPs, Aboriginal and Torres Strait Islander health workers and allied health professionals. The way in which different professionals use the Guidelines will vary depending on their knowledge, skills and role, as well as the setting in which care is provided.

The Guidelines are likely to be of interest and relevance to consumers.

Structure of the Guidelines

The Guidelines include:

- an overview of breastfeeding in Australia, the benefits of breastfeeding to both infant and mother, and mechanisms to protect and promote the benefits of breastfeeding in the Australian community (Chapter 1)
- discussion of strategies for initiating, establishing and maintaining breastfeeding (Chapters 2 and 3)
- discussion of common breastfeeding problems and their management (Chapter 4)
- guidance on expressing and storing breast milk (Chapter 5)
- discussion of breastfeeding in specific situations, including absolute and relative contraindications (Chapter 6)
- discussion of supplementary feeding (Chapter 7)
- guidance on the use of infant formula, including health worker responsibilities and correct preparation (Chapter 8)
- guidance on introducing solid foods (Chapter 9)
- interpretation of the WHO Code for health workers in Australia (Chapter 10).

The appendices provide resources for further reading and information and additional information on the development of the Guidelines.

Directory of key information in these Guidelines

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When you need to know…	Read…
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Which drinks should be avoided in infants aged 6–24 months	Sections 9.4.3, 9.4.4, 9.4.5
What to advise parents of infants with a family history of allergy	Section 9.3.4
What to advise parents of infants on plant-based or vegan diets	Section 9.3.5
What to advise parents about dental caries	Sections 3.3.1, 8.6, 9.3.2 and 9.4.5

1. Encouraging, supporting and promoting breastfeeding in the Australian community

Key points

- Although the majority of women in Australia initiate breastfeeding, rates of breastfeeding decline to approximately 50-60% at 6 months, only a small proportion of women achieve the recommendation of exclusively breastfeeding to this age and only around 25% of women continue to breastfeed for 12 months.
- Exclusive breastfeeding to around 6 months is associated with the lowest short, medium and long-term risk of morbidity and mortality among infants.
- Any breastfeeding and prolonged breastfeeding are associated with the lowest risk of later obesity.
- Breastfeeding has health benefits for mothers, including reduced risk of postpartum haemorrhage and breast and ovarian cancer and prolonged amenorrhoea.
- Breastfeeding also confers economic benefits to the family and to society and provides optimum protection to infants in communities with poor environmental conditions, housing and hygiene.
- The *Australian National Breastfeeding Strategy 2010–2015* provides a framework for protecting, promoting, supporting and monitoring breastfeeding in Australia.

1.1 Breastfeeding in Australia

There have been significant increases in both the rate and duration of breastfeeding over the last few decades. Rates of breastfeeding were low in Australia in the 1960s – records from Victoria show that only 50–60% of mothers were breastfeeding when discharged from hospital, with just 21% still breastfeeding after 3 months.[13] In the early 1970s, breastfeeding rates started to rise again in Australia and comparable overseas countries, beginning in the higher socioeconomic groups. By 1983, the prevalence and duration of breastfeeding in Australia were both among the highest in the western world, with 85% of infants breastfed at discharge and 54–55% at 3 months.[14] Breastfeeding remained around this level for the next two decades.[12] There has been a gradual increase in initiation and duration rates in recent years.

Estimating current breastfeeding rates in Australia is limited by the use of different definitions of breastfeeding and differing study methods (see Glossary and Appendix C). Combining the results of several studies, it is estimated that 90–96% of mothers in Australia initiate breastfeeding (this is the percentage 'ever breastfed').[3,11,15,16] At 6 months of age, approximately 50–60% of Australian infants are continuing to breastfeed ('any breastfeeding').[3,11,16]

While the majority of women in Australia initiate breastfeeding, and the percentage of infants ever breastfed in Australia is above the average for OECD countries,[8] only a small proportion of women achieve the recommendation

of exclusively breastfeeding to around age 6 months. The 2010 Australian National Infant Feeding Survey found that the proportion of children aged 0–24 months who were exclusively breastfed at each month of age declined from 96% at birth to 61% at less than 1 month, 39% at less than 4 months and 15% at less than 6 months.[3]

The current recommendation is to continue breastfeeding until 12 months of age and beyond, for as long as the mother and child desire. It is estimated that at present only 22–28% of mothers continue to breastfeed their infant to age 12 months.[11,15,16]

There is also evidence of considerable variation between socioeconomic groups in both the acceptance and maintenance of breastfeeding in the Australian community, with women in higher socioeconomic groups more likely to breastfeed. Health workers should be aware of these differences, so initiatives and strategies to support women to improve rates and duration can target these groups.

1.2 Breastfeeding as the physiological norm

Numerous studies have demonstrated the importance of breastfeeding for mothers and infants. There is convincing epidemiological evidence of the protective effects of breastfeeding, in both developed and developing countries.[17,18] There is probable evidence that infants who are exclusively breastfed for 6 months do not have deficits in growth compared to those who are not exclusively breastfed (Evidence Grade B).[19-22]

In 2001 the report of a WHO Expert Consultation recommended exclusive breastfeeding for about 6 months, with introduction of complementary foods and continued breastfeeding after that.[23] The 2001 WHA combined these various recommendations in one resolution, recommending exclusive breastfeeding until 6 months of age.[24] This recommendation has since been endorsed by many national authorities (see Appendix D and E). In Australia the wording has been to recommend exclusive breastfeeding to 'around 6 months' of age.[25]

Although infants should still be managed individually so that insufficient growth or other adverse outcomes are recognised and appropriate interventions are provided, the available evidence demonstrates no apparent risks in recommending, as a general policy, exclusive breastfeeding for the first 6 months of life.[20]

Breastfeeding has longstanding health benefits for the infant and brings health benefits to the mother. It also offers economic benefits to the family and to society.

Advice for health workers

- Encourage, support and promote exclusive breastfeeding to around 6 months of age and explain that infants do not require fluids other than breast milk for the first 6 months.
- While breastfeeding is recommended for 6 to 12 months and beyond, any breastfeeding is beneficial to the infant and mother.
- Advise women to continue breastfeeding with appropriate complementary foods until 12 months of age and beyond, for as long as the mother and child desire.
- Inform parents of the benefits of breastfeeding and the risks of not breastfeeding when a change from breastfeeding is being considered.

1.2.1 Benefits to the infant

Breastfeeding has positive effects on the nutritional, physical and psychological wellbeing of the infant.

Nutritional benefits

The composition of breast milk is uniquely suited to the newborn infant, at a time when growth and development are occurring rapidly while many of the infant's systems – such as the digestive, hepatic, neural, renal, vascular and immune systems – are functionally immature. Many of the nutrients contained in breast milk are in forms that are readily absorbed and bioavailable.[26]

Breast milk contains many valuable components including bile salt–stimulated lipase, glutamate, certain polyunsaturated long-chain fatty acids, oligosaccharides, lysozyme, immunoglobulin A, growth factors and numerous other bioactive factors. These components facilitate optimal function of the infant's immature systems and confer both active and passive immunity.[27] The living cells found in breast milk are also important functionally.[28]

Health benefits

Breastfeeding confers a range of benefits to the developing infant, including improved visual acuity, psychomotor development[17] and cognitive development,[29] and reduced malocclusion as a result of better jaw shape and development.[30]

Globally, suboptimal infant feeding is responsible for 45% of neonatal infectious deaths, 30% of diarrhoeal deaths and 18% of acute respiratory deaths in children under five years.[31] Numerous studies have shown that breastfeeding reduces the risk or severity of a number of conditions in infancy and later life, including:

- physiological reflux[32]
- pyloric stenosis[33,34]
- gastrointestinal infections (Evidence Grade B)[18,35,36]
- respiratory illness[18]
- otitis media[18,37]
- urinary tract infections[38,39]
- bacteraemia-meningitis[40,41]
- sudden infant death syndrome (SIDS) (Evidence Grade C)[18,42]
- necrotising enterocolitis in preterm infants[18]
- atopic disease (Evidence Grade C)[18]
- asthma (Evidence Grade C)[17,18]
- some childhood cancers[18]
- type 1[18] and type 2 diabetes[17,18]
- coeliac disease (Evidence Grade C)[43]
- inflammatory bowel disease (Evidence Grade C)[44]
- cardiovascular disease risk factors including blood pressure (Evidence Grade B) [17,18,45,46] and total and low-density lipoprotein (LDL) cholesterol (Evidence Grade C)[17,18]
- obesity in childhood and in later life (Evidence Grade A).[17,18,47,48]

Reviews of the benefits of breastfeeding and risks of not breastfeeding are available elsewhere.[17,18,49,50]

Table 1.1 is an alternative way of presenting these data.

Table 1.1: Excess health risks associated with not breastfeeding

Outcome	Excess risk* (%)
Among full-term infants	
Acute ear infection (otitis media)	100
Eczema (atopic dermatitis)	47
Diarrhoea and vomiting (gastrointestinal infection)	178
Hospitalisation for lower respiratory tract diseases in the first year	257
Asthma, with family history	67
Asthma, no family history	35
Childhood obesity	32
Type 2 diabetes mellitus	64
Acute lymphocytic leukaemia	23
Acute myelogenous leukaemia	18
SIDS	56
Among preterm infants	
Necrotising enterocolitis	138
Among mothers	
Breast cancer	4
Ovarian cancer	27

*The excess risk is approximated using odds ratios.

Source: Adapted from US Department of Human Services 2011.[50]

In the United States (US) National Maternal and Infant Health Survey (n=7,092), predominant breastfeeding was associated with the lowest illness rates in the first 6 months of life.[51] Minimal breastfeeding (defined as infants receiving more foods and liquids compared to breast milk) was not as protective.[51] Breastfeeding conferred health benefits in infants from all socioeconomic groups. More recent evidence from the United Kingdom (UK) Millennium Cohort Study suggests that each month an estimated 53% of hospitalisations for diarrhoea and 27% for lower respiratory tract infections could have been prevented by exclusive breastfeeding and 31% of hospitalisations for diarrhoea and 25% for lower respiratory tract infection by partial breastfeeding.[52]

Two comprehensive systematic reviews provide detailed summaries and meta-analyses of relevant studies for a variety of health outcomes for infants and mothers.[17,18]

Immunoprotection

Breastfeeding is particularly valuable while the infant's immune system is immature but continues to offer significant protection throughout lactation.[53,54]

Factors present in breast milk that offer active or passive immunoprotection include:[55]

- immunoglobulin A – the most abundant antibody in breast milk, which is manufactured and excreted by the breast in response to maternal exposure to specific bacteria and viruses, and provides protection against pathogens in the infant's local environment
- immunoglobulin G and immunoglobulin M – offer further protection against specific pathogens.

Breast milk has factors that are not present in infant formula and have an important role in antigen recognition as a host defence mechanism.[56] Bacterial recognition by mucosal receptors, an important component of the non-

specific innate immune system, is enhanced by components of breast milk in the first 5 days of life, facilitating the ability of the newborn infant to deal with pathogenic bacteria.

Breast milk also contains a range of non-specific and pattern-specific protective factors, including:[57]

- *proteins* – lactoferrin makes iron unavailable to micro-organisms that require iron for growth (e.g. *Escherichia coli*, Candida albicans) and releases a peptide with bactericidal properties[27] and vitamin B_{12}-binding proteins make vitamin B_{12} unavailable to micro-organisms (other proteins with anti-microbiological functions have been described by Lopez-Alverez[58])
- *lysozyme* – bactericidal against certain gram-negative rods and gram-positive bacteria
- *prolactin* – enhances the development of B- and T-lymphocytes and affects differentiation of intestinal lymphoid tissue
- *cortisol, thyroxine, insulin and growth factors* – promote maturation of the newborn infant's intestine and development of intestinal host defences
- *macrophages, monocytes, neutrophils and B- and T-lymphocytes* – inhibit and/or destroy micro-organisms such as bacteria and viruses[27]
- *oligosaccharides* – (12–24 g/L; over 130 different types[59] mostly resistant to digestion in the small intestine[60]) promote bifidus bacteria in the large intestine, inhibit attachment of pathogenic bacteria to intestinal and urinary tract mucosa, may provide important precursors for early brain development, and may be essential to reducing incidence of necrotising enterocolitis[60]
- *some free fatty acids* – several have antimicrobial actions[61,62]
- *nucleotides* – thought to be required for rapid expansion of the immune system in the immediate postpartum period resulting from microbial exposure during birth.[55]

The concentration of most of these protective factors is highest in colostrum, decreasing as lactation is established and increasing again during gradual weaning.

Diabetes

Breastfeeding for at least 3 months has been shown to be associated with a reduced risk of childhood type 1 diabetes.[18] Evidence from the large Eurodiab study[63] indicates that the risk of type 1 diabetes is unrelated to the introduction of either cow's milk or infant formula before 3 months of age.[64]

An analysis of studies evaluating the association between breastfeeding and type 2 diabetes reported a protective effect (odds ratio [OR] 0.63; 95% confidence interval [CI] 0.45–0.89),[17] although further studies are needed to confirm this conclusion. Another review[18] came to a similar conclusion, but noted that the association was present in retrospective case-control studies relying on long-term recall but not in studies that used existing infant records to determine breastfeeding initiation and duration. There is inconclusive evidence linking the method of feeding infants and type 2 diabetes, but there is an indirect relationship through infant growth, particularly the velocity of growth.[65-67]

Bowel disease

A meta-analysis showed that the risk of coeliac disease was significantly reduced in infants who were breastfeeding at the time when gluten was introduced (pooled OR 0.48; 95% CI 0.40–0.59) compared with infants who were not breastfed at this time (Evidence Grade C).[43] A recent meta-analysis indicated that breast milk exposure had a significant protective effect (OR 0.69; 95% CI 0.51–0.94) against developing early-onset inflammatory bowel disease, although a non-significant difference was shown for ulcerative colitis and Crohn's disease individually.[44] Overall the evidence suggests a relationship between breastfeeding and lower rates of inflammatory bowel disease (Evidence Grade C),[44] but further well-designed prospective studies are required.

Allergy and asthma

In Australia, 11–13% of children and 9–11% of adults have asthma.[68] As many as four in ten children have evidence of allergic sensitisation and many will go on to develop allergic diseases such as eczema and allergic rhinitis.[69] The prevalence of asthma and allergic disease has increased markedly since the 1970s, but the prevalence of asthma may be levelling.[70]

Breastfeeding exclusively to around 6 months is compatible with achieving the lowest rates of allergic disease:

- in the general population and families with a history of allergic disease, exclusive breastfeeding for around 6 months can protect against allergic rhinitis, wheezing, asthma and atopy in children[71,72]
- introduction of milk other than breast milk before 6 months increases rates of asthma (OR 1.25; 95% CI 1.02–1.52) and atopic disease (OR 1.30; 95% CI 1.04–1.61) at 6 years of age[72]
- breastfeeding reduces the risk of developing asthma – the protective association occurs in the absence of a family history (OR 0.74; 95% CI 0.6–0.92) and in children younger than 10 years with a family history[18]
- exclusive breastfeeding for at least 3 months is associated with reduced risk of allergic dermatitis in the presence of a family history of atopy (OR 0.58; 95% CI 0.41–0.92)[18]
- animal and human studies suggest that breastfeeding during the period of antigen introduction facilitates the development of oral tolerance,[73] with transforming growth factor-beta (TGFß) a possible critical component in this process[74] and protective against allergic asthma.[75]

There is no evidence that restricting women's diets during pregnancy and breastfeeding reduces the likelihood of allergies in infants.[76,77]

Section 8.5 discusses the use of specialised formulas if breastfeeding is discontinued in infants at risk of allergy. Section 9.3.4 provides information on food allergy and the introduction of solid foods.

Leukaemia

A history of breastfeeding for at least 6 months is associated with a reduced risk of acute lymphocytic leukaemia (OR 0.80; 95% CI 0.71–0.91).[18] Further studies are needed to investigate the biological mechanisms underlying this relationship.[18]

Psychological and cognitive benefits

Breastfeeding can be an important factor in bonding between mother and infant. The interdependence between the breastfeeding mother and infant, regular close interaction and skin-to-skin contact during breastfeeding encourage mutual responsiveness and attachment.[78]

Several studies have shown that the method of feeding in early life affects cognitive development. A recent meta-analysis indicated that children who were breastfed for at least 1 month had higher scores on intelligence tests (mean difference 4.9; 95% CI 2.97–6.92) than those who were never breastfed or breastfed for less than 1 month.[17] This beneficial effect becomes more pronounced with increasing duration of breastfeeding.[79,80] Benefits are more obvious in preterm infants, with those given breast milk for at least 1 month having enhanced cognitive development (approximately 7 IQ units) at 7–8 years of age compared with formula-fed preterm infants.[81-84] This response may be related to the higher concentration in breast milk of the polyunsaturated long-chain fatty acid docosahexaenoic acid (DHA).[85]

Benefits later in life

Breastfeeding confers health advantages that persist into later life.[17,18] This is a difficult area for study as most evidence comes from observational studies with the inherent problem of confounding. Other limitations include the potential for recall bias associated with the retrospective design of most studies and differences in definitions of breastfeeding exposure. Nevertheless, numerous systematic reviews and meta-analyses provide suggestive evidence of a protective association between breastfeeding and several risk factors for cardiovascular disease in later life, including total and LDL cholesterol (Evidence Grade C) and glucose levels (Evidence Grade C) and probable evidence of a protective association between breastfeeding and high blood pressure (Evidence Grade B).[17,18,45,46]

There is convincing high-level evidence that, compared to infants who are formula fed, being breastfed is associated with reduced risk of becoming obese in childhood, adolescence and early adulthood (Evidence Grade A).[17,18,47,48] The protection offered by breastfeeding appears to increase with duration of breastfeeding and plateaus at 9 months.[86,87] In a random effects model, breastfed individuals were less likely than those who had never been breastfed to be considered overweight and/ or obese (OR 0.78; 95% CI 0.72–0.84).[17] An inverse association

between duration of breastfeeding and the risk of overweight has also been reported.[87] In a Western Australian cohort study, infants breastfed for more than 12 months were leaner at 1 year but not at 8 years and breastfeeding for less than 4 months was associated with greatest risk of overweight.[88] However this association was not found in another study in Belarus.[89] Familial factors may modify associations between breastfeeding and adiposity beyond infancy.[88]

1.2.2 Benefits to the mother

Health

There is evidence that breastfeeding reduces the risk of ovarian and breast cancer, the latter particularly in premenopausal women.[18] Meta-analysis of epidemiological studies in 30 countries showed a relative risk of breast cancer reduction of 4.3% (95% CI 2.9–5.8) for every 12 months of breastfeeding in addition to a decrease of 7.0% (95% CI 5.0–9.0) for each birth.[90]

There is some evidence that breastfeeding reduces the risk of developing type 2 diabetes among women with a history of gestational diabetes.[18]

The evidence of an association between lifetime duration of breastfeeding and risk of fractures due to osteoporosis is limited.[18]

Breastfeeding hastens uterine involution after birth and reduces the risk of haemorrhage (thus reducing maternal mortality). As well, preservation of maternal haemoglobin stores through reduced blood loss leads to improved iron status.[91,92] There is equivocal evidence that breastfeeding helps the mother regain her pre-pregnancy body weight.[18] Methodological challenges in studying the effect of breastfeeding on postpartum weight loss include 'the accurate measurement of weight change, adequate control for numerous covariates including the amount of weight gain during pregnancy and quantifying accurately the exclusivity and duration of breastfeeding'.[18]

Contraceptive effect

Although breastfeeding is not regarded as a reliable method of contraception for individual women, it does provide useful benefits on a population basis. There is probable evidence that women who exclusively breastfeed for 6 months experience more prolonged lactational amenorrhoea (Evidence Grade B).[93] It is estimated that if all women in the world stopped breastfeeding, 30–50% more children would be born in the following 12 months.[94,95] The likelihood of pregnancy during periods of lactational amenorrhoea is as low as 1.7% in the first 6 months if a woman is amenorrhoeic and fully or nearly fully breastfeeding day and night.[96-98] Even in developed countries, that rate compares favourably with barrier methods of contraception, as long as the woman remains amenorrhoeic.[99-101] The contraceptive effects of lactational amenorrhoea were included in summaries of the Cochrane Review and the most recent study of lactational amenorrhoea in Australia, published in 2002.[102,103]

Economic benefits

Breastfeeding confers economic benefits to both the family and to society. In 1992, the breast milk supplied by Australian women was estimated to be worth $2.2 billion, which was equivalent to about 0.5% of Gross Domestic Product (GDP), or 6% of private spending on food.[104] In 2001, it was estimated that if breastfeeding levels were increased to those recommended by the US Surgeon General (75% in-hospital and 50% at 6 months), a minimum of US$3.6 billion would be saved from the costs of treating three childhood illnesses – otitis media, gastroenteritis, necrotising enterocolitis.[105] Similarly, in 2002, it was calculated that not breastfeeding led to extra costs to the Australian Capital Territory health system of $1–2 million/ year from five diseases – gastrointestinal illness, respiratory illness, otitis media, eczema and necrotising enterocolitis.[106] A more recent analysis from the US found that if 90% of families could comply with medical recommendations to breastfeed exclusively for 6 months, the US would save US$13 billion per year and 911 deaths would be prevented per year.[107] The economic case for promoting breastfeeding to at least 6 months is overwhelming.

1.2.3 Aboriginal and Torres Strait Islander mothers and infants

All infants and mothers gain benefits from breastfeeding. However in remote communities where Aboriginal and Torres Strait Islander people may live, there are frequently poor environmental conditions, housing and hygiene. Breastfeeding provides the optimum protection to infants against infection and under-nutrition in these conditions. Where infant formula is used, cost and water supply are important factors in assuring adequate infant feeding standards. Health workers need to be culturally sensitive in promoting the benefits of breastfeeding in communities.

The *Australian Dietary Guidelines* contain information on nutrition and diet as it relates to Aboriginal and Torres Strait Islander peoples.[4]

1.3 Protection, promotion and support of breastfeeding

All pregnant women should be encouraged and supported to breastfeed and their right to be supported in their decision to breastfeed should be protected.

The Australian Government is committed to protecting, promoting and supporting exclusive breastfeeding to around 6 months and continued breastfeeding thereafter.[108] Since 1981, Australia has been one of the few developed countries in the world to include a guideline related to breastfeeding in its dietary guidelines.[5] The guideline is included in recognition of the role of the whole community in encouraging and supporting breastfeeding.

In 2009, Australian Health Ministers endorsed the *Australian National Breastfeeding Strategy 2010–2015*.[2] The strategy 'provides a framework for priorities and action for all governments to address the protection, promotion, support and monitoring of breastfeeding throughout Australia'.[2] This strategy builds on State and Territory breastfeeding policies and the earlier *National Breastfeeding Strategy (1996–2000)*.

1.3.1 Protection of breastfeeding

Breastfeeding protection is described in the *Australian National Breastfeeding Strategy 2010–2015* as enabling mothers to breastfeed their infants and young children anywhere a mother and child have a right to be, with confidence and without harassment. Most Australian jurisdictions have specific legislation to prevent discrimination against breastfeeding mothers.

Most recent Australian studies show probable evidence that intention to work or return to paid employment is negatively associated with both initiation and duration of breastfeeding (Evidence Grade B).[109,110] Breastfeeding duration tends to be longer in countries with paid parental leave schemes, such as in Scandinavia.[2] In Australia, a national paid parental leave scheme was introduced in January 2011.[111] No data are available at the time of printing on the impact of this scheme on breastfeeding rates.

1.3.2 Promotion of breastfeeding

The *Australian National Breastfeeding Strategy 2010–2015* (see Appendix F) defines breastfeeding promotion in the context of the definition of health promotion proposed by Howat et al:[112]

> *A combination of educational, organisational, economic and political actions designed with consumer participation, to enable individuals, groups and whole communities to increase control over, and to improve their health through attitudinal, behavioural, social and environmental changes.*

A number of systematic reviews provide evidence-based actions for promoting the initiation and duration of any and/ or exclusive breastfeeding among healthy, full-term infants.[113-117] One of these reviews found convincing evidence that breastfeeding promotion interventions in primary care increased rates of initiation and short (1–3 months) and long-term (6–8 months) exclusive breastfeeding and that interventions involving both ante- and postnatal actions were more effective.[114]

1.3.3 Maternity care practices

Baby Friendly Hospital Initiative

The joint WHO–UNICEF BFHI, launched in 1991, aims to eliminate hospital practices that interfere with successful initiation and maintenance of breastfeeding.[118] Although most Australian mothers remain in hospital for only a short period after the birth, the hospital environment can have a positive and lasting influence on breastfeeding. However, if hospitals are not supportive of breastfeeding, the negative effects can be marked. For example, the distribution of discharge packs (with or without formula) to mothers reduces the number of women who exclusively breastfeed.[119-121]

There is probable evidence that implementation of the BFHI improves breastfeeding outcomes (Evidence Grade B).[122] All steps in this program have been shown to have a positive influence.[122] In particular, evidence suggests that breastfeeding within the first hour after birth improves breastfeeding outcomes (Evidence Grade C)[110,123] and that breastfeeding duration is reduced by the use of prelacteal feeds (Evidence Grade C)[124] and pacifiers before 4 weeks (Evidence Grade C).[125,126] The BFHI promotes the actions in Table 1.2 as the core of its program for every facility providing maternity services and care for newborn infants.[127]

Table 1.2: BFHI 10 steps to successful breastfeeding

1.	Have a written breastfeeding policy that is routinely communicated to all health care staff
2.	Train all health care staff in skills necessary to implement this policy
3.	Inform all pregnant women about the benefits and management of breastfeeding
4.	Help mothers initiate breastfeeding within one hour of birth
5.	Show mothers how to breastfeed, and how to maintain lactation even if they are separated from their infants
6.	Give newborn infants no food or drink other than breast milk, unless medically indicated
7.	Practise rooming-in (allow mothers and infants to remain together), 24 hours a day
8.	Encourage breastfeeding on demand
9.	Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants
10.	Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic

Note: In the Australian version of the BFHI, step 4 is phrased: "place babies in skin-to-skin contact with their mothers immediately following birth for at least an hour and encourage mothers to recognise when their babies are ready to breastfeed, offering help if needed". These Guidelines refer to the original BFHI, as this is the version that has been extensively evaluated.[89,128-130]

In developing countries, BFHI implementation was associated with average annual increases in the rate of exclusive breastfeeding of infants under 2 months (1.54%) and under 6 months (1.11%).[128] In a study in Belarus, infants from the intervention group were significantly more likely to be exclusively breastfed at 3 months and to be breastfed to any degree at 12 months.[89] In Scotland, breastfeeding initiation rates increased in Baby Friendly Hospitals.[129] Similarly in Switzerland, breastfeeding duration and rates of exclusive breastfeeding were higher among infants born in BFHI-accredited hospitals than hospitals without such accreditation.[130,131]

The Baby-Friendly Health Initiative in Australia

The Australian BFHI is founded on the same ten steps developed for the WHO-UNICEF BFHI program, although the wording has been slightly modified for some of the steps. The title was changed from 'hospital' to 'health' to reflect the broadening of the initiative to cover other health facilities such as community health centres. The Australian BFHI is administered by the Australian College of Midwives, which is now developing an assessment and accreditation process for a 7-Point Plan for a Baby-Friendly Community.

As of early 2012, around 30% of hospitals providing maternity services across Australia had achieved 'Baby Friendly' status.[132] There is national variability in implementation of the BFHI as the operational policy of hospitals and health services are generally determined by state and territory governments. Some health care providers may follow BFHI principles without completing the formal accreditation process.

Advice for health workers

- Support the principles of the Baby Friendly Hospital Initiative.

Education and / or support services

It is probable that breastfeeding support increases duration of exclusive and any breastfeeding, both in the immediate postnatal period and at 6 months of age (Evidence Grade B).[113] A Cochrane Review (n=29,385 mother-infant pairs from 14 countries) reported that professional support increased the rate of intermediate duration of breastfeeding (up to 4 months) and had a beneficial effect on exclusive breastfeeding, particularly in the first 3 months.[113] Lay or peer support had a significant beneficial effect on exclusive breastfeeding up to 3 months. Professional and lay support combined significantly reduced cessation of 'any breastfeeding', especially in the first 2 months, with two studies showing a significant reduction in the cessation of exclusive breastfeeding.[113] Additionally, peer support in the antenatal and postnatal period has been shown to be effective in increasing breastfeeding initiation.[115]

Routine structured antenatal education classes have not been shown to increase breastfeeding success.[133] However, antenatal education in small groups that targets breastfeeding is effective in increasing initiation rates and one-to-one health education can be effective in increasing initiation rates in mothers from lower socioeconomic groups.[116,117]

Advice for health workers

- An appropriate mix of the education and support services outlined in Table 1.3 should be routinely delivered by both health professionals and peer supporters according to local population needs. Breastfeeding education is further discussed in Section 2.1.

Table 1.3: Education and support services to promote successful breastfeeding

Informal, practical breastfeeding education in the antenatal period delivered in combination with peer support programs
• A single session of informal, small group and discursive breastfeeding education in the antenatal period (including topics such as prevention of nipple pain and trauma)
• Readily available additional, breastfeeding specific, practical and problem solving support from a health professional in the early postnatal period
• Peer support programs to provide information and listening support in either the antenatal or both antenatal and postnatal periods
• Easily accessible counselling and support services for all mothers, including those who are breastfeeding and those who are not breastfeeding their infants

Source: Adapted from UK National Institute for Health and Clinical Excellence.[116, p.26]

Educating fathers

Fathers can influence the initiation of breastfeeding,[134,135] contribute to maternal breastfeeding confidence,[136] and influence decisions about duration and weaning.[137,138] Without fathers' support, there is probable evidence that duration of breastfeeding is likely to be shorter (Evidence Grade B).[110] While some programs targeting the father's role in promoting breastfeeding have been effective in improving initiation rates,[135,139] less success has been achieved in increasing duration.[135,140]

Support for breastfeeding in the workplace

Workplace interventions can be beneficial in prolonging breastfeeding.[117] A breastfeeding mothers' room that is centrally located and suitably equipped, where mothers can express breast milk in privacy and safely store it is an important element of an effective workplace intervention. Flexible working hours and breastfeeding breaks further support mothers to continue to breastfeed. Health workers can have a positive influence in encouraging supportive workplaces,[141] although providing this support may be more difficult in some workplaces than others (see Section 6.3).

Advice for health workers

- Encourage the mother to use expressed breast milk when away from the infant and breastfeed when mother and infant are together.
- Encourage support in the community and workplace for flexible work schedules, suitable environments for breastfeeding, expressing breast milk, storage of expressed breast milk and child care. Promote the use of paid parental leave schemes and lactation break entitlements.

Programs to increase social acceptance of breastfeeding

Women, particularly those from Western cultures, can cite embarrassment as a reason for not breastfeeding.[142-144] Women who initiate breastfeeding, but are uncomfortable about breastfeeding in public, often confine themselves to home or attempt to restrict the length of time they are away from home, usually to the detriment of breastfeeding duration.[145] A qualitative study of public attitudes and beliefs showed contradictory opinions among US adults.[146] While 43% of adults surveyed supported a woman's right to breastfeed in public, only one in four thought it appropriate to show a woman breastfeeding her infant on television.[146] This highlights the apparent inconsistency between society's endorsement of breastfeeding as the best way to feed an infant while at the same time disapproving of, or even prohibiting, breastfeeding in public.

While media campaigns, particularly involving paid television advertising, have been shown to improve attitudes towards breastfeeding and increase initiation rates, there have been no scientific studies on ways to increase public acceptance of breastfeeding in public places.[117]

Supporting vulnerable groups

There is evidence that certain groups are less likely to breastfeed than others and would benefit from increased antenatal and postnatal support. These include Aboriginal and Torres Strait Islander women,[147] younger women (particularly those younger than 20 years of age) (Evidence Grade B),[109,148] less educated women (Evidence Grade C),[109,149] obese women (Evidence Grade B)[150] and/or those of lower socioeconomic status (Evidence Grade C).[151] Approximately 10–15% of women experience depression within 12 months of delivery[152] and evidence suggests that postnatal depression is associated with shorter breastfeeding duration (Evidence Grade C).[153] The evidence that Caesarean section delivery is negatively associated with the initiation of breastfeeding, particularly exclusive breastfeeding, and to a lesser extent duration, is limited (Evidence Grade D).[110,154,155]

2. Initiating breastfeeding

Key points

- Health workers can provide invaluable help to mothers initiating breastfeeding by offering factual information and empathetic support, demonstrating practical skills, and discussing strategies for problem solving.
- Starting to breastfeed within the first hour or so of birth is good for both mother and infant and for continued breastfeeding.
- Mothers and infants vary in a range of aspects of breastfeeding, including breast anatomy, rate of milk flow, mouth–breast positioning and changes in milk composition during a feed.
- Correct positioning and attachment support effective removal of milk from the breasts, which is important to continuing breastfeeding as supply equals demand.

2.1 Breastfeeding education for parents

Breastfeeding should be regarded as best practice for all infants. All women should be informed of the benefits of breastfeeding and the risks of not breastfeeding (see Section 1.2). Health professionals should also discuss the management of breastfeeding with mothers and encourage them to use available antenatal education services. The health worker's role is one of encouragement and support, always having regard for the mother's suggestions, concerns and cultural background.

In many cultures, the support of grandmothers and other female relatives is important. Changes in family structures in Australian society mean that the father's role has assumed greater importance. Education programs should involve fathers and help them understand the advantages of breastfeeding and the important role they can play in supporting the breastfeeding mother.[156]

A range of useful, easy-to-read publications about pregnancy and breastfeeding is available through antenatal programs, hospital wards, outpatient services, early childhood centres, community health centres, health department publication services and websites and medical practitioners. Many hospitals and other agencies also offer information about the Australian Breastfeeding Association (ABA) and contact details for local support groups. A resource list is provided in Appendix G. The ABA's Lactation Resource Centre has breastfeeding information available in a variety of media. Many of these resources are also available from local ABA groups. Steps should be taken to ensure that information is at a level likely to engage those with low levels of literacy.

2.1.1 Antenatal advice

The initial antenatal interview between a woman and her doctor or midwife should include a careful assessment of a woman's (and her partner's) attitudes, beliefs, expectations, knowledge and experience in relation to infant feeding. Research shows that the earlier in the pregnancy a decision to breastfeed is made, the more likely that breastfeeding will be successful.[134]

Routine antenatal education should cover:

- the importance of exclusive breastfeeding to around 6 months and breastfeeding to 12 months and beyond (including the nutritional and protective benefits)
- basic breastfeeding management
- anticipatory guidance for coping with minor problems.

During antenatal examination the following breast characteristics should be noted:

- scars indicating previous surgery
- extra-large breasts, which may sometimes cause initial difficulties with attachment
- nipple or areola eczema or dermatitis
- minimal or absent development of the mammary tissue (this is very rare)
- any other breast pathology.

Physical problems that interfere with breastfeeding are extremely rare, and in most societies breastfeeding has been universal.[157,158] However, there is limited evidence that perceived breast milk insufficiency is the reason for 25–35% of lactating women reducing the duration or exclusivity of breastfeeding (Evidence Grade D).[159]

Approximately 8–10% of lactating women have at least one flat, inverted or non-protractile nipple. Antenatal treatment is not recommended as it has been found to be ineffective and associated with a negative impact on breastfeeding.[160,161] Various practices for antenatal nipple preparation – including some form of nipple friction, application of cream, and antenatal expression of colostrum – have been evaluated by researchers, but no evidence has been found to support these practices.[26] Nor is there evidence to support the commonly held belief that fair-skinned women are more likely to experience nipple problems.[162,163]

Advice for health workers

- Provide antenatal information and counselling about the benefits and practical aspects of breastfeeding and the risks of not breastfeeding to all potential mothers, fathers and primary carers.

2.1.2 Postnatal advice

Physiologically, almost all women produce breast milk after giving birth and are able to breastfeed, but breastfeeding is not easy for some and learning and patience are necessary.[164]

In hospital, during the postnatal period, midwives give support, help and advice as mothers begin breastfeeding. In many hospitals a lactation consultant is available for those who experience difficulties and need specialist advice. Women whose infants are in special care should be encouraged – using both practical demonstration and written information – to initiate and maintain an adequate milk supply. When breast milk needs to be expressed, mothers sometimes have particular difficulty in the immediate postpartum period and may require extra support.

Following discharge from hospital, support from community midwives and lactation consultants may be beneficial. Mothers are also encouraged to seek assistance from other people, such as maternal and child health nurses and ABA counsellors. GPs should be familiar with breastfeeding or at least with points of referral for assistance.

Advice for health workers

- Provide postnatal breastfeeding support information.

2.1.3 Young mothers

The literature review for the *Australian Dietary Guidelines* found probable evidence that younger maternal age, particularly being aged under 20, may be negatively associated with both initiation and duration of breastfeeding (Evidence Grade B).[165,166] The results of many observational and two intervention studies show that adolescent mothers breastfeed less often than older mothers.[165,166] Adolescent mothers' breast milk is comparable in composition and volume to that of adults.[166] However, many adolescents view breastfeeding negatively, and have adverse experiences in relation to breastfeeding.[166,167]

There is some evidence that intensive support may increase the rate of initiation of breastfeeding by adolescent mothers, but this does not appear to influence the duration of breastfeeding or rate of exclusive breastfeeding.[168] Younger mothers generally require more support to maintain satisfactory breastfeeding levels.

2.2 Physiology of breast milk and breastfeeding

2.2.1 Breast milk production

The alveoli of the breast mature during pregnancy under the control of pregnancy hormones. Progesterone, prolactin and human placental lactogen are essential for the final stages of mammary growth and differentiation. Lactogenesis stage I is complete by mid-pregnancy. The breast is then able to secrete small quantities of specific milk components, such as lactose. Late in pregnancy, copious milk production is inhibited by high concentrations of serum progesterone. In the presence of permissive hormones (prolactin, cortisol and insulin), the withdrawal of progesterone following the delivery of the placenta triggers a rapid increase in milk production approximately 30–40 hours after birth.[169] During the first 3–4 days postpartum, copious milk secretion occurs – this is lactogenesis stage II,[57] which involves preparation of the mammary epithelium, maintained prolactin levels and removal of milk from the breast.[170]

Milk 'comes in' about 48–72 hours after birth and this is perceived by the mother as the start of lactation.[171] However, milk 'coming in' does not mean a sudden increase in the infant's milk intake, and the aetiology of associated engorgement is not necessarily a result of inadequate milk transfer.

2.2.2 Regulation of milk production

One of the most important factors in successful lactation is the effective removal of milk from the breasts. Research shows that the lactating mammary gland exercises a local feedback inhibitory control over milk synthesis, referred to as autocrine control.[172,173] It is important to emphasise the following simple equation:

SUPPLY = DEMAND

The rate of milk production is regulated to match the amount of milk removed, with the infant controlling milk intake.[174] If milk withdrawal has not started within 3 days postpartum, the changes in milk composition with lactogenesis are reversed and the likelihood of establishing successful breastfeeding declines.[170,175]

Prolactin is secreted by the anterior pituitary gland in response to sucking and the consequent stimulation of nerve endings in the nipple and areola. The secretion of prolactin is greatest in early lactation and declines to only a small response 6 months after birth. There does not appear to be any relationship between the release of prolactin and milk yield once lactation is established.[176] It is thought that hormonal influences regulate the maximum potential for milk production in women and that autocrine control 'down regulates' milk synthesis to match the mother's supply of milk to the infant's appetite. The rate of milk synthesis is related to the degree to which the breast has been drained. The subsequent rate of milk synthesis is higher if the breast is well drained.[176,177]

A meta-analysis of the milk volumes of exclusively breastfeeding women shows that milk production is fairly constant across studies from different countries, at about 800 mL a day (mean 820 mL; standard deviation 110 mL).[178] A more recent detailed study of Australian mothers found an average production of 798 g per day (range 478–1356 g per day).[179]

2.2.3 Milk ejection

Within seconds of an infant stimulating the sensory nerve endings around the nipple by sucking, a pulse of oxytocin is released from the posterior pituitary gland. Oxytocin stimulates the contraction of myoepithelial cells surrounding the alveoli, and milk is forced into the ducts and lactiferous sinuses towards the nipple. This process is known as milk ejection or milk let-down. Multiple releases of oxytocin can occur during a breastfeed (or during breast expression). Milk ejection can be inhibited by stress and eliciting milk ejection can at times be a problem for mothers expressing breast milk.

There is insufficient evidence (only one ultrasound study) to suggest that lactiferous sinuses are not a physiological feature.

2.2.4 Factors affecting initiation of lactation after birth

A number of factors may delay initiation of lactation after birth.

- *Stressful delivery* – may interfere with the release of oxytocin, the hormone responsible for milk ejection.[180]
- *Caesarian section* – the withdrawal of progesterone and changes in milk composition following delivery by Caesarean section are similar to those following normal delivery.[181,182] There is limited evidence (Evidence Grade D)[134,155,183,184] that delivery by Caesarean section may be negatively associated with the initiation of breastfeeding, particularly exclusive breastfeeding, and to a lesser extent breastfeeding duration. Not all studies have reported a negative association between breastfeeding and Caesarean section delivery.[110,184] These differences may be related to the type of anaesthesia used, the postpartum management of women who deliver by Caesarean section and the prevalence of Caesarean section in the population.[185] For instance, mothers who delivered by Caesarean section have been shown to have a longer time to first breastfeed than those who deliver by spontaneous or instrumentally assisted vaginal delivery,[186] and it is suggested that the early initiation of breastfeeding within 1 hour of birth is associated with improved breastfeeding outcomes (Evidence Grade C)[187,188] (see Section 2.3). Where possible, management of breastfeeding after a Caesarean section delivery should be similar to that after a normal birth.
- *Maternal type 1 diabetes* – initiation of lactation may be delayed by 24 hours. [189] These women may need additional support and encouragement to breastfeed.
- *Retained Placental Fragment* – initiation of lactation may be inhibited where there is retained placental fragment.[26] This factor should be considered in the perinatal management of lactation with women receiving additional support and encouragement to breastfeed.
- *Maternal obesity* – has a probable negative association with initiation of breastfeeding and breastfeeding duration (Evidence Grade B), and has been associated with delayed onset of lactation.[190,191] It has been postulated that, as adipose tissues concentrate progesterone, obese women may have higher levels of progesterone, leading to a reduced prolactin response and a subsequent delay in the onset of lactogenesis stage II.[191] An alternative theory is that impaired suckling as a result of mechanical difficulties leads to the diminished prolactin response, suggesting a physical rather than a physiological mechanism.[192] Despite initial difficulties, with sufficient lactation guidance the vast majority of overweight women are able to successfully establish exclusive breastfeeding.[190]

2.2.5 Breast milk composition

Human breast milk is a complex secretion, consisting of thousands of compounds and cellular components.[193] The composition of milk varies greatly between different species. Mature human milk tends to fall at one extreme (see Table 2.1), having low concentrations of protein and sodium chloride and high concentrations of lactose and oligosaccharides.[194]

Table 2.1: Composition of mature human milk, cow's milk and infant formula

Mean value for component (per litre)			
	Mature human milk[a]	Cow's milk[b]	Infant formula[c]
Energy (kJ)	2,929	2,930	2,500–3,550
Energy (kcal)	700	700	597–848
Protein (g)	10.3	35	11–24.8
Fat (g)	43.8	35	26–53
Carbohydrate (g)	68.9	63	72–75
Sodium (mg)	170	370	125–532
Calcium (mg)	320	1070	min 300
Phosphorus (mg)	140	920	150–887
Iron (mg)	0.3[d]	negligible	5–17.7[e]
Vitamin A (mcg)	610	530	350–1526
Vitamin C (mg)	50	negligible	min 42.5
Vitamin D (mcg)	1.0	5.2	6.25–22.3
Potassium (mg)	510	1420	500–1775

a. US Department of Agriculture (USDA) National Nutrient Database for Standard Reference 2011.[195]
b. Regular fat (~3.5%) cow's milk. Nutrient Tables for Use in Australia (NUTTAB) 2010.[196]
c. Ranges for infant formula products (from birth, cow's milk–based) based on the regulatory minimum and, where given, maximum range permitted. Adapted from: FSANZ Code Standard 2.9.1.[197]
d. Iron in breast milk is highly bioavailable, with absorption of 50–70%.
e. The bioavailability of iron in infant formula is around 10%, so formulas are fortified to account for this fact.

Human breast milk has a characteristic opalescent appearance. Breast milk has a high water content that meets all the infant's fluid requirements for at least 6 months, so no additional fluids are required during this time even in hot climate. Breast milk's whiteness comes from its fat content. The slower the milk flows, the higher the fat content, making it whiter in appearance. It is misleading to describe breast milk as 'thin' or 'watery' as it contains the same energy and total solids content as cow's milk.

The increase in the fat content as milk is withdrawn from the breast is a feature of mammalian lactation. Much emphasis has been given to the significance of this change for an infant's energy intake, but the physiology of milk synthesis, secretion and removal is not fully understood. There are only two ways a breastfed infant can obtain a higher energy intake over a 24-hour period – if the mother produces more milk, or if the mother produces the same volume of milk with a higher fat content. Since animal studies demonstrate that it is difficult to alter the average daily composition of milk, it is not surprising that research shows that variations in the intervals between breastfeeds and in the amount of milk withdrawn during a breastfeed explain only a small proportion (20–26%) of the variation in the fat content of breast milk.[198,199] The degree of breast emptying explains changes in the fat content, but not the fatty acid composition of human milk.[198]

A factor determining the fat content of breast milk is the fullness of the breast. The first milk withdrawn from a full breast has a low-fat content, with fat content rising more rapidly after the removal of about 40% of the breast's storage capacity. Depending on both the fullness and the storage capacity of the mother's breasts, the fat content at the end of one breastfeed (the hind milk) may be either lower or higher than that at the beginning (the fore milk) of a subsequent breastfeed.[57,198]

Colostrum, which is produced during late pregnancy and for the first 30–40 hours after birth, is yellowish and thicker than mature milk and contains a high concentration of immunoglobulins.[164]

2.2.6 Individual variation

Mothers and infants vary considerably in a range of aspects of breastfeeding.[200] The anatomy of the breast varies greatly between women. Some women can store up to six times more milk than other women.[200,201] As a result, women with large storage capacity have great flexibility in their frequency of breastfeeding, while women with a smaller storage capacity need to feed more frequently to maintain similar levels of milk production. This latter group should spread breastfeeds fairly evenly over the 24-hour cycle. This highlights the importance of infant-led feeding – allowing the infant to regulate intake according to need. It also shows the value of letting the infant 'finish' the feed in his/ her own time, not according to the clock.

Apart from storage capacity, there is considerable variability in the rate of milk flow, the nature of mouth–breast positioning, and changes in milk composition during a feed.

Infants' milk intake varies, with average intakes of exclusively breastfed infants ranging from 710 g/day for the first 2 months to 900 g/day at 9–11 months of age. For partially breastfed infants, average intake decreases from 640–687 g/day at birth to 5 months of age to 436–448 g/day after 9 months of age.

Advice should be tailored to each mother and her infant's circumstances, rather than imposing arbitrary rules on timing and positioning.[202]

2.2.7 Positioning and attachment at the breast: the key to successful breastfeeding

An infant's 'milking' of the breast is dependent on two things:

- attachment to sufficient breast tissue, the tongue positioned forward over the lower gum-line and sufficient vacuum within the intra-oral space
- correct positioning at the breast and correct latching-on and milking action.

Table 2.2: Correct positioning during breastfeeding

• The mother should be seated comfortably in an upright position, so that her breasts fall naturally and she has good support for her back, arms and feet
• The infant should be unwrapped to allow easy handling and avoid overheating
• A semi-recumbant position can also be used while breastfeeding[203]
• If the nipple is erect, support the outer area of the breast with a 'C' hold, being careful not to alter the breast position • If the nipple is flat or inverted, move the 'C' hold under the breast and shape the breast between the thumb and index finger, well back from the areola
• The infant should be supported behind the shoulders and facing the mother, with his or her body flexed around the mother's body – the position must be a comfortable drinking position for the infant
• The infant's nose should be level with the mother's nipple, and a wide gape should be encouraged by teasing the infant's mouth with the underside of the areola
• When the infant gapes widely, bring him or her quickly onto the breast so that he or she will take a good mouthful of breast – bring the infant to the breast, not the breast to the infant.
• The chin should be tucked well into the breast, and the infant's mouth should be wide open, with the bottom lip curled back – more areola will be evident above the infant's top lip than below the bottom lip
• When positioning is correct it is not necessary to hold the breast away from the infant's nose
• After an initial short burst of sucking, the rhythm will be slow and even, with deep jaw movements that should not cause the mother any discomfort – pauses are a normal part of the feed and they become more frequent as the feed continues
• If the cheeks are being sucked in or there is audible 'clicking', the infant is not attached correctly
• The infant should stop feeding of his or her own accord by coming off the breast spontaneously
• The nipple will appear slightly elongated but there should be no evidence of trauma

Note: There is a range of other positions and attachment techniques that are preferred by some women.

Women commonly experience heightened nipple sensitivity and tenderness in the first few days after birth but this usually subsides as breastfeeding becomes established. If nipples are already sore or cracked, and even if positioning and attaching errors are corrected, they may continue to be tender at the start and end of feeds for some time. The mother should be reassured that the discomfort will diminish as the nipples heal and feeding continues.

If the infant is correctly positioned and attached and is sucking correctly there should be no nipple pain.

Advice for health workers

- When discussing breastfeeding with women, pay particular attention to the importance of correct positioning and attachment when breastfeeding.

2.2.8 Signs of a functioning milk-ejection reflex

Although some mothers report no noticeable signs of the milk-ejection reflex, many mothers do notice one or more of the following signs:

- tingling or prickling – 'pins and needles', which may take several weeks to develop
- a sudden feeling of fullness
- an increase in skin temperature
- a feeling of wellbeing or relaxation
- for some mothers, pain or nausea
- dripping, leaking or spurting from the unsucked breast
- for some mothers, an intense thirst
- uterine contractions accompanied by a gush of lochia in the immediate postpartum period – this is more common in women who have had two or more children.

There may also be noticeable changes in the infant's sucking and swallowing pattern. This sign is more consistent than any of the others, but it may take the mother several days of observation after her milk 'comes in' to recognise the changes. There are two types of sucking:

- non-nutritive sucking occurs in short, sharp bursts at a rate of up to two per second
- nutritive sucking occurs at a slower rate – about one per second.

Once the milk has started to flow, the sucking continues at a regular rate. As the feed progresses, sucking becomes fragmented into bursts, usually separated by pauses of longer duration than are seen in the non-nutritive phase. At the start of each burst there may be two to three fast sucks typical of non-nutritive sucking – termed 'restart sucking'.

2.3 The first breastfeed

There is evidence that starting to breastfeed within the first hour or so of birth is good for both mother and infant and for continued breastfeeding (Evidence Grade C).[110,123] A successful first breastfeed has a number of positive effects:

- it builds the mother's confidence in her ability to breastfeed
- the infant starts to receive the immunological benefits of colostrum
- the infant's digestion and bowel function are stimulated
- correct sucking at the breast at this stage may avert later sucking difficulties
- bonding and attachment between mother and infant are enhanced.

Ideally, uninterrupted skin-to-skin contact should be maintained following birth. Common practices such as early weighing, bathing the infant, or passing him or her around should be delayed until later. Good antenatal education will help with parents' expectations in this regard. When the infant indicates an interest in sucking or signs of readiness to feed, the midwife can guide the mother into a comfortable position that will enable the infant to attach correctly.

Unless there is a medical reason (such as prematurity) mother and infant should remain together, so that breastfeeding begins and proceeds according to the infant's needs – without restriction on the number or length of feeds. However, although early contact between mother and infant is the ideal, when this is not possible it does not preclude successful breastfeeding. In Australia, rates of breastfeeding are similar for infants delivered vaginally or by Caesarean section. In many cultures, the mother may not have contact with her infant for many hours, yet successful breastfeeding is almost universal.

3. Establishing and maintaining breastfeeding

Key points

- Unrestricted feeding, both day and night, is an important factor in successfully establishing breastfeeding and results in optimum milk production.
- Exclusive breastfeeding ensures that an infant receives the full nutritional and protective benefits of colostrum and breast milk.
- Early use of bottles, pacifiers and supplementary feeds interfere with the establishment of breastfeeding.
- The adequacy of breastfeeding can be assessed by observing the infant's behaviour, feeding patterns, urine output and bowel actions, and by checking the infant's weight and using growth reference charts.
- The *Australian Dietary Guidelines* provide advice on an appropriate diet for a breastfeeding woman.

3.1 Natural patterns of breastfeeding

Infants typically establish a pattern of feeding 8–12 times over a 24-hour period during the first week of life. Infants will vary the feeds according to their needs and the rate of milk transfer. The length of each feed is highly variable, and during the early neonatal period feeds can take up to an hour. Failure to regularly stimulate milk supply via suckling or to use available milk will lead to inhibition of lactation and under-supply of milk.

The Academy of Breastfeeding Medicine (ABM) states that breastfeeding effectiveness should be assessed before a mother and her infant go home. This requires a trained health professional to evaluate position, attachment, milk transfer, rate of infant weight loss, presence of jaundice, and stool and urine output. Any breastfeeding problems, either observed during the assessment or anticipated, should be addressed before discharge.[204] Where it is not possible to address all breastfeeding problems before discharge, ongoing support and advice should be arranged.

Health workers should aim to help mothers achieve confidence and independence in breastfeeding and caring for their infants. If mothers are managing well, particularly mothers who have previously breastfed successfully, advice from midwives and others may be inappropriate if it is not requested. However expertise should never be assumed and multigravida mothers should be asked about previous experience and current level of confidence with breastfeeding.

3.2 Difficulties establishing breastfeeding

3.2.1 The sleepy newborn infant

The last trimester of pregnancy and the first months of life constitute a period of rapid change and maturation of the brain stem and sleep control mechanisms, including shifts in the nature of sleep and establishment of circadian rhythms. Newborn infants will vary in their levels of arousal, with some remaining quite sleepy for

some time after birth and not 'demanding' feeds. It is important to be sure that this is not related to the effects of maternal analgesia during labour and delivery, or to the effects of the birth process or illness. Infants who are born preterm or post-term are more vulnerable to illness. Infants should not be allowed to sleep in preference to feeding in the first few days of life as this will hinder the establishment of lactation and may mask illness. If the infant does not want to feed after about 5 hours, he or she should be roused and put to the breast.

Table 3.1: Strategies for sleepy infants

• Changing the nappy often wakes an infant
• Cradle the infant's head near the breast and express a drop or two of colostrum onto the infant's lips
• Unwrapping the infant, talking to him or her, and gently stroking the legs and abdomen or holding the infant against the breast may stimulate the infant to wake and start seeking the breast
• Sometimes getting the infant to suck on a clean finger will stimulate the sucking reflex
• Stroking the lip and cheek will stimulate the rooting reflex
• The mother can cuddle her infant as often as she likes, and holding the infant against her breast may stimulate seeking – regular and prolonged direct skin-to-skin contact is important
• If the infant still does not take the breast and appears otherwise well, it is essential to express the colostrum and feed it by teaspoon, syringe, cup or bottle – possible causes for the lack of ability/ desire to breastfeed should be assessed by an appropriately qualified medical practitioner

3.2.2 Persistent sleepiness

Occasionally sleepiness persists beyond the first day of life. The infant may be one of the few who do not wake for feeds and so may fail to thrive as expected. It is important that any medical causes are excluded before the infant is regarded as a 'sleepy' infant. This will be apparent after several days. Modern nappies absorb a lot of fluid and volume of urine may be difficult to assess. If all other causes are excluded – particularly incorrect attachment and sucking – the mother must make sure she feeds the infant at least six times in a 24-hour period. Persistently sleepy infants usually start feeding more frequently as they grow bigger and older. Mothers of these infants should be alerted to the possible need to wake the infant and offer more frequent feeds for some time to come.

3.2.3 The unsettled infant

Most infants have unsettled periods, which can be distressing for parents even though the causes (when they can be found) are usually minor. The midwife and mother may need to evaluate feeding progress and develop strategies for settling the infant. Health workers and parents should be aware that the use of bottles and pacifiers (dummies) is usually inappropriate at this early stage of breastfeeding (see Section 3.3.1). Unsettled periods may occur before the mother's milk 'comes in'. It is common for infants to want to feed frequently before the milk comes in, particularly in the second 24 hours. The mother may need to be reassured that this is normal and that frequent feeds help to stimulate the milk supply and reduce the likelihood of engorgement. Frequent feeds can, however, present a problem for tired mothers during the night. Regular and prolonged direct skin-to-skin contact is beneficial.

After the milk comes in, the following factors should be assessed:

- Is the infant attached properly and receiving the milk?
- Is the mother leaving the infant on the breast until he or she comes off naturally?
- Is the infant sucking properly?

Some infants take several days to establish a good sucking technique. Until that happens, breast milk may need to be expressed and given to the infant after the breastfeed, by spoon, cup, syringe or bottle.

Unrealistic expectations

Because of entrenched social attitudes about sleeping and eating schedules, many people mistakenly think that infants sleep for 3–4 hours in regular patterns around the clock. Frequent feeding is normal and infants' individuality and variations in their appetites should be carefully explained to new mothers.

It is important for mothers to realise that breastfeeding is a learned function and may take some time to master. It does not always happen naturally or automatically.

Does the infant need attention other than for breastfeeding?

Infants need contact for comfort in addition to food. There is a range of strategies and options for helping restless or crying infants (see Section 4.3.2).

3.3 Factors affecting establishment of breastfeeding

Maximising opportunities to breastfeed while mother and infant are still in hospital is important in initiating and maintaining breastfeeding. Interventions that may lessen the drive of mother and infant to breastfeed, such as use of pacifiers and supplementary feeds, should be resisted.

3.3.1 Bottle and pacifier use

Early use of bottles and pacifiers (dummies, soothers), especially during the establishment of breastfeeding, is believed to interfere with natural processes of breastfeeding, reducing the infant's sucking capacity and stimulation of the mother's breasts. The likely result is delayed or poor establishment of lactation.[205] A number of observational studies and a recent systematic review documented an association of early cessation of breastfeeding with the use of pacifiers.[110,125,206,207] This association has been questioned in a prospective cohort study and in a systematic literature review when the pacifiers are introduced after breastfeeding is established.[208] In the literature review evidence suggests that the use of a pacifier before 4 weeks is associated with reduced duration of breastfeeding (any, predominant and exclusive) (Evidence Grade C).[125,126]

However, a number of studies have confirmed a probable association between the use of pacifiers during sleep and a decrease in the risk of SIDS (Evidence Grade B).[209] At the present time, the evidence suggests that pacifiers not be used in the first 4 weeks of life[125,126] but after 4 weeks, it is probable that the use of a pacifier reduces the risk of SIDS.[209] It is important to note that the mechanism of action of pacifiers is not known and this may be a marker for some other protective factor. Additional information on the value of breastfeeding in preventing SIDS is available in a statement from the National SIDS Council of Australia and a review by Hauck et al.[42]

Parents and carers should not place a pacifier (or anything else, such as a teat) in their own mouth if it is to be given to an infant. This practice has the potential for transmission of cariogenic bacteria to the infant.[210,211] Dipping pacifiers and bottle teats in sugar, jam, honey or any other sugary substance may also lead to dental caries. It is probable that Helicobactor pylori may also be transmitted from mother to infant in this way.[212,213]

Advice for parents

- A pacifier (dummy) may be offered, while placing infant on their back to sleep, no earlier than 4 weeks of age and after breastfeeding has been established.
- Do not dip pacifiers or bottle teats in sugar, jam, honey or other sugary substance.
- Do not put anything in your infant's mouth if it has been in your mouth to avoid spreading bacteria that cause tooth decay.

3.3.2 Supplementary feeds

Offering supplementary feeds – water, glucose or infant formula – when there is no medical reason has been shown to adversely affect the establishment and maintenance of successful breastfeeding.[214,215] An Australian study confirmed that formula feeding in hospital decreased the likelihood of breastfeeding to 6 months of age.[215] In the BFHI framework, step six states: 'Give newborn infants no food or drink other than breast milk, unless medically indicated'. There is suggestive evidence supporting the hypothesis that the use of prelacteal feeds negatively affects breastfeeding duration (Evidence Grade C)(see Section 7.1).[214,215]

If an infant is unable to take all feeds directly at the breast, expressed breast milk should be the preferred method of feeding.[216,217]

If lactation is not fully established, the mother should be helped to understand the processes of lactation and breastfeeding techniques and encouraged to call on support people or groups when in need. These can include home midwifery services (in the early days after birth), early childhood community health nurses, the ABA telephone helpline (offering a free phone support seven days a week, 1800 686 268 and local counsellors, with local group meetings) or a lactation consultant (for complex breastfeeding issues).

The use of supplementary feeds other than expressed breast milk is rarely necessary, and mothers should make an informed decision and give their permission before such a step is undertaken (see Appendix H). A sample Supplementary Feeds Information and Approval Form is shown in Appendix I. Chapter 7 discusses informed use of supplementary feeding in hospital.

Breastfeeding of preterm infants while in hospital is occasionally supplemented by formula feeding (usually a special product for low birth weight infants) or donor human milk if available (preferably pasteurised from a milk bank). If these feeds are to be continued after discharge, the mother's competence in formula preparation and bottle-feeding should be ensured and follow-up care organised.

In particular, the mother will benefit from information about how she can establish predominant breastfeeding by:

- gradually increasing her milk supply by expressing after feeds (note: mothers should receive instruction on hand expression of breast milk)
- increasing the number of breastfeeds a day or
- gradually reducing the amount of bottle supplements, by putting slightly less in the bottle each time or by cutting down the supplementary feed at a certain time, daily or on alternate days, or more slowly if appropriate.

Even if the mother does need to continue giving supplementary feeds indefinitely, she should be encouraged to continue breastfeeding before offering the supplementary feed. It should not be suggested that the infant be totally formula fed.

Breast milk bank products are only available in Australia for preterm infants or those with serious medical conditions. Milk banks can ensure the quality of products and minimise risks to infants of transmitting infections. Outside established hospital milk banks, there may be dangers from sharing milk from unknown sources.

3.3.3 Rooming-in

Rooming-in 24 hours a day is the usual practice in most Australian hospitals and means the infant is with the mother from birth. The practice is beneficial for many reasons, especially because it encourages breastfeeding.[130,218,219] Rooming-in has become such a part of normal Australian maternity care that it is difficult methodologically to show difference and benefit, especially in relation to breastfeeding initiation and duration rates, compared to other practices.[110,123] Rooming-in:

- facilitates unrestricted breastfeeding
- promotes mother–infant bonding
- prevents cross-infection
- allows mother and infant contact with the father and other family members
- helps the mother learn about her infant's patterns of behaviour and feeding, which can help foster infant care.

After delivery the infant should remain with the mother, so that they are transferred to the postnatal ward together. Mother and infant should sleep in proximity to each other to facilitate breastfeeding. The infant should

sleep on a separate surface (e.g. in a cot beside the mother's bed). Mothers who have their infants with them at night lose no more sleep than mothers whose infants are in a nursery.[220] If a mother does choose to place her infant with staff, the infant should be taken to her for breastfeeds or the mother should be encouraged and helped to express breast milk.

After delivery by Caesarean section, as for any birth, mother and infant should be supported to stay together whenever possible, only being separated for medical reasons (e.g. if the infant needs to be admitted to the neonatal nursery). Initially, rooming-in after Caesarean section calls for extra support from the midwife. If mothers and infants are ever separated, the identification of the infant should always be checked with the mother when mother and infant are re-united.

3.3.4 Co-sleeping

In many cultures and in some sections of the community, it is common for mothers to sleep with their infants.

The Western Australian Department of Health recommends:

> *Any benefits of bed-sharing must be carefully considered with the known risk factors. When your baby is settled it is recommended that you return your baby to his/her cot.*[221]

Mother and infant should sleep in proximity to each other to facilitate breastfeeding. The safest way of doing this is for the infant to have his or her own safe sleeping place in the same room as an adult caregiver for the first 6–12 months.

3.4 Monitoring an infant's progress

To ensure that an infant is well and to allay any concerns the mother might have, both mother and health worker need a means of assessing the infant's progress. Observing the infant and his or her behaviour and documenting feeding and output contribute to this assessment. A healthy infant is alert and responsive when awake and has bright eyes and firm skin with good elasticity.

3.4.1 Behaviour

Infants are generally content after feeds, although many have a period each day when they want to feed frequently and will not settle (see Section 4.3.2). This often happens in the evening, and should not be interpreted as 'running out of milk at the end of the day' – milk production is continuous over a 24-hour period.

3.4.2 Feeding patterns

Some mothers expect their infant to feed following a regular 4-hourly pattern, but they should be reassured that this is not common. The length of each feed is variable, and during the early neonatal period feeds can take up to an hour. If an infant is spending long periods on the first breast, however, there is a good chance there is a feeding problem – the most likely cause is that the infant is not attached properly and cannot milk the breast effectively.

3.4.3 Urine output

Until the mother's milk comes in, an infant will not pass urine often. Provided the infant voids once or more every 24 hours there is generally no cause for concern. As the milk volume increases, the infant's urine output will increase, and soak a nappy with pale or colourless urine six or more times every 24 hours. If an infant's urine becomes scanty and strongly yellow in colour, suggesting the development of dehydration, medical evaluation of feeding frequency and milk transfer is recommended.

3.4.4 Bowel actions

An infant's first bowel actions consist of meconium, which is greenish-black. After 24–48 hours the meconium changes – first to brownish 'transitional' stools and then, by the third or fourth day, to typical breastfed infants' stools, which are loose and mustard-yellow (sometimes with milk curds), although occasionally they are green or orange. None of these changes is significant in a healthy breastfed infant.[222] Frequent, runny stools do not mean a breastfed infant has diarrhoea or lactose intolerance – they should simply be viewed as evidence of sufficient milk.

The number of bowel motions of breastfed infants tends to decrease between 6 weeks and 3 months of age. Intervals of several days or more between stools are common. If the infant is receiving breast milk only and no other food or fluid, there is no cause for concern. Mothers need to be aware of the potential change in their infant's motions when they are weaning.

Constipation refers to the hard, dry consistency of the stools, not the frequency of bowel motions. Exclusively breastfed infants are rarely constipated. Many breastfed infants show signs of discomfort or distress before passing a motion. This is a normal response to body sensations they are not used to and it may not indicate constipation. Hard, dry bowel motions are more likely to occur after formula or solid foods have been introduced.

Advice for health workers

- To avoid unnecessary intervention, inform parents about the wide variation in normal bowel function in infants who are breastfed. If parents are concerned, they should consult a relevant health professional.

Diarrhoea entails frequent watery stools and there is a risk of dehydration. If an infant has diarrhoeal disease, breastfeeding should be continued and supplemented with an age-appropriate electrolyte solution as necessary.

Advice for health workers

- An infant with suspected dehydration should be assessed by a medical practitioner.

3.4.5 Weight

A newborn infant adapts to the small amounts of colostrum available. With the passage of meconium and loss of water by evaporation, an initial weight loss of up to 10% of the birth weight during the first week is normal. Between 4 and 6 days of age the infant starts to regain weight and by 2 weeks should have returned to his or her birth weight. If the infant appears contented and healthy there is no immediate cause for concern about minor fluctuations in weight – these can result from factors as simple as passing a stool, urinating or a recent feed. Discrepancies can also occur erroneously from using different sets of scales. However, static weight or suspected weight loss over several days should be examined. Further investigation to exclude illness or disease should include evaluating feeding frequency and milk transfer.

In general, weight gain is assessed on a 4-week average. The rate of growth is the most important factor, although if growth is above the 90th percentile or below the 10th, or crosses these percentiles, further investigation is required. For preference, an appropriate growth chart should be used, but an approximate guide is:[223,224]

- birth to 3 months: a gain of 150–200 g a week
- 3 to 6 months: a gain of 100–150 g a week
- 6 to 12 months: a gain of 70–90 g a week.

Percentile growth reference charts

Percentile charts are used to assess growth. The international growth reference widely used in Australia in 2012 was originally derived from US data and is based on a high proportion of data from formula-fed infants.[225] Exclusively breastfed and formula-fed infants follow different growth trajectories.[226] In 2006 the WHO introduced a new set of growth curves based on exclusively breastfed infants and proposed that these be used as a 'standard' to compare infant growth (a 'standard' proposes how children should grow as opposed to a 'reference' which merely describes how they grew at a particular time and place).[227,228] In 2012, all Australian jurisdictions agreed to adopt the WHO 2006 growth charts as the standard for Australian children aged 0–2 years. The WHO growth standards for this age group are already in use in the Northern Territory and Victoria. They will be phased in by other states and territories for use at the primary health care level in child health records. Education and training materials to assist Australian health professionals in using the WHO Charts are being developed and will become available in 2013. Other specialised growth charts may still be used by clinicians for groups with particular needs or characteristics (see Appendix J).

Growth reference charts are monitoring or screening tools, not diagnostic instruments. The pattern of the infant's growth, in particular whether the pattern crosses the centile channels, as well as the position on the growth chart, are used in conjunction with clinical assessment in determining if there is a problem. As a result, a decision that may affect the infant's feeding pattern should never be based on growth monitoring alone.

3.5 Maternal nutrition

Good nutrition is important for the health and wellbeing of all women and particularly for breastfeeding women, who have additional nutritional requirements.[193] However, even mothers in a poor nutritional state are able to produce breast milk of adequate quality.[229] The additional nutrient requirements are documented in the *Nutrient reference values for Australia and New Zealand*.[230] A range of dietary patterns providing these nutrient requirements have been described in the new *Food modelling system* to inform the revision of the *Australian Guide to Healthy Eating*.

Mothers have increased energy needs while breastfeeding. It is estimated that a woman who fully breastfeeds for the first 6 months and partially breastfeeds thereafter will require, on average, an extra 2,000–2,100 kJ/day.[230] However this amount will vary depending on the mother's level of milk production, rate of postpartum weight loss and changes in physical activity level.

Milk production and protein, fat and lactose concentrations are largely unaffected by maternal diet.[176] However, maternal diet can influence the micronutrient and fatty acid composition of breast milk.[193,231,232] The *Australian Dietary Guidelines* provide advice on appropriate dietary patterns for breastfeeding women.[4] Mothers who are on restrictive diets – for example some vegan diets – are at risk of deficiencies of nutrients including vitamin B_{12}, iron, zinc and calcium and may need referral to a dietitian.

3.5.1 Vitamin D

The vitamin D content of breast milk is highly variable and is directly related to the mother's vitamin status.[233] If a mother's stores are replete, her infant has an 8–12 week store of vitamin D,[234] after which the vitamin D content of breast milk is inadequate to meet infant requirements. In Australia, the incidence of rickets in breastfed infants is still rare, particularly in infants less than 6 months of age. Most breastfed infants receive adequate amounts of vitamin D through breast milk and casual exposure to sunlight.[235]

However, vitamin D deficiency has re-emerged as a significant paediatric health issue in specific population sub-groups.[236] Breastfed infants of dark-skinned peoples are at greater risk because their increased skin pigmentation requires considerably longer exposure to sunlight to produce vitamin D. Infants of veiled women who have limited exposure to sunlight for cultural reasons are also at risk and this may be exacerbated in those with dark skin pigmentation.[236,237]

The American Academy of Pediatrics (AAP) recommends that all breastfed infants receive a daily supplement of 400 IU (10 mcg) of vitamin D.[233] In Australia, the recommendation to use vitamin D supplements (10 mcg/day) is limited to 'at risk' breastfed infants of dark-skinned and veiled women.[236] The vitamin D status of mothers and infants in Australia requires further research due to the difficulty of balancing the risks of sun exposure against the need for vitamin D synthesis.[238]

3.5.2 Iodine

The current recommendation for daily iodine intake during lactation is 270 mcg.[230] It is difficult to obtain enough iodine through food alone, therefore daily oral iodine supplements (150 mcg) are recommended for women who are breastfeeding. Multivitamin preparations available in Australia may contain lesser amounts of iodine, so their content should be checked. Women with pre-existing thyroid conditions should seek advice from their medical practitioner before taking a supplement.[239]

3.5.3 Weight loss diets

There is some evidence that breastfeeding promotes postpartum weight loss. However, during pregnancy many women gain more weight than recommended and, even with breastfeeding, fail to return to their pre-pregnancy weight. Excess weight gain in pregnancy and failure to return to pre-pregnancy weight within 6 months postpartum can predict long-term obesity.[240,241]

There is a theoretical risk that weight reduction may compromise lactation and some argue that lactating women should not attempt weight loss before 6 months postpartum, after which time breast milk is no longer the sole source of nutrition for their infant.[242] However, evidence from a number of studies suggests that dietary restriction to promote modest weight loss has no effect on milk volume and concentration and interventions that involve moderate energy deficits, or short-term higher energy deficits, do not impair lactation.[243-245]

3.5.4 Herbal remedies

The effect of herbal remedies on lactation has not been fully explored. However, the excretion of some components of herbal remedies into breast milk is a concern, as their lipophilic chemicals may be concentrated in breast milk and transferred to the infant. More research into this area is needed before using herbal remedies when breastfeeding or giving these compounds directly to infants or children.[246]

4. Breastfeeding – Common problems and their management

Key points

- Education on positioning and attachment both during pregnancy and when breastfeeding is initiated may assist in preventing common problems.
- When problems with breastfeeding occur, it is important to identify and manage contributing factors and to provide support until the problem is resolved.
- Most problems are temporary and can be managed without discontinuing breastfeeding.

4.1 Preventing or minimising problems with breastfeeding

Many mothers experience some difficulties when breastfeeding, particularly early in the process of establishing breastfeeding (see Table 4.1). These difficulties are usually minor and can be readily overcome with advice, assistance and support.[247] However, problems that seem minor to the health worker can be major issues for the infant's parents. Adequate support in the community and in general practice – particularly through the use of lactation consultants and other trained health professionals – is of value in minimising the impact of problems on breastfeeding outcomes.[113]

Table 4.1: Prevalence of problems during breastfeeding (%)

Age of infant (weeks)						
Problem	**In hospital**	**2**	**6**	**10**	**14**	**18**
Sore nipples	46.8	15.8	5.0	2.3	2.2	0.8
Engorged breasts	22.3	2.3	1.2	0.3	0.0	0.0
'Milk too fast'	19.2	1.3	1.5	0.3	0.7	0.0
Mastitis	–	2.1	5.0	3.2	1.1	1.2
Sucking difficulty	7.0	3.6	0.3	0.0	0.0	0.0
Not gaining weight	2.7	0.5	0.3	0.3	1.1	0.0

Note: n=566 in hospital, declining to 218 at 24 weeks.

Source: Scott et al 1995.[248]

Advice for health workers

- Take steps to identify breastfeeding difficulties by asking appropriate questions during any health-related visits with the mother. Manage those difficulties if appropriately qualified, or refer to an appropriately qualified health professional for management (e.g. lactation consultant).

4.2 Maternal factors affecting breastfeeding

Note that the quality of evidence related to the management of breastfeeding problems is sometimes poor, and information in the following section is often based on good clinical practice.

4.2.1 Hygiene

Good basic hygiene is important when caring for infants. Mothers should be advised to carefully wash their hands with soap and water after changing a nappy and before handling their breasts and preparing expressed breast milk.

4.2.2 Nipple pain and trauma

Nipple pain or discomfort is common among breastfeeding women and is reported by many during the early days, peaking on the third day.[249] It is one of the most commonly given reasons for ceasing breastfeeding.[250] Despite the frequency of early difficulties, continuing nipple pain is not normal and could be a sign of problems. The nipple is vulnerable because of its repeated exposure to trauma and bacteria.

A number of causes of nipple pain have been identified or postulated. These include maternal and infant factors:[249]

- poor skin health (eczema, thrush)
- dietary deficiencies
- flat or retracted nipples
- use of nipple shields
- lack of nipple exposure to light and air
- breast engorgement
- nipple vasospasm (Raynaud's phenomenon)(see below)
- incorrect positioning of infant at the breast
- unrelieved negative pressure and breaking suction incorrectly
- incorrect sucking action
- mouth or palatal abnormalities.

Nipple pain may also be caused by local *Staphyloccus aureus* infection.[251,252]

Many interventions have been proposed to prevent or treat nipple pain. Antenatal education on positioning and attachment technique is the intervention for which there is most evidence and is recommended in preventing or reducing nipple pain associated with breastfeeding. Evidence also supports early postnatal education.[253] Common treatments for nipple pain include compresses with warm water, breast milk or tea bags; the evidence favours the use of warm water compresses. There is inadequate evidence to enable recommendation of breast shells and shields, aerosol spray, hydrogel dressing, film dressing, modified lanolin, collagenase and/or dexpanthenol.[249,253]

The ABM recommends that 'before leaving the hospital breastfeeding mothers should be able to position the baby correctly at the breast with no pain during the feeding'.[217, p. 175]

Table 4.2: Nipple care

• Avoid using shampoos and soaps on the nipples
• Air dry the nipples after breastfeeding
• If breastfeeding pads are used, replace damp pads frequently
• Generally avoid applying ointments, sprays, tinctures and powders

Table 4.3: Management of nipple pain and trauma

• Identify and treat any associated cause of nipple pain
• Correct positioning and attachment are essential (see Section 2.2.7)
• Continue breastfeeding unless the pain is intolerable or, in spite of every effort, the trauma worsens
• Except in rare circumstances, an infant who has been removed from the breast should be fed on expressed breast milk and returned to the breast as soon as possible – skilled support is usually required

4.2.3 Other nipples problems

Nipple vasospasm (Raynaud's phenomenon)

The vasospasm of extremities precipitated by cold and recognised by the symptoms of pain and tri-phasic colour change of blanching and then cyanosis and erythema (Raynaud's phenomenon) may also affect the nipple, and result in pain sufficient to interfere with breastfeeding.[254,255] Symptoms may also be precipitated by poor attachment. It is important to recognise this problem. Initial treatment is to avoid triggers of the reaction (typically cold, but also trauma). Heat packs may help to relieve pain. If these fail to resolve the issue, treatment with nifedipine has been used and appears to be safe.[254]

Nipple variation

Most women's nipples are perfectly adequate for breastfeeding, in spite of variations in shape and size. There is limited evidence that about 8–10% of women have at least one flat, non-protractile or inverted nipple (Evidence Grade D).[190,207,256,257] For some of these women, nipple variations can present difficulties when initiating breastfeeding and can compromise milk intake and interfere with infant growth.[190,207,256,257]

Previous breast or nipple surgery or nipple piercing can cause maternal discomfort, as well as difficulties in attachment and sucking, and there are concerns about potential risks to the infant if ducts are damaged and milk production is diminished.[258,259]

The evidence on the benefit of nipple preparation during the antenatal period is limited and it is not generally recommended as there are concerns that it may stimulate uterine contraction.[253,256]

Table 4.4: Supporting breastfeeding among women with significant variations in nipple shape

• If some degree of flatness or retraction is present, identify this early and advise and assist the new mother in managing these problems
• Begin breastfeeding early, preferably within an hour of birth, when the infant is alert and eager to suckle – teaching correct attachment and encouraging correct suckling action at this time may reduce the likelihood of subsequent problems
• 'Body-art' is usually important to those who have undergone piercing – this should be respected, and it is important that each case is individually assessed
• Options for managing difficulties in breastfeeding with piercings include temporary removal of the jewellery during breastfeeding until successful attachment is achieved – a retainer may be used if the mother is concerned that removal of the jewellery would cause the piercing hole to close
• If the infant cannot attach to the breast, the colostrum needs to be expressed and fed to the infant
• Support mothers through the process of establishing breastfeeding[253]

Nipple shields

Nipple shields – devices placed over the nipple and areola to facilitate attachment, usually in women with inverted nipples – have a long history of use, but little supporting evidence. Their use should be limited to situations where all other avenues of treatment have failed. If a nipple shield is needed, the woman should be referred to a qualified health professional with expertise in their use.

Dermatitis and eczema

The nipples and breasts of breastfeeding women may be affected by dermatitis and eczema. These conditions are recognised by their itchiness, redness and dry flaking skin, but sometimes may have a 'weepy' exudate. It is useful to distinguish eczema and dermatitis as either allergic or chemical:

- atopic eczema reflects an allergic disposition and the nipples are affected as part of a more generalised skin disease
- irritant contact dermatitis is a chemical reaction occurring in response to an agent being applied to the nipples
- allergic contact dermatitis is a delayed hypersensitivity reaction to an allergen in contact with the nipple – for example, an ingredient in nipple cream or even food in the infant's mouth.[260]

Table 4.5: Management of dermatitis and eczema of the nipples and breasts

• Avoid using soap and nipple creams, except for the treatment of Candida (thrush) (see Section 4.2.5)
• If a nipple cream being used to manage thrush is a suspected cause, change to another antifungal agent
• Breastfeed before offering solid foods to the infant and/ or rinse the infant's mouth with water to avoid food allergens in the mouth
• To reduce the infant's exposure, use topical corticosteroids only as a last resort
• If necessary, seek the advice of a medical practitioner[261]

4.2.4 Engorgement

Engorgement is the distension and swelling of the breast that occurs as milk production increases, typically on the third to fifth day after birth, when breastfeeding has not yet been firmly established, leading to overfilling of the breasts. It is a normal physiological event to feel breast distension when milk first comes in.

Engorgement associated with discomfort and pain is experienced by many women initiating lactation and may indicate breastfeeding problems. If not managed effectively, this can be very distressing and may progress to mastitis and abscess formation.[262-264]

There has been limited research into prevention of engorgement. The ABM suggests emptying one breast at each feeding and changing which breast is offered first.[265]

A range of approaches to managing symptoms has been advocated, including compression binders, cold packs, application of cold cabbage leaves, ultrasound, acupuncture and analgesia. It is not clear that any of these techniques offer any advantage over no intervention.[264] A single counselling session in hospital was not found to be beneficial in aiding symptom resolution, suggesting that continuing support may be necessary.[266]

In the absence of evidence to support any specific interventions, support of mothers initiating breastfeeding is recommended, with attention to attachment and sucking techniques.

Table 4.6: Management of engorgement

• Mothers can express enough milk for comfort (hand expressing is best) so that the breast is soft enough for the infant to attach
• If engorgement persists for more than a day or two (especially in the early days of lactation) the cycle can be broken by completely draining both breasts with an electric pump after a feed – this is a 'one-off' strategy that brings relief and makes it easier for the infant to attach to the breast at the next feed
• Young infants may feed 8 to 12 times in 24 hours, including several times during the night – if a mother is separated from her infant, complete expression (usually as often as the infant would breastfeed) is necessary
• Engorgement tends to decrease with time, but this advice also applies if engorgement is experienced at any time during lactation

4.2.5 Inflammatory conditions of the breast

Mastitis

Mastitis is inflammation of the breast tissue, and lactational mastitis is inflammation that arises in a lactating breast. Mastitis involves pain, swelling, redness, and often fever.[267] The definitions used in the literature are inconsistent and reflect the lack of understanding of the pathological processes involved.[268] Approximately 10–25% of breastfeeding women experience at least one episode of mastitis (Evidence Grade D).[250,269-271] Mastitis occurs more commonly with first infants and typically in the first month after birth, but can occur later.[250,270,271] Risk factors for mastitis are not well established but may include nipple damage, poor drainage of the breast and a prior history of mastitis.[151,269,272]

The literature is not clear about the role of infection in the development of mastitis.[268] There appears to be a continuum from breast milk stasis and engorgement, through non-infective inflammation to infective mastitis (cellulitis of the interlobular connective tissue). In general, mastitis is not associated with poorer breastfeeding outcomes.[207,271]

The combination of poor breast drainage and the presence of a colonising organism and lowered maternal resistance, either because of local injury (e.g. a cracked nipple facilitating entry of bacteria) or systemic vulnerability (fatigue, poor nutrition, other illness), make breastfeeding mothers vulnerable to bacterial infection.[273,274] Infective mastitis is most commonly caused by *Staphylococcus aureus,* or less commonly by a *Streptococcus* or *E. coli*.[273,274] The only way to clearly differentiate infective and non-infective mastitis early is by culture and cell count, which is often not practical. In practice, failure to resolve symptoms with simple treatments, or progression of symptoms, leads to considering a diagnosis of infective mastitis. The appearance of a breast harbouring infective mastitis differs only in degree from that of a breast with a blocked duct. In both cases, the breast will usually be red, swollen, hot and painful. The skin may appear tight and shiny and be streaked with red. The mother will be feeling unwell, with general myalgia (muscle pain) and a fever.

The ABM states the most important step in treating mastitis is frequent and effective milk removal.[273] Approaches to managing mastitis are listed in Table 4.7.

Table 4.7: Management of mastitis

• Optimise support of the breastfeeding mother with mastitis and initiate treatment promptly, as delay in treatment is more likely to lead to infection and breast abscess[273,275]
• Breastfeeding can continue – if breastfeeding is very painful, milk must be removed by expression to prevent progression of the condition
• Check the infant's positioning and attachment
• Feed the infant frequently, starting with the affected side
• If pain inhibits milk ejection, begin feeding on the unaffected side, and switch breasts as soon as milk ejection occurs
• A warm cloth can be applied before and during a feed to assist milk ejection; a warm shower before the feed may also help
• The affected area can be gently massaged towards the nipple while feeding or expressing
• Cold packs can be applied for comfort after feeding
• Simple analgesia can be taken as needed – paracetamol or ibuprofen, four-hourly
• When treated promptly, a blocked duct should clear in 24–48 hours[273]

If symptoms persist after trying these measures, antibiotics should be started early and continued for 10–14 days.[273,274] It is safe to continue breastfeeding when taking antibiotics. Culture of the milk is usually not practical or necessary. As noted, Staphylococcus aureus is the most common cause, and suitable antibiotics are Flucloxacillin (first line) or Cephalexin (if allergic to penicillin).[273,274,276] On completing a course of antibiotics, the mother may need reassessment by her GP to ensure that the mastitis has resolved completely.

Hospitalisation and intravenous antibiotics may be required in severe infections. Adequate analgesia should be provided, and bed rest and an adequate fluid intake encouraged.

Mastitis may be a reason some women cease breastfeeding and infant feeding guidance and support should be available to all mothers.

Breast abscess

A breast abscess is a serious and painful complication of mastitis that occurs when there has been inadequate treatment or where treatment has been delayed. Breast abscess occurs in approximately 0.1–0.5% of breastfeeding women (Evidence Grade D)[270,277] and in approximately 3–10% of breastfeeding women with inflammatory symptoms of the breast (Evidence Grade D).[270,277] Ultrasound examination is useful in confirming the presence of an abscess if suspected because of localised mass and fever.[270,273,274] Breastfeeding should continue on the unaffected breast.

The abscess may be managed with needle aspiration or surgical incision, but unless the position of the incision makes it impossible, breastfeeding should continue, or resume, once treatment has started.[270,273,274] If breastfeeding is not possible, expressing from the affected breast is recommended to prevent complications such as engorgement.

It is important to note that continuing breastfeeding is not harmful to the infant and is important for resolving both mastitis and abscesses. As with mastitis, a breast abscess may be a reason some women cease breastfeeding, and infant feeding guidance and support should be available to all mothers.

Candida infection

Candida species are dimorphic yeasts that exist as spores and as hyphal forms. They are widespread in the environment and are commensal inhabitants of the skin and gastrointestinal tract. They are capable of opportunistically proliferating to cause topical infections and of invading tissues. Candidiasis is most commonly recognised as an oral infection of young infants or vulvo-vaginal infections of women (thrush).

The literature on Candida infection of the nipple and breast is largely confined to case reports and it is difficult to confirm true breast infection, given the high prevalence of cutaneous colonisation with Candida species and that no studies have reported isolation of the organism with ductal cannulation, excluding contamination from skin.

Symptoms of shooting, burning pain 'like red-hot needles' that radiates from the nipple into the breast have been ascribed to Candida infection.[278] Unfortunately these symptoms do not consistently correlate with laboratory identification of Candida. A 2004 study reported the presence of three or more symptoms or flaky, shiny skin at the areola as weakly predictive of Candida in breast milk.[279] In contrast, a recent study failed to find any link with the typical symptoms attributed to Candida infection.[280] The diagnosis of Candida infection of the nipple/ breast should be made after considering all differential diagnoses (nipple trauma, bacterial infection, dermatitis, nipple vasospasm). Oral antifungal treatment may be considered in women where Candida infection is likely (e.g. prior history of Candida infections, recent antibiotic treatment).

Clear identification of cutaneous candidiasis warrants topical treatment – miconazole or nystatin have been recommended as suitable antifungal agents for topical application to the nipples while simultaneously treating the infant with an oral preparation.[278] There are no controlled trials of topical antifungal treatment of ductal infections. Treatment should continue until mother and infant have been symptom-free for several days. Breastfeeding can continue during treatment.

4.2.6 Blood in the breast milk

Blood in the breast milk occasionally occurs in late pregnancy or in the first few days after delivery. It sometimes manifests when the infant vomits blood. The cause of bleeding into the breast milk is often not clear but it is thought to be due to duct hyperplasia. When excess duct cells are dislodged during feeding or expressing, bleeding may result. Since only a small amount of blood is involved, it will not upset the infant and breastfeeding can continue as normal. Sometimes it may be due to damage to the nipple. If bleeding persists beyond a few days, medical review is recommended to rule out maternal bleeding disorders. Young infants who vomit moderate amounts of blood they have swallowed during feeding will require medical review to rule out illness.

4.2.7 'Too much milk'

When an infant is not removing the milk effectively, there might be a perceived 'oversupply' of milk (see also Section 4.2.4). Some women find they initially have so much milk that it causes temporary difficulties. This is more common in the early days of breastfeeding because the breasts have the potential to feed more than one infant. But as an infant continues to feed, local autocrine control of milk production helps to balance the amount of milk produced with the amount the infant is taking.

Table 4.8: Management of women with 'too much milk'

• Provide reassurance that it is usually a temporary problem and will resolve with time
• Try temporarily feeding on one breast only at each feeding time. The infant is put back on the first breast instead of being offered the second breast (note: an adverse outcome of this approach could be mastitis)
• Provide symptomatic relief – cold packs, simple analgesia (paracetamol) and breast support
• Expressing a small amount of milk at the beginning or end of feeds will help to ease discomfort. It may prolong the excess production but it can be a more comfortable approach while the milk supply is settling down. The expressed milk can be saved and stored for future use (see Section 5.3)

4.2.8 'Too little milk'

Mothers are often concerned that they are not producing enough breast milk. Evidence suggests that approximately 25–35% of women reduce breastfeeding duration or level due to perceived breast milk insufficiency (Evidence Grade C).[281-284] However, there is little evidence of inability to produce adequate milk, except in rare circumstances related to maternal illness.

Mothers can be reassured regarding the adequacy of their milk volume and quality if the infant:

- is fully breastfed – that is, receiving no other fluids or solids – and producing six to eight very wet nappies of pale, inoffensive-smelling urine in a 24-hour period
- has appropriate weight gain when averaged out over a 4-week period, remembering that infants often lose 5–10% of their birth weight during the first week (see Section 3.4.5)
- is alert, with bright eyes, moist lips and good skin tone
- is reasonably content for some time between some feeds.

Reassure mothers that there is no evidence for any physiological reason why a previously breastfed infant would suddenly be incapable of breastfeeding and yet still be capable of bottle-feeding. If the infant has an illness underlying the breast refusal then breast milk is the best immunological support for the infant's recovery.

If these conditions are not met there may be a temporary problem with the adequacy of the milk volume, which can compromise initiation or maintenance of breastfeeding.

Table 4.9: Factors that can contribute to inadequate milk volume

• Poor attachment or frequent disruption so that there is inadequate stimulation of breast milk production
• Not feeding often enough
• Use of nipple shields
• Abnormal nipples
• Maternal nicotine or other substance abuse
• Maternal under-nutrition (only in severe cases, very rare in Australia)
• Maternal illness
• Demands (such as work) which limit the mother's time for breastfeeding
• Use of pacifiers or dummies and the use of supplementary feeds

Sources: Dearden et al 2002[285] and Powers 2001.[286]

It is difficult to demonstrate low milk volume. Measurement of breast milk volume following expression is used to assess breastfeeding adequacy, but has not been systematically evaluated. It is possible that milk production during expression may be less than the infant gains from natural breastfeeding and this could concern the mother unnecessarily.

Management

Attention to ensuring adequate milk supply should occur across a continuum, with emphasis on prevention that merges with treatment strategies. Low supply of breast milk is usually a temporary difficulty that only occasionally becomes a continuing problem requiring supplementation.

Table 4.10: Strategies to ensure adequate milk supply

• Check positioning and attachment
• Feed more frequently – offer the breast between the usual feeds; offer the breast as a comforter instead of a pacifier; wake the infant and offer an extra feed before going to bed
• Allow the infant to finish the first breast before offering the second breast
• Always feed from each breast more than once each feed
• Express milk between feeds

It is important that health workers recognise the signs and symptoms of insufficient milk, including infant lethargy and/ or irritability, jaundice, infrequent stools, and scant urine production or infrequent urinating. Any failure to gain weight or excessive weight loss (7–10% of birth weight) over a period of 4 weeks should be assessed. In the first 2 weeks, weight loss over 2 or more days should be investigated. Intervention is vital if an infant's health might be jeopardised and should include a full assessment of lactation and a plan that preserves breastfeeding.

As well as the strategies outlined in Table 4.10, good maternal nutrition and rest should be encouraged:

- recommend a healthy, well-balanced diet
- discourage excessive exercise and weight-loss diets
- ensure adequate fluid intake by encouraging the mother to drink a glass of water every time she breastfeeds and when thirsty
- encourage rest and relaxation
- suggest frequent skin-to-skin contact, breast massage and nipple stimulation.

Galactogogues (substances that promote breast milk supply) were recently reviewed in an ABM protocol.[287,288] Both metoclopramide and domperidine have been used as galactogogues, and domperidone has been tested in a randomised trial.[289,290] Recently, recombinant human prolactin has been shown to be an effective galactogogue in a limited open label trial.[291] These drugs have not been approved for use as galactogogues in Australia. Any use would be 'off label' and medical advice should be sought.

If the infant requires supplementation, this can best be achieved by using a supplementary nursing system available from the ABA or some pharmacies. Such a system consists of a plastic container of expressed breast milk or formula hung around the mother's neck. A fine tube leading from it is taped to the mother's breast near the nipple, and as the infant sucks on the breast he or she gets milk from the breast and expressed milk or formula from the supplementary nursing system. This helps to ensure that the infant receives adequate milk intake, while stimulating breast milk supply. Mothers using a supplementary nursing system when discharged from hospital need specific follow-up and referral to a health professional. Careful washing and drying of the system is essential.

These strategies should only be implemented with the support of an appropriate health professional. It should be acknowledged that these conditions and their management may be stressful and upsetting to some mothers, and support and counselling should be available.

4.2.9 Postnatal depression and other mental health disorders

Mood changes are common during and after pregnancy, occurring in up to 85% of women in the first week after the birth and peaking on the third to fifth day.[292] These mood changes vary from tearfulness to elation and irritability or increased sensitivity. Mood changes beyond this time may suggest more significant mental health disorders, including depression, anxiety and psychosis.[293]

Postnatal depression (Edinburgh Postnatal Depression Scale [EPDS] ≥ 12) affects approximately 10–15% of women within 12 months of delivery (Evidence Grade B), and appears to occur in all cultural groups.[294-296] Many epidemiological studies have documented the prevalence of postnatal depression around the world.[297] A review of 59 studies showed that the mean prevalence of postnatal depression was 13%, with onset mostly within the first 3 months after the birth.[298] More recent studies have concluded that 7% of women experienced a major depressive episode within 3 months of the birth and, when cases of minor depression were included, the 3-month period prevalence rate was 19%.[299]

Adverse effects associated with postnatal mental health disorders

Breastfeeding initiation and duration

Postnatal mental health disorders may interfere with the mother–infant relationship and make breastfeeding difficult to establish. Studies in multiple countries have confirmed the relationship between postnatal depression and early discontinuation of breastfeeding. An Australian longitudinal study (n=1,745) found that postnatal depression was significantly negatively associated with breastfeeding duration, and that women who experience postnatal depression have a greater risk of stopping breastfeeding than women who do not.[300] The same association was seen in studies in the UK, Canada and the US.[301-303]

The literature review also found evidence suggesting that postnatal depression is associated with a shorter breastfeeding duration (Evidence Grade C)[153,300,304,305] and with psychological attachment difficulties, behavioural abnormalities and growth disturbance in the infant because of breastfeeding difficulties.[153,300,304,305]

Growth faltering in infants

Several studies, particularly in developing countries, have shown that postnatal depression can influence infant growth. An analysis of the relationship between postnatal depression and growth faltering[305] noted that – in addition to the confounding effects of poverty, parental education and birth weight – the effects of depression such as tiredness, worthlessness and psychomotor slowing can affect the mother's ability to provide proper care, and may interfere with infant growth. It is important to note that the effects upon growth are not long-term.[152,306]

Risk factors for postnatal depression

There is considerable variation in the risk factors reported for developing postnatal depression in different countries around the world. A meta-analysis of 44 studies found that 'prenatal depression', 'child care stress', 'life stress', 'social support', 'prenatal anxiety', 'maternity blues', 'marital dissatisfaction', and 'history of previous depression' are predictor variables of postnatal depression.[307] Several other meta-analyses have found that factors with moderate to strong association with postnatal depression include 'depression and anxiety during pregnancy', 'postpartum blues', 'previous history of depression', 'stressful life events', 'a poor marital relationship', and 'poor social support'.[308-311] Other risk factors such as 'low socioeconomic status', 'obstetric factors', and 'difficult infant temperament' were less strongly related to postpartum depression.[308,311]

Identifying postnatal depression

Depression is characterised by desolation, sadness, anxiety, fears, irrational thoughts, feelings of inadequacy, loss of libido, tiredness, and dependency.[312] Epidemiological studies usually define postnatal depression as beginning within 12 weeks of birth.[313,314] The onset of postnatal depression is usually within the first 4 weeks after the birth.[315] In addition, a major depressive episode should be defined as occurring for 2 weeks or longer during which a woman has either depressed mood or feeling of inadequacy or pleasure in activities which are different from normal functioning.[295] As well, the presence of four or more additional symptoms such as significant weight loss when not dieting, weight gain, change in appetite, insomnia, hypersomnia, psychomotor agitation, and retardation almost every day is required for a diagnosis.[295]

Screening for postnatal depression most commonly uses the EPDS,[316] which is the only validated screening tool. The EPDS is not diagnostic, and is not appropriate for screening for the more severe perinatal mental health disorders (e.g. postpartum psychosis), nor does it adequately screen for anxiety disorders. The use of the EPDS is described in clinical practice guidelines on assessing and treating depression and related disorders in the perinatal period.[317]

Table 4.11: Recognising postnatal depression

• The preferred method for identifying women with symptoms of postnatal depression is the systematic use of a validated screening tool, such as the EPDS, at postnatal follow-up (see Appendix K)
• Ask mothers if they feel down or anxious – many women with postnatal depression report anxiety as a primary symptom (e.g. excessive worrying about their own or their infant's health) rather than depressed mood
• Ask mothers about disordered sleeping, either inability to sleep despite being exhausted and their child sleeping, or excessive sleeping and inability to get out of bed
• Ask mothers if they are losing or gaining weight or have a poor appetite – many women with postnatal depression report a poor appetite, but eat because they need to keep their strength up or for breastfeeding, and may gain weight

Source: Chaudron et al 2008.[318]

Safety

Very severe mental health disorders can threaten the safety of both mother and infant.[293] It is important to distinguish the woman with postnatal depression whose intrusive thoughts or fears of harming the infant are incongruent with her wish to keep her infant safe, from the woman with postpartum psychosis who is delusional. Mothers who experience intrusive thoughts do not wish to harm their children and may avoid the topics of their fears (e.g. a mother is afraid her infant will drown and therefore always has her partner bathe the infant). A woman who is delusional may have thoughts of harming her infant to 'save the infant from the devil or a life of torment'.

Delusional mothers (e.g. in postpartum psychosis) are at great risk of harming their infants or themselves and must be immediately evaluated by a psychiatrist.

Table 4.12: Assessing safety of the infant

• Ask mothers directly but in an open, non-threatening manner about any intrusive thoughts or fears of harming their children – e.g. 'Many new mothers feel anxious about their new baby. They may have thoughts that are unusual or frighten them, such as fears that they may harm their baby. Does this ever happen to you?'
• Ask mothers if they have concerns or questions about adapting to a new infant
• Consider the mother's interactions with the infant, including the responsiveness of mother and infant

Source: Chaudron et al 2008.[318]

Managing postnatal depression and other mental health disorders

Due to the risks associated with untreated postnatal depression, the ABM strongly recommends treatment.[318] Women with severe postnatal depression and other mental health disorders should be referred for expert psychiatric care. Some women will need hospitalisation, with others requiring intensive outpatient treatment and support.[293]

There is evidence that counselling, psychotherapy and support can have a beneficial effect on postnatal depression.[292,319] Pharmacotherapy is commonly used for treating postnatal depression. The evidence is based principally on case studies and open trials, with only modest evidence from randomised trials.[292,297,320-323] There is, however, a strong body of opinion about the benefits of antidepressants, particularly selective serotonin reuptake inhibitors (SSRIs), for treating postnatal depression.[292]

The use of pharmacotherapy needs to be weighed against potential risks to the breastfeeding infant. A limited number of studies have assessed levels of antidepressant medications in breast milk.[297,324,325] Current evidence suggests that paroxetine, sertraline and nortriptyline are unlikely to be excreted in the breast milk at high levels. Fluoxetine and citalopram should be used cautiously because of higher levels of excretion into breast milk in some individuals. It is not clear if exposure to these medications early in life can have long-term neurocognitive effects. The mood-stabilising salt lithium has generally been considered contraindicated for mothers who are breastfeeding because of concerns that the newborn infant's kidneys will not clear the salt and are especially vulnerable to toxic effects. A recent study documented low lithium levels in a group of breastfed infants of mothers taking lithium, so it may be considered in some circumstances.[326]

Despite these known and potential risks, it is worthwhile encouraging mothers with postnatal depression to breastfeed. In addition to the nutritional benefits of breastfeeding, successful breastfeeding can enhance bonding and increase maternal self-esteem. Mothers treated for postnatal depression and other mental health disorders will, however, need extra help and support to initiate and maintain breastfeeding, because of the challenges of developing an attachment to the infant, and, if receiving SSRIs, because these medications have the potential to inhibit milk secretion.[327]

4.3 Infant factors affecting breastfeeding

The quality of evidence related to management of breastfeeding problems is sometimes poor. The information in the following section is often based on good clinical practice.

4.3.1 Breast refusal

Breast refusal is sometimes stated as a reason for ceasing breastfeeding – numerous causes have been postulated, but often no cause can be found. There is no accepted definition of breast refusal, and no literature that informs management of this problem. Possible infant-related causes of breast refusal include infectious illness (e.g. respiratory illness causing a blocked nose and/ or ear infection, or thrush) and distraction while feeding. Possible mother-related causes include a change in perfume or talcum powder, mastitis (which may lead to salty-tasting milk), an unwell mother (with decreased milk supply), postnatal depression, medication altering the taste of milk and hormonal changes (including around ovulation, menstruation and pregnancy), which may affect both the taste and the supply of milk.

Table 4.13: Management strategies for breast refusal

• Reassurance – encouraging mothers to relax and not to perceive breast refusal as a personal rejection. They need to know this is usually a temporary situation. Support from their health professional or ABA counsellor is extremely important
• Stopping the feed when the infant cries and refuses the breast
• Feeding the infant when he or she is drowsy, either when just waking up or just going to sleep
• Encouraging the infant to suck on a clean finger and then slipping the nipple into his or her mouth
• Calming the infant by singing, rocking or massaging the infant before feeding
• Trying alternative feeding positions
• Expressing milk into the infant's mouth
• Expressing milk and feeding the infant with a cup or bottle
• Dealing with any underlying causes of an unwell infant

4.3.2 The crying infant

Parents of one in five Australian infants report concerns with crying and fussing, and many will seek medical advice, despite the fact that crying is a part of normal infant development. The median crying time at age 6 weeks is almost 3 hours per day, and crying is most common in the afternoon and evening.[328-331] Despite the fact that disease is diagnosed in less than 5% of such infants, they are at risk of medicalisation of their behaviour, and of diagnosis of a range of disorders, including colic (unsettled infant), 'silent reflux' and lactose intolerance.[332] They are also at risk of early cessation of breastfeeding.[329]

Changes in diets and restrictions on individual foods have had very limited success in treating colic. Research into this common area of concern continues, but at this point no specific dietary recommendations for treating colic can be made.

Advice for health workers

- Ensure that any dietary modification or pharmacological intervention for managing excessive crying is safe and does not result in nutritional deficiencies.

Assessment

When confronted with infants who are crying excessively, health workers should exclude simple environmental and local stimuli such as being too hot, too cold or suffering from a rash such as chemical dermatitis. Excessive hunger due to inadequate milk is rare. Growth and development should be assessed. Crying and fussing infants who need additional assessment include those who have associated fever, vomiting, offensive urine, ear discharge, failure to gain weight, failure to achieve normal developmental progression or abnormalities of head growth and those who have obvious bruising.[330,332] It is important to explore potential parental factors such as parental depression and anxiety, which are risk factors for reporting excessive infant crying.[333,334]

Education and support

For many parents, an explanation of the natural history of infant crying and fussiness, plus a demonstration of normal growth and development, will allay their anxieties and enable them to deal positively with their infant. Some parents will need ongoing education and help to cope with their infant's crying.[329]

Interventions

Wide-ranging advice is offered to parents about how they might intervene and reduce excessive infant crying. Most of this advice, including that related to changing milks, reducing or increasing stimulation, massage and manipulation, is not supported by evidence from randomised controlled trials.[335] Mothers should be advised not to switch from breastfeeding to formula, as may be encouraged by well-intentioned friends and family members.

4.3.3 Regurgitation and gastro-oesophageal reflux

Gastro-oesophageal reflux (GOR) is the regurgitation of stomach contents to the oesophagus, mouth, or externally, and is recognised by regurgitant vomiting or spilling of feeds. It is common in infancy with more than half of children reported to have GOR at 3–6 months of age.[32,336,337] In the majority of infants, GOR spontaneously resolves by 12 months of age. Limited data suggest that breastfeeding neither causes nor protects against GOR, although fully breastfed infants tend to regurgitate less frequently than those who are formula or partially breastfed.[32,336,338]

Assessment of gastro-oesophageal reflux

In assessing an infant with GOR, it is essential to consider other causes of vomiting including systemic and enteric infections, intestinal obstructions including pyloric stenosis, metabolic disease and neurological disorders. Regurgitant vomiting is the main symptom of GOR. A range of other symptoms is ascribed to GOR, but it is not always possible to confirm the relationship between GOR and the particular symptoms. For most infants there is no association between GOR and disease.[32,336] A small group of infants will develop complications of GOR including gastroesophageal reflux disease (GORD), poor weight gain and growth, respiratory disease or oesophagitis. Clinical history of regurgitant vomiting plus poor growth or haematemesis (vomiting blood), apnoea or respiratory symptoms, anaemia, or abnormal posturing, warrant a careful medical review and sometimes more detailed investigation.[339]

Infants with irritability and feeding refusal are more difficult to assess for GOR. An Australian study of infants aged 0.5–8.2 months who presented with persistent fussiness found no association between the number of episodes of acid reflux or the total period of acid exposure of the oesophagus and GOR.[340] The study also found no association between back-arching and acid reflux and concluded that, in the absence of frequent vomiting, GOR is unlikely to account for fussiness in infancy.

Management of gastro-oesophageal reflux

Although GOR is sometimes distressing for parents, and about 20% will seek medical advice, it is important to emphasise the generally benign nature and course of this condition, with its tendency to spontaneously resolve by 12 months of age. Therapeutic intervention is usually reserved for infants who have complications of GOR. Specialised assessment and investigation may be required to clarify the presence and extent of complications. For complicated GOR, treatment typically employs a series of interventions, ranging from modification of feeding patterns to surgery.[339]

Change in feeding pattern

Initial treatments are likely to be modification of volume or duration of feeds, and changes in posture, although there is minimal evidence to support changing feed volume[341] and some evidence that even small intragastric volume change may induce gastro-oesophageal sphincter relaxation in some infants.[342] There is no evidence to suggest that stopping breastfeeding is beneficial for GOR.

Feed thickening

Thickening of feeds (using a range of thickening agents) has some benefit in decreasing the amount regurgitated, but is not effective in decreasing the number of episodes of GOR or acid exposure, and thus has no real place in the management of complicated GOR.[343] In addition, feed thickeners cannot be used in breastfeeding. Some have also been shown to have adverse side effects, including delaying gastric emptying and increasing GOR.[344]

Posture

GOR is decreased in infants in the prone position compared with the supine position, and in the head elevated position compared with the flat position.[339,345-348] Recently the supine position at an elevation of 40 degrees was shown to be beneficial in an open trial.[339] However, the prone position is associated with increased risks of SIDS and should not be used for sleeping infants.[339,349]

Medication

Prokinetic agents which increase lower oesophageal sphincter pressure or enhance gastric emptying have been used to treat GOR in children, although there are only limited data supporting efficacy, there are associated complications, and an expert group recently concluded that there is no justification for their routine use.[339,350,351]

Proton pump inhibitors (PPIs) are widely prescribed for presumed symptoms of GOR. They effectively decrease acid production, and with this volume of gastric secretions may potentially decrease refluxate volume, but they decrease GOR symptoms only as often as a placebo.[352] PPIs increase the risks of a number of complications, including community-acquired pneumonia and enteric infections and should only be used for extended periods where oesophagitis has been confirmed.[339,352] Other acid modifying agents are not particularly useful for managing oesophagitis.[339] The H_2 receptor antagonists (cimetidine and ranitidine) are not as effective as the PPIs because of rapid development of tolerance to their effect, and antacid suspensions do not affect gastric pH and can lead to excess ingestion of aluminium.

Surgery

Infants with persistent GOR with serious complications, despite medical therapy, should be considered for anti-reflux surgery. It is important to note that anti-reflux surgery can be lifesaving, but carries risks of significant complications.[339]

4.3.4 Eosinophilic oesophagitis

There is an increasingly recognised group of infants who have some evidence of allergic disease or eosinophilic oesophagitis, sometimes in association with GOR.[353] These children are often clinically indistinguishable from infants and children with reflux oesophagitis, and will need detailed assessment including endoscopic biopsy for diagnosis.[354] If formula fed, these infants may benefit from antigen elimination by switching from a standard to a hydrolysed or amino acid-based (elemental) formula under medical and dietetic supervision.

4.3.5 Physiological jaundice

Jaundice in the first week of life occurs in 60% of healthy newborn infants and 80% of preterm infants, reflecting an imbalance between bilirubin production from breakdown of red blood cells and clearance of bilirubin by conjugation with glucuronic acid in the liver and secretion as a water-soluble glucuronide.[355] Factors promoting jaundice in the newborn include increased red blood cell turnover, impaired conjugation and increased enterohepatic circulation associated with slow intestinal transit. The jaundice typically develops between the second and fourth day of life, and is cleared by about a week, or slightly longer in preterm infants. Delay in clearance of meconium delays clearance of bilirubin.[356] The ABM recommends early, frequent breastfeeding to enhance clearance of bilirubin.[357]

While physiological jaundice is benign it is important to recognise pathological forms of jaundice – severe unconjugated hyperbilirubinaemia, because of its potential to cause brain damage, and conjugated hyperbilirubinaemia, because of its association with chronic liver disease. All newborn infants who are jaundiced in the first 24 hours of life, who are deeply jaundiced, or who are jaundiced beyond 2 weeks of age should have total and conjugated levels of bilirubin estimated and attempts made to determine the cause of the pathological jaundice.[358] If serum levels of unconjugated bilirubin are significantly elevated, phototherapy may be used to enhance elimination of bilirubin. Breastfeeding should be maintained during phototherapy, with the infant removed from the phototherapy unit for feeding.[359] The AAP graded the quality of evidence C (benefits exceed harms) for this recommendation.[360] If additional fluids are required, breast milk is the fluid of choice.[358] The UK National Institute for Health and Clinical Excellence (NICE) has developed detailed clinical guidelines for the management of neonatal jaundice.[361]

4.3.6 Breast milk jaundice

As many as a third of otherwise healthy, breastfed infants will develop jaundice in the first 3 weeks of life, often after the first week, with persistent unconjugated hyperbilirubinaemia.[362] The cause of breast milk jaundice is not well understood, but is distinct from inadequate fluid intake. Before breast milk jaundice is diagnosed, it is important to ensure that the infant has adequate fluid intake and to rule out haemolytic disease, hypothyroidism, galactosaemia and intestinal obstruction. If levels of unconjugated bilirubin remain very high, disorders of bilirubin conjugation need to be considered.

Breast milk jaundice is a benign disorder, and has not been associated with kernicterus (bilirubin-induced brain dysfunction). Once a diagnosis of breast milk jaundice is established, no further investigation or treatment is required. Most infants will be clear of jaundice by 12 weeks of age.[362]

4.3.7 Ankyloglossia (tongue-tie)

Ankyloglossia or 'tongue-tie' is a developmental variant in which the tongue has limited mobility within the mouth due to a thickened or shortened lingual frenulum. There is limited evidence that 'tongue-tie' occurs in approximately 4–10% of healthy newborn infants (Evidence Grade D).[363,364]

Opinion differs regarding the effects of tongue-tie upon breastfeeding, compounded by inconsistency in definition of the anomaly.[364] There is limited evidence (Evidence Grade D) to suggest that infants with 'tongue-tie' more commonly experience breastfeeding difficulties.[363,365]

The presence of an abnormal lingual frenulum does not preclude successful breastfeeding, although additional support and counselling of the mother may be required.[363,365,366] While surgical management of tongue-tie has been tried (frenulotomy, frenectomy or frenuloplasty), further controlled trials are required.

4.3.8 Oropharyngeal dysphagia

The normal development of sucking and swallowing behaviour involves the progressive coordination of breathing, sucking and swallowing so that by 36 weeks gestation these activities are well coordinated. Much of the behaviour that facilitates infant feeding is reflex, including the rooting reflex (involuntary turning of the head towards the breast when the cheek is stroked), the suck-swallow reflex (in response to stimuli in the mouth) and the gag reflex (in newborn infants, stimulation of the anterior three-quarters of the tongue results in pharyngeal constriction and elevation).[367] A small number of infants are believed to be especially sensitive to oral stimulation, with induction of reflex responses, including tongue protrusion.[367] There are no well-established therapeutic approaches to these children, but in general, patient attempts at establishing breastfeeding will be rewarded as the neurological components of sucking and swallowing mature.

5. Expressing and storing breast milk

Key points

- Expressing breast milk can assist with some breastfeeding problems and allows continuation of breastfeeding if mother and infant are temporarily separated.
- Expressed breast milk can be safely stored in the refrigerator or freezer for limited periods of time.

5.1 Expressing breast milk

Almost all breastfeeding mothers in Australia express breast milk at some time before their infant is 6 months old. An online survey of Australian mothers who were members of the ABA found that 98% of respondents (n=903) had expressed breast milk.[368] In the US, the National Infant Feeding Practices Study found that 92% of breastfeeding women had expressed breast milk at some time.[369] In the Perth Infant Feeding Study, at 1 month 76% of mothers had expressed breast milk, increasing to 84% at 5 months.[370] Mothers who expressed breast milk were more likely to breastfeed to 6 months (any breastfeeding), but expressing breast milk is not an essential component of successful breastfeeding.

Teaching mothers how to express and the appropriate use of expressed breast milk may be a means of helping mothers achieve 6 months of predominant breastfeeding while giving more lifestyle options.

Measurement of breast milk quantity obtained by expression is not an appropriate way of measuring the adequacy of breastfeeding because of the variation in individual feeds. No published studies in English have evaluated assessment of breastfeeding in this way, but there are a number of theoretical difficulties associated with this procedure:

- mothers not familiar with expression may have difficulty with the procedure
- there is no evidence that measuring one or two breast milk expressions is useful in assessing breast milk adequacy
- it is beneficial to the infant for breastfeeding to continue.

Assessment of overall infant growth is the most appropriate way to assess breastfeeding adequacy.

5.1.1 Indications for mothers to express breast milk

In the Perth Infant Feeding Study, the most common reason for expressing breast milk was to manage difficulties in breastfeeding, usually due to distended breasts or mastitis.[370,371]

Other reasons given by mothers include:

- the infant is sick or preterm
- mother and infant are or will be temporarily separated
- the mother is returning to paid work
- the milk supply needs to be increased
- the mother's breasts are uncomfortably full.

In the US, most descriptive papers report mothers expressing breast milk when returning to paid work. The requirements for collecting breast milk for sick or preterm infants in hospital are more stringent than

those applying to collecting milk for healthy infants at home. Midwives, lactation consultants, early childhood nurses and ABA counsellors are available to provide advice about expressing.

There are three methods of expressing – hand expressing, hand pump or electric pump. The mother's choice will depend on her reason for expressing, cost, duration of expression and her personal preference. A Cochrane review demonstrated that, overall, electric or foot operated pumps are more efficient than hand expression.[372]

The ABM protocol for expression and storage of breast milk states:[373]

Women should wash their hands with soap and water, or a waterless hand cleanser if their hands don't appear dirty, before milk expression. Unclean hands may transmit viruses and bacteria, some of which can cause illness. Studies show that human milk containing fewer bacteria at the time of expression develops less bacterial growth during storage and has higher protein levels compared to milk that has an abundance of bacteria. As long as the appropriate steps are taken for hand cleansing and cleaning of pump parts as per the pump manufacturer, there does not seem to be a difference in milk contamination with pumping versus manual expression.

Table 5.1: General principles for expressing breast milk by any method

• Express in a comfortable, private place
• Disable the telephone
• Have a glass of water nearby
• Have all expressing equipment ready
• Relax! Music may help

5.1.2 Hand expression

Every mother should be shown how to hand express her milk, regardless of whether she chooses other methods to use in the longer term.[217] This method has many advantages – it is convenient and the skin-to-skin contact stimulates milk production. Many women find that hand expressing becomes easier with practice.

Table 5.2: Steps for expressing breast milk by hand

• Wash hands with soap and warm water (cold hands can cause the process to take longer than warm hands)
• Hands must be thoroughly dried with a clean towel, single-use towel or hand dryer[374]
• Gently massage the breast – start from the top of the breast and stroke towards the nipple, massage the underside too and repeat several times to ensure that the whole breast is massaged
• Hold a clean plastic dish under the breast to collect the milk – this may be difficult for some mothers to manage when they are learning and, instead, a wide bowl can be held between the legs or placed on a low table, leaving both hands free, a towel may be needed to catch any spills
• Place thumb and finger diagonally opposite each other on the edge of the areola
• Gently press inward towards the centre of the breast, squeezing the finger and thumb together
• Repeat with a rhythmic rolling movement, feeling for the milk sinuses – the fingers should not slide over or pinch the skin
• Once the milk flow has stopped, move the fingers around the nipple and press again – this helps express more milk and empty all sectors of the breast
• Repeat the process on the other breast
• If more milk is required, the mother can change from breast to breast until she has the amount of milk needed or she can wait and try again later
• Pour the collected milk into a storage container and put it in the refrigerator (see Section 5.3)

5.1.3 Hand pumps

Hand pumps are portable and relatively inexpensive. Many types are available and should be used according to the manufacturers' instructions.

Table 5.3: Steps for expressing breast milk using a hand pump

• Wash hands with soap and warm water
• Have a clean, sterilised pump ready
• Gently massage the breast – start from the top of the breast and stroke towards the nipple, massage the underside too and repeat several times to ensure that the whole breast is massaged
• Place the flat rim of the breast cup on the breast, centring the nipple
• Gently work the pump with a smooth action, pulling the piston and releasing the suction rhythmically – by releasing the suction, the blood circulation to the areola and the nipple will be maintained
• Continue working the pump until the breast is soft and about half the required amount of milk has been expressed
• Change to the other breast and repeat the process, starting with the gentle massage
• If more milk is required the mother can change from breast to breast until she has the amount needed or she can wait and try again later
• Pour the collected milk into a storage container and put it in the refrigerator (see Section 5.3)

5.1.4 Electric pumps

Electric breast pumps may be preferable for longer-term use. Electric breast pumps can be purchased or hired from many pharmacies or from the ABA.

Table 5.4: Steps for expressing breast milk using an electric pump

• Wash hands with soap and warm water
• Have the sterilised pump equipment ready
• Gently massage the breast – start from the top of the breast and stroke towards the nipple, massage the underside too and repeat several times to ensure that the whole breast is massaged
• Hand expressing for a few minutes before and after pumping can optimise milk output
• Place the breast cup on the areola, centring on the nipple
• Ensure that the flange is the correct size – women with larger nipples may need a larger flange
• Turn the suction strength to low, start the pump, and relax
• Gradually increase the suction strength – as long as there is no discomfort. The strength should not be increased above the recommended level for the type of pump being used. High levels of suction do not increase milk production
• Continue until the breast is soft and about half the required amount of milk is collected
• Change the cup to the other breast, turning the suction to low, and repeat the process, beginning with the gentle breast massage
• If more milk is required, the mother can change from breast to breast until she has the required amount or she can wait and try again later
• Pumping both breasts at the same time (double pumping) may increase milk yield and saves time
• Pour the collected milk into a storage container and put it in the refrigerator (see Section 5.3)

5.2 Feeding with expressed breast milk

Expressed breast milk can be fed to an infant by bottle, cup or spoon. Whether a bottle, a cup or a spoon is used, the same procedures for sterilisation and storage apply (see Section 8.3.3).

Health workers should advise against top-up feeding (i.e. adding infant formula to expressed breast milk) when mothers perceive that their infant is not getting enough breast milk.

5.3 Storage of expressed breast milk

As for collection, the requirements for storing breast milk are more stringent for sick or pre-term infants in hospital than for healthy infants at home. The literature review identified evidence suggesting that the maximum storage time of breast milk under clean conditions in a refrigerator at 0–4°C is 96 hours (Evidence Grade C).[375] Note that breast milk storage guidelines vary.

5.3.1 Storing breast milk in hospital

Storage of breast milk in hospital is out of scope for these guidelines – reference should be made to specific guidelines available for hospital milk banks.

5.3.2 Storing breast milk at home

The ABM has recently updated its protocol for storing breast milk for home use.[373] The safety measures for storing breast milk outlined in these guidelines are consistent with the recent ABM protocol. Breast milk can be stored in glass or plastic containers, including sealable plastic bags. Freshly expressed milk that is being refrigerated or frozen should be stored in a new container rather than added to previously refrigerated or frozen milk.[376]

Table 5.5: Guide to storing expressed breast milk at home

• Wash hands thoroughly with soap and water – hands must be thoroughly dried with a clean towel, single use towel or hand dryer
• Refrigerate or freeze milk after expressing
• Use fresh milk whenever possible
• Freeze milk that will not be used within 2 days
• Date the container at the time of collection and use the oldest milk first

Sources: WHO[374] and Barger 1987.[377]

Table 5.6: Length of time breast milk can be stored

Breast milk status	Storage at room temperature (26°C or lower)	Storage in refrigerator (5°C or lower)	Storage in freezer
Freshly expressed into sterile container	6–8 hours If refrigeration is available store milk there	No more than 72 hours Store at back, where it is coldest	2 weeks in freezer compartment inside refrigerator (–15°C) 3 months in freezer section of refrigerator with separate door (–18°C) 6–12 months in deep freeze (–20°C)*
Previously frozen (thawed)	4 hours or less – that is, the next feeding	24 hours	Do not refreeze
Thawed outside refrigerator in warm water	For completion of feeding	4 hours or until next feeding	Do not refreeze
Infant has begun feeding	Only for completion of feeding Discard after feed	Discard	Discard

* Chest or upright manual defrost deep freezer that is opened infrequently and maintains ideal temperature

Sources: Lawrence & Lawrence 2005,[26] ABM 2004,[373] Slutzah et al 2010,[375] NZ Ministry of Health.[376]

Table 5.7: Transporting breast milk

• Transport breast milk in an insulated container – an Esky with a freezer brick
• If some milk has thawed it should be used within 4 hours – do not refreeze it
• Place the labelled milk in the refrigerator (or in the freezer if it is still frozen) immediately upon arrival

6. Breastfeeding in specific situations

Key points

- In Australia there are very few situations in which breastfeeding is absolutely contraindicated, although temporary avoidance of breastfeeding may be needed while certain conditions are treated.
- Breastfeeding women should be encouraged to avoid smoking, passive smoking, alcohol and illicit drugs.
- Health workers need to be informed and positive when advising parents about combining breastfeeding and paid work.
- In emergency situations, breastfeeding women need nutritional support and supplies of clean water to enable continued breastfeeding.

6.1 Absolute and relative contraindications for breastfeeding

Recent reviews have identified some maternal conditions in which breastfeeding is contraindicated and other conditions which need to be considered on a case-by-case basis.[217,378]

Infants with severe anatomical abnormalities and genetic abnormalities should be treated on a case-by-case basis. Note that some infant conditions are beyond the scope of these guidelines.

- *Inborn errors of metabolism* – these disorders have been included to provide examples of how infants with special needs require specialist paediatric advice. The Australasian Society for Inborn Errors of Metabolism (ASIEMM) has handbooks for the treatment of many inborn errors of metabolism.[379]
- *Low birth weight* (<2,500 g) – these infants have relatively higher requirements for nutrients (e.g. protein, calcium, phosphorus, zinc) and may need breast milk that has been fortified. Feeding infants of low or very low birth weight with breast milk reduces the incidence of infection, including septicaemia, meningitis and necrotising enterocolitis.[380] Expressed breast milk reduces the incidence of necrotising enterocolitis in neonatal intensive care units.[107,381,382]

Table 6.1: Infant conditions and breastfeeding

Condition	Comments
Infants conditions in which breast milk is not appropriate and special formula is required	
Galactosaemia	Galactose-free formula
Maple syrup urine disease	Formula free of leucine, isoleucine and valine
Phenylketonuria (PKU)	Phenylalanine-free formula (some breastfeeding is possible with careful monitoring)
Infants conditions in which breast milk remains the best feeding option	
Very low birth weight (<1,500 g)	Formula may be required in addition to breast milk for a limited period
Preterm birth (<32 weeks)	Formula may be required in addition to breast milk for a limited period
Risk of hypoglycaemia	Impaired metabolic adaptation or increased glucose demand may occur in infants who are unwell, preterm, small for gestational age, experience significant intrapartum hypoxic/ ischaemic stress, or whose mothers have diabetes Formula may be required in addition to breast milk for a limited period

Table 6.2: Maternal conditions and breastfeeding

Condition	Comments
Maternal conditions that may justify permanent avoidance of breastfeeding	
Human immunodeficiency virus (HIV)	Avoid breastfeeding if replacement feeding is acceptable, feasible, affordable, sustainable and safe
Maternal conditions that may justify temporary avoidance of breastfeeding	
Severe illness (e.g. sepsis)	Mother may be unable to care for her infant
Herpes simplex virus type 1 (HSV-1)	Direct contact between lesions on the mother's breasts and the infant's mouth should be avoided until all active lesions have resolved
Recently acquired syphilis	Mother-to-infant contact and breastfeeding can begin after 24 hours of therapy, provided there are no lesions around the breasts or nipples
Maternal medication	Sedating psychotherapeutic drugs, antiepileptic drugs and opioids and their combinations may cause side effects (e.g. drowsiness, respiratory depression) and are better avoided if a safer alternative is available
	Radioactive iodine-131 is better avoided given that safer alternatives are available
	Excessive use of topical iodine or iodophors (e.g. povidone-iodine), especially on open wounds or mucous membranes, may result in thyroid suppression or electrolyte abnormalities in the breastfed infant and medical advice is required
	Cytotoxic chemotherapy requires that a mother stops breastfeeding during therapy
Maternal conditions during which breastfeeding can continue	
Hepatitis B	Infants should be given hepatitis B vaccine, within the first 24 hours or as soon as possible thereafter
Hepatitis C	There is no association between transmission of hepatitis C and mode of infant feeding (see Section 6.1.2)
Inactive tuberculosis	Breast milk does not contain tubercle bacilli, so women with inactive tuberculosis may breastfeed, however breastfeeding is contraindicated in some circumstances (see Section 6.1.1)

Condition	Comments
Maternal conditions that may justify permanent avoidance of breastfeeding	
Substance use	Maternal use of nicotine, alcohol, ecstasy, amphetamines, cocaine and related stimulants, has been demonstrated to have harmful effects on breastfed infants (see Sections 6.2.1 and 6.2.3)
	As alcohol (see Section 6.2.2), opioids, benzodiazepines and cannabis can cause sedation in both the mother and the infant, mothers should be encouraged not to use these substances, and given opportunities and support to abstain
Inflammatory conditions of the breast	Continuing breastfeeding is not harmful to the infant and is important for the resolution of mastitis and breast abscess (see Section 4.2.5)

6.1.1 Absolute contraindications to breastfeeding

In a limited number of situations breastfeeding is absolutely contraindicated.

HIV infection

In Australia, women who are HIV positive are advised not to breastfeed. Transmission of HIV through breastfeeding is well documented. The US Centers for Disease Control and Prevention (CDC)[383] and AAP[384] advise women with HIV infection not to breastfeed.

Advice for health workers

- At present, breastfeeding is contraindicated when a mother is known to be HIV positive (specialist advice is needed for each individual case).

Active tuberculosis

Tuberculosis remains a public health problem in Australia, particularly in the overseas-born population. The National Notifiable Diseases Surveillance System received 1,135 tuberculosis notifications in 2007, of which 1,086 were new cases and 49 were relapsed cases.[385] The incidence of tuberculosis in Australia in 2007 was 5.4 cases per 100,000 people, similar to rates since 1986. In 2007, 86.4% of cases occurred in the overseas-born population.[385]

Active pulmonary tuberculosis that has not yet been treated is a contraindication to breastfeeding. Any close contact with the infant, including breastfeeding, is not permitted, to prevent respiratory transmission (regardless of mode of infant feeding) until the mother has finished 2 weeks of treatment. The infant is usually prescribed prophylactic treatment. Lactation is initiated and maintained by expressing breast milk until contact is approved.

Breast milk does not contain tubercle bacilli, so women with inactive tuberculosis may breastfeed.[386-389] Once treatment has been established and the mother has a negative sputum culture, expressed breast milk can be given safely to the infant, the only contraindication being when the mother has an active breast lesion or tuberculosis mastitis. In this case, breast milk cannot be fed to the infant until the lesion is healed or the mastitis is eliminated.[386,387]

First line antituberculosis drugs are thought to be compatible with breastfeeding by paediatric groups such as the AAP[390,391] and also by respiratory organisations.[392,393]

Mother and infant should be managed according to national tuberculosis guidelines.

Breast cancer treatment

In Australia, 700 women under 40 years of age are diagnosed annually with breast cancer, which is about 6% of the total number of women diagnosed annually.[394]

Breast cancer detected during pregnancy is a contraindication to breastfeeding if the mother is having chemotherapy. If a mother is not undergoing chemotherapy, continuation of breastfeeding should be evaluated on an individual basis. Appropriate medical specialist advice should be sought.

Syphilis lesions of the breast or nipples

In 2009, 2,835 cases of syphilis were notified in Australia.[395] Most cases occur through male-to-male sexual transmission and syphilis remains uncommon in women of reproductive age. There is a routine screening and treatment program for syphilis in pregnant women in Australia.[395]

In recently acquired maternal syphilis, mother-to-infant contact and breastfeeding can begin after 24 hours of therapy, provided there are no lesions around the breasts or nipples. If there are lesions around the breasts or nipples, feeding may begin or resume once treatment is complete and the lesions are healed.

Untreated brucellosis

In Australia, brucellosis is very rare and diagnosis an unlikely event. As brucella can be cultured from breast milk,[396] breastfeeding should be suspended until treatment is complete.[397]

Infant conditions

Rare metabolic disorders of infants such as galactosaemia and maple syrup urine disease, severely limit or render impossible the infant's use of certain milk components and special formula is required.

6.1.2 Relative contraindications to breastfeeding

Some conditions may need to be considered on a case-by-case basis before advice is given to discontinue breastfeeding and use infant formula.

Phenylketonuria

In Australia the incidence of phenylketonuria (PKU) is 1 in every 10,000–14,000 births, 1 in 50 people carry the PKU gene, and approximately 2,025 infants are diagnosed with PKU each year.[398]

The ASIEM has developed a consumer handbook, which provides a practical guide to managing infants with PKU.[399] It is possible to breastfeed infants with PKU and maintain the plasma phenylalanine at a safe level. However careful monitoring by a paediatrician and a dietitian with expertise in metabolic disease is required.

While inborn errors of metabolism are outside the scope of these Guidelines, PKU has been included to provide an example of how infants with special needs require specialist paediatric advice.

Hepatitis B

Current Australian recommendations are that all infants be vaccinated against hepatitis B within 24 hours of birth.[400] In hepatitis B-positive mothers breastfeeding may begin or resume once the infant has been immunised. Extensive experience indicates that the birth dose of hepatitis B vaccine is very well tolerated by newborn infants. It does not interfere with the establishment or maintenance of breastfeeding, and it is not associated with an increased risk of either fever or medical investigation for sepsis in the newborn infant.

Hepatitis C

The evidence suggests that there is no association between transmission of hepatitis C and mode of infant feeding (Evidence Grade C).[401,402] The largest studies have been the retrospective analysis and the prospective study of the European Paediatric Hepatitis C Network (EPHN), which showed no effect among women with only

hepatitis C virus infection.[403] Mothers who are both hepatitis C and HIV positive should be managed according to the HIV protocol. There is limited evidence showing that mothers co-infected with hepatitis C and HIV are at an increased risk of transmitting hepatitis C through breast milk (Evidence Grade D).[403-405]

Maternal medications

Most medications are excreted into the breast milk, usually in concentrations similar to blood levels. Typically this amounts to less than 1–2% of the maternal dose, which rarely poses a danger to the infant.[390,406-408] Breastfeeding can be continued while the mother is on most of the medications commonly prescribed in Australia; however information provided in the Consumer Medicine Information (CMI) should always be reviewed. Statins are a commonly prescribed group of drugs that should generally not be used in pregnancy and lactation because of their action on lipid metabolism.[409,410]

Up-to-date information can be obtained from the National Library of Medicines (NLM) LactMed database,[411] which catalogues medications and other chemicals to which breastfeeding mothers may be exposed. It includes information on the levels of such substances in breast milk and infant blood, and possible adverse effects in the breastfeeding infant. Statements of the AAP concerning the compatibility of a substance with breastfeeding are provided, as are suggested therapeutic alternatives where appropriate. All data are derived from the scientific literature and fully referenced. Data are organised into substance-specific records, which provide a summary of the pertinent reported information and include links to other NLM databases. Supplemental links to breastfeeding resources from credible organisations are also provided.

Advice for health workers

- Most prescription drugs and medicines are compatible with breastfeeding, but each case should be specifically assessed by a health professional.
- Statins are a commonly used class of pharmaceuticals that should not generally be used during pregnancy or breastfeeding.

Other maternal illnesses

Breastfeeding can continue in almost all other circumstances depending on the mother's overall state of health and her desire to continue. In severe maternal illness and malignancy, continuation of breastfeeding depends on the mother's health and the medications being used.

In cases of maternal psychiatric illness, breastfeeding is not advisable if there is definite danger to the infant. A psychiatrist's advice should be sought. Postnatal depression is discussed in Section 4.2.9.

6.2 Tobacco, alcohol and other drugs

6.2.1 Tobacco

There is convincing evidence that maternal and paternal smoking is negatively associated with breastfeeding outcomes, including initiation and duration (Evidence Grade A).[17] Smoking was independently negatively associated with breastfeeding initiation in larger studies and with breastfeeding duration in almost all studies. A meta-analysis reported a pooled odds ratio for 15 studies of 1.93 (95% CI 1.55–2.40) for the likelihood of cessation of breastfeeding before 13 weeks.[17] The findings of the two systematic literature reviews[412,413] were confirmed by the findings of subsequent studies.[17,109,154,414,415]

It remains unclear whether the mechanism for the association is biological, psychological, behavioural and/or cultural. Mothers should be educated about the negative impact of smoking on breast milk supply and this should be included in breastfeeding educational materials. Smokers are less likely to breastfeed but they should be encouraged to do so because of the modifying effect breastfeeding has on the adverse effects of smoking.

Table 6.3: Practical advice on smoking and breastfeeding

• Smoking may affect the mother's milk supply and may cause gastrointestinal upsets in the infant, so parents are advised to give up smoking
• If giving up smoking is not possible, parents should reduce their smoking as much as possible, completely avoiding smoking in the hour before feeding and during feeding
• No-one should smoke in the same room as an infant because of the dangers of passive smoking[416,417]
• The two most commonly used medications to assist smoking cessation in Australia – varenicline *(Champix)* and bupropion *(Zyban)* – are not recommended during pregnancy or lactation. If these medications are used by women who are intending to become pregnant, it is recommended that treatment is timed so that the course is completed before conception

Australian Aboriginal mothers have a very high rate of smoking and commonly smoke while breastfeeding.[418,419] Health professionals should encourage cessation of smoking during pregnancy and lactation to minimise exposure of infants to the detrimental effects of tobacco and to promote the continuation of breastfeeding.

Advice for health workers

- Encourage mothers, fathers, primary carers and other household members who smoke to stop or reduce smoking and to avoid exposing the infant to tobacco smoke. Even if parents persist with smoking, breastfeeding remains the best choice.

6.2.2 Alcohol

The NHMRC guidelines to reduce health risks from drinking alcohol recommend: [420]

> Maternal alcohol consumption can harm the developing fetus or breastfeeding baby. For women who are pregnant or planning a pregnancy, not drinking is the safest option. For women who are breastfeeding, not drinking is the safest option.

Alcohol enters the breast milk and may persist in the milk for several hours after alcohol consumption (see Table 6.4).[421] Analysis of the 2001 National Health Survey found that, although most breastfeeding women drink at low levels (up to two standard drinks per week), 17% were drinking more than seven standard drinks per week. This proportion was significantly higher than in the 1995 survey (13%).[422] Qualitative research has shown that breastfeeding mothers are generally unaware of the effects of alcohol on breastfeeding performance and development of the infant.[423] Women who consumed alcohol at levels of more than two standard drinks per day were almost twice as likely to discontinue breastfeeding before the infant was 6 months old than women who drank below this level.[422,424]

Table 6.4: Time taken for alcohol to be cleared from breast milk (hours: minutes)

Australian standard drinks							
Maternal weight (kg)	**1**	**2**	**3**	**4**	**5**	**6**	**7**
50	1:51	3:43	5:35	7:27	9:18	11:11	13:03
59	1:42	3:26	5:09	6:52	8:36	10:19	12:02
66	1:37	3:15	4:53	6:31	8:10	9:48	11:26
70	1:33	3:07	4:41	6:15	7:50	9:24	10:57

Note: Time is calculated from the beginning of drinking. Assumptions made: alcohol metabolism is constant at 15 mg/dL; height of the women is 162.56 centimetres. A standard drink contains 10 g of alcohol.

Source: Giglia et al 2006.[415]

The effect of alcohol consumption on milk production, breast milk and infant blood alcohol concentrations, and the breastfeeding infant, have been described in a systematic review of animal and human research from 1990–2005.[421] This review found that consumption of two standard drinks or more a day during lactation was associated with:

- decreased lactational performance (in terms of the milk ejection reflex, milk production by the mother and milk consumption by the infant)
- earlier cessation of breastfeeding
- deficits in infant psychomotor development
- disrupted infant sleep-wake behavioural patterns.

The literature review for the *Australian Dietary Guidelines* found probable evidence that consumption of alcohol by lactating women in the range of 0.3–0.8 g/kg body weight per session is associated with increased risk of adverse infant outcomes (Evidence Grade B).[421,425]

Table 6.5: Practical advice on alcohol consumption and breastfeeding

• Breastfeeding mothers should be advised that not drinking is the safest option and, specifically, to consider not drinking alcohol in the first month after the birth, until breastfeeding is well established
• For women who choose to drink after this time, advice should be provided on a recommended maximum level of consumption (e.g. two standard drinks or less in any one day), the length of time that alcohol is excreted in breast milk and the optimal timing of breastfeeding in relation to intake
• The option of expressing prior to consuming alcohol could also be discussed

Advice for health workers

- Advise mothers that not drinking alcohol is the safest option. For women who choose to drink, provide advice on the recommended maximum intake level (e.g. two standard drinks or less in any one day) and the optimal timing of breastfeeding in relation to intake.

6.2.3 Illicit drugs

Breastfeeding mothers should not smoke marijuana. Use of other mood-altering substances, including illicit drugs, is also contraindicated – these substances may be excreted in the breast milk. In addition to the effects such drugs may have on a breastfeeding infant, a mother who is not fully alert can be a hazard to herself and her infant while breastfeeding or preparing infant formula.

There is a lack of studies on the most appropriate ways to manage breastfeeding by mothers who use drugs of addiction. The National Drug Strategy has produced guidelines for pregnancy and breastfeeding[426] and recently the ABM prepared a protocol based on best clinical practice.[427] The ABM protocol suggests that women who meet certain criteria (see Table 6.6) should be supported in their decision to breastfeed their infants.[427]

Table 6.6: ABM criteria for supporting breastfeeding in women who use drugs of addiction

• Women engaged in substance abuse treatment who have provided consent to discuss progress in treatment and plans for postpartum treatment with a substance abuse treatment counsellor
• Women whose counsellors endorse their ability to achieve and maintain sobriety prenatally; counsellor approves of client's plan for breastfeeding
• Women who plan to continue in substance abuse treatment in the postpartum period
• Women who have been abstinent from illicit drug use or illicit drug abuse for 90 days prior to delivery and have demonstrated the ability to maintain sobriety in an outpatient setting
• Women with a negative maternal urine toxicology testing at delivery except for prescribed medications
• Women who received consistent antenatal care
• Women who do not have a medical contraindication to breastfeeding (such as HIV)
• Women who are not taking a psychiatric medication that is contraindicated during lactation
• Stable methadone-maintained women wishing to breastfeed should be encouraged to do so regardless of maternal methadone dose

The management of breastfeeding by mothers using addictive drugs requires the use of integrated services from a drug addiction service, paediatrician and lactation consultant or other health professional with breastfeeding expertise.

Advice for health workers

- Encourage and support mothers to avoid illicit drugs (specialist advice is needed for each individual).

6.2.4 Caffeinated beverages

There are subjective reports from breastfeeding women that infants become unsettled and irritable following maternal consumption of large volumes of caffeinated beverages such as tea and coffee. There have been no controlled trials of early caffeine exposure on infant behaviour.

The amount of caffeine transferred to breast milk depends on the quantity and the mother's ability to absorb and metabolise caffeine. The caffeine content of a cup of tea or coffee also varies due to the method of preparation and quantity consumed. On average, espresso coffee has 60–120 mg per 250 mL cup, instant coffee (one teaspoon/cup) has 60–80 mg per 250 mL cup and tea has 10–50 mg per 250 mL cup.[428] Cola, energy drinks and some sports drinks also contain significant amounts of caffeine.[425] The Australia New Zealand Food Standards Code restricts the total caffeine content in cola-type drinks to 145 mg/kg in the drink as consumed and energy drinks have a maximum permitted level of 320 mg/L of caffeine.[428] The Food Standards Code also covers additional labelling requirements including advice that these products are not suitable for pregnant or lactating women.[428] Peak levels of caffeine in breast milk are reached approximately 1 hour after consumption of caffeine-containing beverages.[429]

The amount of caffeine available for infant absorption after a single caffeinated beverage is approximately 1% of the maternal dose.[26] Mothers are encouraged to moderate their intake of tea, coffee, and other caffeinated beverages, as caffeine can accumulate in the newborn infant[26] and newborn infants metabolise caffeine at a slow rate. For most adults the elimination half-life of caffeine varies between 3 and 7 hours.[430] In newborn infants the half-life ranges from 50–100 hours, but by 3–4 months of age most infants have developed the ability to metabolise caffeine.[26,431] The reduced rate of elimination by the newborn infant could potentially lead to an accumulation of considerable amounts of caffeine and cause adverse effects.

Cigarette smoking may compound the effects of caffeine in breastfed infants.[26] It is advised that mothers who choose to continue smoking during lactation limit their consumption of caffeinated beverages.

For non-smoking women, the La Leche League states that the amount of caffeine in five or fewer cups of coffee (less than 750 mL) will not pose a risk to the breastfed infant.[432] While the modest use of caffeine is compatible with breastfeeding, women who consume large quantities of caffeinated beverages may require specific advice on moderating their caffeine intake.[430]

6.3 Women and paid work

The literature review found probable evidence that intention to work or return to paid employment is negatively associated with both initiation and duration of breastfeeding (Evidence Grade B).[109,154,414] Studies from Australia, New Zealand and China[154,433,434] indicate that returning to paid work or the anticipation of return to employment has a significant impact on the experience of breastfeeding and is commonly cited as a reason for ceasing to breastfeed.

Data from the Longitudinal Study of Australian Children (n=5,090) found that women who returned to work full-time were less likely to be still predominantly breastfeeding at 1 and 2 months.[154] In the Perth Infant Feeding Study II, return to work before 12 months was negatively associated with the duration of predominant and any breastfeeding.[110]

Many women, for economic or personal reasons, return to paid work before they want to stop breastfeeding. Among the factors that have limited mothers' ability to continue breastfeeding are the relative brevity of maternity leave, inflexible hours of work, and the lack of paid breastfeeding (or expressing) breaks while at work,[110] along with lack of facilities, such as work-based childcare and a suitable place to express and store milk. Because of this, some women who intend to return to work may be discouraged from initiating breastfeeding and others may feel that breastfeeding has to stop once paid work starts.

To manage this perception by some mothers, health workers need to be well informed and positive when advising parents about combining breastfeeding and paid work.

Table 6.7: Options when it is not possible for a mother to go to her infant during working hours

Continue on-demand breastfeeding whenever mother and infant are together
Replacing breastfeeds during work hours with expressed breast milk fed from a cup or a bottle
For infants aged 6 months and over, replacing breastfeeds during work hours with formula and food from a spoon and a cup
Replacing breastfeeds during work hours with infant formula fed from a cup or a bottle

Mothers should be assured that while exclusive breastfeeding is ideal, continued partial breastfeeding is still beneficial to the infant and mother.

A study of professional women in Nairobi, Kenya has documented how almost 100% were able to successfully continue breastfeeding, even when they had to use formula feeding while at work.[435] When formula is used during working hours, breastfeeding can still continue before and after work and during weekends. A combination of both expressed breast milk and formula can be given to an infant when there is not enough expressed milk.

It is important that in the first 6 weeks to 3 months of an infant's life, health workers give the mother as much assistance as possible to establish breastfeeding successfully. That way, the mother has a greater range of options if she returns to work. Accurate advice on expressing, storing and using frozen breast milk, as well as on bottle-feeding and using formula, is also necessary.

Where a breastfeeding mother returns to work there are a number of ways that the employer can facilitate continued breastfeeding. Health workers should become advocates for adoption of workplace policies that enable women to breastfeed. A number of jurisdictions have introduced breastfeeding and work policies.[436-439] The ABA has developed the Breastfeeding Friendly Workplace Accreditation (BFWA) program that includes the provision of breastfeeding breaks.[440] Employers are also required to provide a clean, hygienic and private area to express breast milk or feed infants, a fridge/ freezer to store breast milk, and storage space for related equipment. Guidelines are available on the provision of facilities for breastfeeding at childcare centres.

The International Labour Organisation's Convention 103 on Maternity Protection (1952) calls on member nations to provide, by national legislation, an entitlement of at least 12 weeks' maternity leave. The convention also calls for nursing breaks for women in the workplace.[441] Australia's Paid Parental Leave Scheme with income support for a maximum of 18 weeks[111] has the potential to increase Australia's breastfeeding rates.

6.4 Breastfeeding in emergency situations

Following any natural or human made disaster, mothers and their infants are always the most vulnerable group in the population. For the mothers of infants who are breastfed it is important to ensure that the mother has adequate nutritional support, including supplies of clean water to enable her to continue breastfeeding.

7. Informed use of supplementary feeds in hospital

In Australia there is no clear differentiation between the terms 'supplementary feeding' and 'complementary feeding'. In these Guidelines, supplementary feeding is defined as 'additional liquids given to the infant during the first 7 days after birth, including glucose solutions, water, and commercial infant formula'. Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk.[442]

7.1 Prelacteal feeds

Prelacteal feeds are defined as any feeds given before the onset of lactogenesis stage II, which is the onset of copious lactation that occurs within 4 days of birth.[443] Prelacteal feeds are not recommended because of their influence on the onset of lactation and on perinatal morbidity and mortality.[444-446] In some cultures, prelacteal feeds are common – for example in China, rates of prelacteal feeds are in the range of 26–52%.[445,446] In Australia, the rate of prelacteal feeds is estimated to be around 15%.[110] Other reports suggest that the rate could be much higher. In a cross-sectional study in Adelaide, 45% of mothers answered yes to the question 'was your baby given a bottle-feed while in the postnatal ward?'.[447] This would include prelacteal and supplementary feeds. Since this study did not give reasons why the bottle-feed was offered, these results should be interpreted with caution. By definition, an infant who receives prelacteal feeds is not exclusively breastfed.

The BFHI framework's sixth step states: 'Give newborn infants no food or drink other than breast milk unless medically indicated'. [127]

If an infant has become dehydrated, rehydration may enable him or her to begin breastfeeding successfully. The infant's condition should be discussed with the mother and a paediatric assessment should be made before seeking the mother's consent for rehydration. It should be emphasised, however, that such a situation is uncommon, even in the Australian climate. The implications of supplementary feeding for establishing and maintaining successful breastfeeding should be discussed between health worker and mother.

Advice for health workers

- If supplementary feeding is needed in hospital, it should only be given for specific medical indications and with the mother's agreement.

8. Infant Formula

Key points

- Given the significant health benefits to both infant and mother, health workers have a responsibility to promote breastfeeding first but, if infant formula is needed, to educate and support parents about formula feeding.
- A mother's informed decision not to breastfeed should be respected and support from a health worker and/or other members of the multidisiplinary team provided.
- When infants are not breastfed, infant formula is the only suitable and safe alternative to meeting their primary nutritional needs.
- Infant formula requires accurate reconstitution and hygienic preparation to ensure its safety, so it is important that health workers know how to demonstrate the preparation of infant formula and how to feed an infant with a bottle.
- Cow's milk-based formula is suitable for the first 12 months of life unless the infant cannot take cow's milk-based products for specific medical, cultural or religious reasons, in which case special formulas may be used under medical supervision.

8.1 Composition of infant formula

All infant formulas available in Australia are regulated by the Australia New Zealand Food Standards Code and contain adequate nutrients for infants.[4] The constituents of human milk are used as a reference in developing infant formula. However, infant formula lacks many factors present in human milk, including numerous types of living cells, cholesterol, polyamines, free amino acids, enzymes and a wide range of other bioactive substances. Furthermore, the sterilisation (pasteurisation) processes used in manufacturing formula slightly modify the structure of the cow's milk proteins, with a consequent loss of any cross-species protection against infection.

Compared with unmodified cow's milk and early efforts to manufacture infant feeds, all modern infant formulas contain reduced protein and electrolyte levels and have added iron and vitamins (including A, B group, C, D, E and K) and other nutrients. Although research into the development of formulas is continuing, it is unlikely that these products could ever duplicate the variety of nutrient and active factors present in human milk or the changing nature of the milk during the course of a feed.

Protein levels in infant formula

The protein in infant formula is either casein or whey dominated. Amino acid content differs from breast milk and a higher protein level is required to meet minimum amounts of specified amino acids, especially tryptophan.

Research into infant feeding and later growth has reported that infants breastfed more than 12 months were leaner at one year.[88,448] A major well-conducted, randomised, controlled trial of lower protein formula undertaken in Europe[449,450] concluded that a 'higher protein content of infant formula is associated with higher weight in the first 2 years of life but has no effect on length. Lower protein intake in infancy might diminish the later risk of

overweight and obesity'. Since this study, the quality of the protein in many brands of infant formula in Europe has been improved, enabling the overall protein levels to be reduced.

A review of links between protein levels of infant formula and cow's milk and obesity and chronic disease in adulthood is now available.[451] This evidence suggests that preferable levels of protein in formula to promote growth rates similar to breastfed infants are similar to the levels in human milk, subject to a minimum content of specific amino acids.[452] Human breast milk contains 1–1.1 g protein per 100 mL compared to cow's milk with 3.3 g per 100 mL.[453] Protein content in infant formulas available in Australia is in the range of 1.3–2.0 g protein per 100 mL, with goat's milk formula at the high end of this range.

Standards for infant formula

Almost all infant formulas sold in Australia are imported and their quality, composition and labelling is regulated through Standard 2.9.1 of the Australia New Zealand Food Standards Code.[197] The Standard:

- defines an infant as a person aged up to 12 months
- specifies compositional requirements of infant formulas, including a protein content of 0.45–0.7 g per 100 kJ that meets specific amino acid requirements
- prescribes the use of the terms 'infant formula' (suitable from birth) and 'follow-on formula' (suitable only for infants over 6 months)
- requires that labels include date marking, source(s) of protein and instructions for storage after the product is opened – there are other general labelling requirements contained in Standard 1.2 of the Australia New Zealand Food Standards Code that also apply to infant formula products.

Choice of formula

In Australia, a range of cow's milk and goat's milk formulas that meet the Australia New Zealand Food Standards Code for infant formula are available. There is little evidence that, if breastfeeding is discontinued for any reason, one formula is better than another for healthy full-term infants:

- use of a particular formula by a hospital does not mean that formula is the 'best' one
- interchange between formulas within the same generic group is optional, however frequent changes may generate confusion and increases the risk of inaccurate preparation/dosing
- the use of 'follow-on formula' for infants aged 6–12 months is not considered necessary and no studies have shown advantages over using 'infant formula'
- it is preferable to use a formula with a lower protein level.

The use of formula for infants at risk of allergy or with cow's milk allergy is discussed in Section 8.5.

8.2 Health workers and infant formula

Health workers have a responsibility to promote breastfeeding first but, where it is needed, to educate and support parents about formula feeding. Some mothers may experience feelings of grief or loss if they decide not to breastfeed. A mother's informed decision not to breastfeed should be respected and support from a health worker and/or other members of the multidisciplinary team provided.

This responsibility is outlined in the WHO Code[9] and the Australia New Zealand Food Standards Code.[197]

Under the WHO Code:[9]

- feeding with infant formula should only be demonstrated by health workers, or other community workers if necessary, and only to the mothers or family members who need to use it
- the information given should include a clear explanation of the hazards of improper use.

Chapter 10 provides more information on the WHO Code and its implementation in Australia.

Under Standard 2.9.1 of the Australia New Zealand Food Standards Code,[197] labels of infant formula products must contain a statement that a doctor or health worker should be consulted before deciding to use the product.

Health workers are seen by the public as the main source of advice on infant feeding and are well placed to advise mothers and carers, regardless of the feeding option they have chosen for their infant.

For mothers who do not breastfeed, or do so only partially, advice should include:

- that a suitable infant formula should be used until the infant is 12 months of age
- the cost of formula feeding
- the hazards of improper formula preparation and storage.

Advice for health workers

- Educate parents on the importance of correctly preparing infant formula and following the instructions carefully, including using the correct scoop and not overfilling or underfilling the scoop.
- Check that infant formula is being prepared according to instructions (i.e. to the correct concentration).

8.3 Preparing infant formula

Safe bottle-feeding depends on a safe water supply, sufficient family income to meet the costs of continued purchase of adequate amounts of formula, effective refrigeration, clean surroundings and satisfactory arrangements for sterilising and storing equipment. Tap water is preferred for preparing infant formula (consistent with the *Australian Dietary Guidelines)*.[4] All tap water used to prepare infant formulas should be boiled and cooled according to the instructions on the formula package label.[454] Bottled water (but not sparkling mineral water or soda water) can be used to prepare formula if unopened, but it is not necessary.

As health workers are the only group authorised to demonstrate infant formula feeding, it is essential that they show the correct methods and monitor methods regularly. Parents without literacy skills or from a non–English speaking background may need extra help to make sure bottle-feeding is done safely.

8.3.1 Risks associated with incorrect preparation of infant formula

Powdered infant formula is not a sterile product and there are occasional infections of infants with *Cronobacter sakazakii* (*'Enterobacter sakazakii*' is still sometimes used in current literature), with higher risk in low birth weight infants. *C. sakazakii* is invasive and has a high mortality rate. A Food and Agriculture Organization (FAO)/WHO review of *C. sakazakii* infections worldwide identified around 120 documented cases among infants and young children up to 3 years of age. However globally, there appear to be very few surveillance data for *C. sakazakii* -related illnesses.[455] In developed countries, the risk is relatively low and the US CDC reported only 46 cases over a 40-year period.[456] There have been no reported cases in Australia.

The FAO/WHO have developed a risk-assessment model and advice on the control of contamination in powdered infant formulas.[457] The Codex Alimentarius Commission has adopted a *Code of hygienic practice for powdered formulae for infants and young children* to reduce the risk from *C. sakazakii* and Salmonellae species contamination.[458] Since the introduction of control programs for *C. sakazakii* by these organisations and manufacturers of powdered infant formula, its levels in raw material and finished products have reduced. A testing program undertaken in New South Wales did not find any cases of contamination in the samples of infant formula tested.[459]

The WHO advocates the use of water at 70°C for preparing formula as this temperature will destroy bacteria.[460] However, vitamins and nutrients will also be destroyed[461] and use of water at this temperature brings the risk of serious burns. Infants are not at risk from *C. sakazakii* when formula is prepared with lukewarm (body temperature), previously boiled water and fed within 1 hour.[455] As the risk of infection from *C. sakazakii* is negligible in Australia if correct preparation techniques are followed, the Infant Nutrition Council (INC)[1] advocates the use of water at body temperature (i.e. not hotter than 37°C), which poses no risk of nutrient deficiency or scalding.[454]

1 The Infant Nutrition Council Ltd was established in 2009 and is an amalgamation of the Infant Formula Manufacturers' Association of Australia (IFMAA) and the New Zealand Infant Formula Marketers' Association (NZIFMA).

8.3.2 Correct preparation of infant formula

Many parents and carers do not prepare infant formula correctly. A systematic literature review identified common problems with preparation of formula feeds,[462] including over-concentration, under-concentration and the addition of cereal to the bottle. Results from the US Infant Feeding Practices Study II concluded that many mothers do not follow safe practices:[463]

- 55% did not always wash their hands with soap before preparing infant formula
- 32% did not adequately wash bottle teats between uses
- 35% heated formula bottles in a microwave oven
- 6% did not always discard formula left standing for more than two hours.

Australian surveys have found similar rates of errors in formula preparation.[464,465]

Reports of incorrect preparation of formula highlight the difficulties mothers face with differing scoops and instructions for different brands of formula.[466]

The INC suggests that infants are best protected from risks of harm through clear and consistent advice on the preparation, handling and storage of infant formula. Table 8.1 gives instructions for formula preparation that reduce these risks.

Table 8.1: Preparation of infant formula

• Always wash hands before preparing formula and ensure that formula is prepared in a clean area
• Wash bottles, teats, caps and knives – careful attention to washing is essential – and sterilise by boiling for 5 minutes or using an approved sterilising agent (see Section 8.3.3)
• Boil fresh water and allow it to cool until lukewarm – to cool to a safe temperature, allow the water to sit for at least 30 minutes (in places with clean water supply which meets Australian standards, hot water urns such as hydroboils are safe to use for formula reconstitution, provided the supply of very hot water has not been depleted)
• Ideally prepare only one bottle of formula at a time, just before feeding
• Always read the instructions to check the correct amount of water and powder as shown on the feeding table on the back of the pack – this may vary between different formulas
• Add water to the bottle first, then powder
• Pour the correct amount of previously boiled (now cooled) water into a sterilised bottle
• Always measure the amount of powder using the scoop provided in the can, as scoop sizes vary between different formulas
• Fill the measuring scoop with formula powder and level off using the levelling device provided or the back of a sterilised knife – the scoop should be lightly tapped to remove any air bubbles
• Take care to add the correct number of scoops to the water in the bottle – do not add half scoops or more scoops than stated in the instructions
• Keep the scoop in the can when not in use – do not wash the scoop as this can introduce moisture into the tin if not dried adequately
• Place the teat and cap on the bottle and shake it until the powder dissolves
• Test the temperature of the milk with a few drops on the inside of your wrist – it should feel just warm, but cool is better than too hot
• Feed infant – any formula left at the end of the feed must be discarded
• A feed should take no longer than 1 hour – any formula that has been at room temperature for longer than 1 hour should be discarded
• Formula that has been at room temperature for less than 1 hour may be stored in a refrigerator for up to 24 hours (in a sterile container) – discard any refrigerated feed that has not been used within 24 hours[460]
• When a container of formula is finished, throw away the scoop with the container, to ensure that the correct scoop is used next time

'Ready to drink' formulas

'Ready to drink' infant formula products are available in aseptically packed glass bottles for hospital use only or in aseptically packed tetra packs for domestic use. The liquid formula needs to be poured into a sterilised bottle and can be warmed in the bottle if desired, just before feeding. However once opened, 'Ready to drink' formats (glass bottle or tetra pack) may be poured into numerous sterilised bottles provided that these bottles are refrigerated below 5°C continuously and used within 24 hours. Any unfinished formula left in the bottle after a feed must be discarded and not kept for use in a later feed.

Preparing feeds in advance

Ideally only one bottle of formula should be prepared at a time. If formula needs to be prepared in advance (e.g. for a babysitter or to take to a child care centre) it must be refrigerated (at 5˚C or below) and used within 24 hours. Alternatively, prepared sterilised bottles of boiled water may be refrigerated and used as required, first warming by standing bottle in a container of warm water and then adding formula.

Refrigerated prepared formula should be warmed by standing the bottle in a container of warm water before feeding the infant. Using a microwave to heat infant formula is not recommended as heating can occur unevenly and burn the infant's mouth. If feasible, the use of 'ready to drink' infant formula can be considered in situations where sterilisation is not possible.

Transporting feeds

It is much safer to prepare bottles of infant formula at the destination, rather than transporting bottles of prepared formula. Harmful bacteria thrive in warm, moist conditions. Ready-made bottles of prepared formula can be a breeding ground for bacteria if the bottles have been sitting in a car or baby bag for several hours, especially on a warm day. Because of the potential for growth of harmful bacteria during transport, feeds should first be cooled to no more than 5°C in a refrigerator and then transported.

Table 8.2: Transporting formula feeds

• Prepare the feed and put in the refrigerator
• Ensure feed is cold before transporting
• Do not remove feed from the refrigerator until immediately before transporting
• Transport feed in a cool bag with ice packs
• Use feeds transported in a cool bag within 2 hours, as cool bags do not always keep foods adequately chilled
• Re-warm at the destination (for no more than 15 minutes)
• If the destination is reached within 2 hours, feeds transported in a cool bag can be placed in a refrigerator and held for up to 24 hours from the time of preparation

There are a number of special containers available designed to carry single serves of infant formula. It is also recommended to take one or more separate sterilised bottles of cooled boiled water at the correct volume, so the formula can be prepared at the destination. Alternatively, single-serve sachets of infant formula powder are available. Manufacturer's instructions should always be checked before use.

8.3.3 Sterilisation methods

Boiling

Boiling is the preferred option for sterilising bottles and other infant feeding equipment. Boiling gives consistent and reliable results if the steps outlined in Table 8.3 are taken.

Table 8.3: Sterilisation by boiling

• Wash bottles, teats and caps in hot soapy water with a bottle/ teat brush before sterilisation
• Place utensils, including bottles, teats and caps in a large saucepan on the back burner of the stove
• Cover utensils with water, making sure to eliminate all air bubbles from the bottle
• Bring water to the boil and boil for 5 minutes. Turn off – do not allow it to boil dry
• Allow the equipment to cool in the saucepan until it is hand hot and then remove it – be very careful if children are present
• Store equipment that is not being used straight away in a clean container in the fridge
• Boil all equipment within 24 hours of use

Sterilising using chemicals

A chemical sterilant is an antibacterial solution that comes in liquid or tablet form. Washing bottles with soap or detergent until visibly clean, followed by submersion in 50 ppm hypochlorite solution for 30 minutes, completely eliminates bacterial contamination.[467] Chemical sterilisation is not as effective as boiling unless bottles and other utensils are meticulously cleaned.

Table 8.4: Sterilisation using chemicals

• Follow the manufacturer's instructions carefully when making up the solution to ensure the correct dilution
• Discard the solution after 24 hours, thoroughly scrub the container and equipment in warm water with detergent and make up a new solution
• Make sure all equipment is made of plastic or glass: metal corrodes when left in chemical sterilant
• Completely submerge everything, making sure there are no air bubbles, and leave it in the solution for at least the recommended time – equipment can be left in the solution until it is needed
• Allow the equipment to drain, do not rinse off the sterilising liquid or there will be a risk of re-contamination
• Store the sterilising concentrate and solution well out of the reach of children

Steam sterilisers

Steam sterilisers are automatic units that raise the temperature quickly to the range that kills harmful bacteria. Thoroughly cleaned equipment is placed inside the unit, water added according to the manufacturer's instructions, and the unit switched on (it switches itself off when sterilisation is complete).

Microwave steam sterilisers

Sterilising units designed for use in a microwave oven are available. The caveats that apply to chemical sterilisation also apply to microwave sterilisation.

8.4 Using infant formula

8.4.1 Teats and flow rates

Teats are available in a range of shapes and materials. There is no evidence to support the benefits of particular teats for problems such as colic (unsettled infant).

Several types of teats may have to be tried until a suitable one is found, as it can be difficult to get the milk to flow at the right rate. Flow rate is tested by holding a bottle of room-temperature milk mixture upside down.

The milk should drip steadily, without pouring out in a stream. If the bottle has to be shaken vigorously, the teat is too 'slow' and the infant may go to sleep before drinking as much as they need. A little leakage at the corners of the mouth during feeding is not a concern – this stops as infants get older. When the ideal teat cannot be found, a faster teat is usually preferable to a slower one.

All teats should be cleaned well with a bottle/ teat brush and sterilised correctly (see Section 8.3.3). Teats need to be checked and replaced regularly. Silicone and rubber teats are prone to perishing and can become dangerous if they crack – they can harbour bacteria, and there is a risk of pieces coming off and being inhaled or ingested.

8.4.2 Good bottle-feeding practice

Good practice in bottle-feeding involves making feeding a comfortable experience for parent and infant while avoiding risks associated with incorrect bottle-feeding. This includes:

- always checking the temperature of the formula before feeding by shaking a little milk from the teat onto the inside of the wrist – it should feel warm, not hot
- holding, cuddling and talking to (if it is not too distracting) the infant while feeding and responding to infant cues – parent–infant contact is extremely important
- not leaving an infant to feed on their own (i.e. with the bottle propped) – the milk may flow too quickly and cause the infant to splutter or choke
- not putting an infant to sleep while drinking from a bottle – as well as the risk of choking this increases the risk of ear infection and dental caries.[37,468-471]

Advice for parents

- Put an infant to bed without a bottle or take the bottle away when the infant has finished feeding. Don't let the infant keep sucking on the bottle.
- Avoid leaving an infant unattended with a bottle containing liquids (i.e. no bottle propping).

8.4.3 How much milk?

As with breastfeeding, bottle-feeding according to need is appropriate. Formula is designed to remain at a constant strength and as an infant grows it is the amount of formula that should increase, not the strength. Bottle-fed infants up to 6 months require about 150 mL/kg body weight each day to meet their nutrient needs. Some will require more (up to 200 mL/kg), others less. It is important for parents to be aware that there are many individual variations in the amount of formula and the number of bottles consumed each 24 hours. Information on formula packages recommending certain amounts for various ages is a guide only and does not necessarily suit every infant. Plenty of wet nappies (six or more per day), consistent (but not excessive) weight gain, and a thriving, active infant indicate that all is well.

Table 8.5: Approximate formula requirements for infants

Days 1 to 4	• Commence at 30–60 mL/kg/day and increase over the next few days
Day 5 to 3 months	• 150 mL/kg/day • Some infants, especially those who were preterm, will require up to 180–200 mL/kg/day
3 to 6 months	• 120 mL/kg/day
6 to 12 months	• 100 mL/kg/day • Some infants may reduce to 90 mL/kg/day • Infants of this age also take solid foods

Note: Values given are a guide only.

Advice for parents

- Bottle-feeding according to need is appropriate – information on formula packages recommending certain amounts for various ages is a guide only and does not necessarily suit every infant.

Regular monitoring of the infant's progress is important for all infants including those being formula fed (see Section 3.4). Constipation may occur after formula is introduced. While formula-fed infants tend to pass firmer[472] and fewer[473,474] stools than breastfed infants, hard, dry stools may indicate incorrect preparation of formula. If diarrhoea occurs, it may be necessary to briefly interrupt formula feeding for rehydration.

8.4.4 Using a feeding cup

A feeding cup can be used instead of a bottle for feeding infant formula or expressed breast milk. The WHO states 'If you live in an area where sanitation and clean water are a problem, cup-feeding is a safer option than bottle-feeding. This is because the teats and screw tops of bottles are more difficult to clean and can trap harmful bacteria that could make infants ill'.[475]

For infants over the age of 6 months, parents may choose to wean onto a cup rather than a feeding bottle and encourage cessation of bottle use by 12 months. The technique used by an infant to suck on the teat of a bottle differs from that used on the breast, and use of a feeding cup instead of a bottle reduces the risk of nipple confusion.[476-479] Feeding cups containing formula or breast milk should continue to be sterilised up to 12 months (see Section 8.3.3).

Advice for parents

- A cup can be introduced at around 6 months, to teach infants the skill of sipping drinks from a cup.

8.5 Special infant formulas

Cow's milk-based formula is suitable for most healthy full-term infants and is recommended over formulas made from soybeans, goat's milk or modified lactose formula. Special formula designed for infants with nutritional problems should be used only in the case of medically diagnosed conditions on the advice of a paediatrician (see Section 8.5.2). Changing the type of formula because of minor rashes, irritability or infant or parent distress is usually of no benefit.

Advice for parents

- Use cow's milk-based infant formulas until 12 months of age (all infant formulas available in Australia are iron-fortified).
- Special formulas may be used under medical supervision for infants who cannot take cow's milk-based products for specific medical, cultural or religious reasons.

8.5.1 Preventing allergies in infants with a family history

Allergies and food reactions in infants and children are common and may be associated with a variety of foods including adapted cow's milk formula. Parents often consider using special infant formulas for preventing or treating allergic disorders. Different infant formulas have been considered for this purpose, including amino acid-based formula, hydrolysed formula, soy formula and milk from other animal species. However the evidence is mixed and routine use of special formulas for preventing allergy is not recommended. An Australian expert panel has made recommendations on the use of soy, extensively hydrolysed and amino acid formulas for treating cow's milk protein allergy.[480]

Hydrolysed formula

Hydrolysed formula, which is cow's milk-based formula that has been processed to break down most of the proteins into smaller particles, may modify the development of allergic disease.[76] For infants with a strong history of atopy, there is limited evidence that hydrolysed formula, in comparison with cow's milk formula, reduces infant and childhood allergy.[481] Most studies on the use of hydrolysed formulas have involved infants at high risk of atopy rather than the general population and benefits have been modest. Additional randomised studies are needed among infants from families with low risk of atopy. There is no evidence that partially hydrolysed infant formula prevents allergic disease when used for supplementary feeds in hospitals, and widespread use for this purpose may undermine breastfeeding.

The Royal Australasian College of Physicians (RACP) recommends the use of extensively hydrolysed infant formula in infants with proven cow's milk allergy or cow's milk protein intolerance who are not breastfed.[482]

Soy-based formulas

Soy formula has not been shown to be effective in preventing the development of atopy in 'at-risk' children, and may worsen atopic illness with prolonged use.[482] A Cochrane review concluded that feeding with soy formula should not be recommended for preventing atopy in infants at high risk of developing allergy.[483] Further research may be warranted to determine the role of soy formulas for preventing allergy or food intolerance in infants who are unable to be breastfed, who have a strong family history of allergy or cow's milk protein intolerance.

The RACP policy for the use of soy formula in infants recommends that:[482]

- infants under 12 months who are not breastfed should be fed an infant formula, not a soy drink or dairy-based milk marketed for older children or adult consumption
- soy-based infant formula should not be used for preterm infants
- the possible interaction of soy-based formula with thyroxin replacement therapy should be considered for children with thyroid disorders.

A number of concerns have been raised about soy-based infant formulas, on the basis of possible physiological effects of isoflavone compounds on the infant's developing neuroendocrine system. There is no clear clinical or scientific evidence to support the position that these compounds are harmful, although no long-term studies have conclusively documented the product's safety in infants.

It is appropriate to use soy infant formula in the management of galactosaemia.[482,484] Its use may also be appropriate for infants who cannot consume dairy-based products for cultural or religious reasons.[484]

Goat's milk formula

Compared to cow's milk formulas, there have been fewer studies evaluating the safety and efficacy of goat's milk formulas. Goat's milk is not considered to have any role in preventing or treating allergic disease. Many infants who are allergic to cow's milk are also allergic to goat's milk and soy drinks.[483,485] The use of goat's milk formula is not recommended.

Amino acid-based formula

Amino acid-based or elemental formula is "built" from component nutrients including individual amino acids. Its use in preventing atopic disease has not been studied.[76]

Infant formulas with probiotics or prebiotics

The evidence on probiotics or prebiotics in infant formula to prevent atopic disease varies. Two Cochrane reviews and a review by the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Committee on Nutrition concluded there was insufficient evidence to recommend their use.[486-488]

Maternal dietary restriction

There is no evidence that avoiding any particular foods or food allergens during pregnancy, lactation or infancy provides any benefit in preventing allergy and this is no longer recommended.[73]

Table 8.6: Minimising the risk of allergy in infants with a family history

• Do not smoke during pregnancy and provide a smoke-free environment for your child after birth[489]
• Dietary elimination of potential allergens during pregnancy is not recommended for preventing childhood allergy
• If breastfeeding is discontinued for any reason, there is no advantage in using special formulas, except under medical supervision
• Soy-based formulas do not prevent or reduce the risk of developing allergies and are not a suitable alternative to cow's milk-based formulas

Advice for parents

- Soy or goat's milk-based formulas are not suitable alternatives for infants with allergies to cow's milk-based formulas unless used under medical supervision.
- Avoiding any particular foods or food allergens during pregnancy, lactation or infancy does not prevent allergy development.

8.5.2 Formulas for managing other infant conditions

A number of infant formulas marketed in Australia claim that they are suited for managing minor conditions and symptoms. An extensive literature review failed to find any evidence of their efficacy.

Special infant formulas for managing metabolic, renal, hepatic, immunological and malabsorptive conditions are available (Standard 2.9.1 of the FSANZ Code). Inborn errors of metabolism are outside of the scope of these Guidelines.

8.6 Fluoride in infant feeding

Fluoride is an essential nutrient, being part of the structure of bones and teeth. The water supply in most metropolitan and many regional areas in Australia is fortified with approximately 1 mg per litre of fluoride and it is assumed that this water will be used in preparing infant formula. However, fluoridation policies and naturally occurring fluoride levels vary by region. In areas where the water supply is not fluoridated, an inadequate intake of fluoride by infants and the general community poses a public health problem. However, infants under 6 months do not require a fluoride supplement.[490]

Excessive exposure to fluoride results in dental fluorosis. FSANZ requires that the labels of infant formula products that exceed the stipulated amounts of fluoride indicate this risk and recommend discussion with a medical practitioner or other health professional (Clause 19 (2) of Standard 2.9.1 of the FSANZ Code).

Advice for parents

- Fluoride supplementation is not recommended.
- For children between the ages of 6 and 24 months who are living in areas where the household water supply is not fluoridated, further advice should be sought from a local dentist.

8.7 Contamination of infant formula

There have been several episodes of contamination of infant formula and product recalls due to quality issues in recent years. The largest recall was of formula in China contaminated with the industrial chemical melamine.[491] Because of rigorous standards and comprehensive testing regimes it is unlikely that such a problem could occur in Australia.

Several countries have banned the use of infant feeding bottles made of polycarbonate that contain small amounts of bisphenol A (BPA). Canada was the first country to initiate a mandatory ban, although it recognised that there was no problem.[492] The risk from BPA is very low and the European Food Safety Authority (EFSA) has not recommended a ban.[493] In Australia, the manufacturers and importers of infant feeding bottles have implemented a voluntary ban on BPA in infant bottles in response to consumer preference and demand. FSANZ has evaluated the safety of BPA and plasticisers in baby bottles and concluded that levels of intake of BPA or plasticisers are very low and do not pose a risk to infants health.[494]

8.8 Formula feeding in emergency situations

Where infants are being formula fed, supplies of infant formula, sterile water and feeding containers are required. There are important health and ethical issues associated with distribution of infant formula in disaster situations.[495-498] The preparation of any disaster plan should include discussion of these issues.[495,496]

9. Introducing solid foods

Key points

- From around 6 months, infants should be offered a range of foods of an appropriate texture and consistency for their developmental stage.
- 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.
- Breast milk or infant formula should be continued while introducing solids, with other drinks, except cooled boiled tap water, avoided until the infant is 12 months old.

9.1 Current Australian practices

Available data suggests that all Australian infants are introduced to solid foods by 6 months or within a few weeks of this age. The 2010 Australian National Infant Feeding Survey reported a median age for introduction of solids of 4.7 months.[3] The average age for introducing cow's milk was 10.3 months, although some culturally and linguistically diverse groups introduced it earlier. The groups most likely to introduce solid foods before 4 months were very young mothers, first-time mothers and mothers speaking languages other than English. The 2010 Australian National Infant Feeding Survey found that 35.3% of infants aged 4 months and 91.5% of those aged 6 months had received soft/semi-solid/solid food in the previous 24 hours.[3] Other studies reported introduction of solids at a median age of 17.5 weeks in Perth[499] and at a mean age of 4.3 months in Melbourne.[500]

9.2 When should solid foods be introduced

Infancy is the period of most rapid growth in weight, height and all of the developmental parameters. In round figures, growth in the first 4 months of life is 150–200g per week and then 100–150 g per week until 6 months. In the first 6 months the average infant doubles his or her birth weight and by 1 year typically weighs 2½ times the weight at birth.

Continued growth and development through good nutrition is important to protect the infant against morbidity and mortality.[52,501] Appropriate growth during infancy protects against stunting at one extreme and obesity at the other.[18] There is increasing evidence of the importance of growth and nutrition in relation to obesity rates and cognitive development.[18,29,502] Appropriate early growth and development also protects against the development of chronic disease in adulthood[503-507] and influences future bone mass.[18]

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

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 upon breast milk ceases. Due to this confusion, and use of 'weaning' in various contexts in the literature, these Guidelines use the term 'introduction of solid foods' instead.

9.2.1 Introducing solid foods at around 6 months

By around 6 months of age most infants are able to adapt to different foods, food textures and modes of feeding.[24,229,508] 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),[508] with iron status a particular concern after 6 months[509]
- feeding behaviour has progressed from sucking to biting (most infants are chewing by 7–9 months and can manage finger foods at 8 months)[510]
- 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[508]
- the digestive system has matured and the infant is able to digest starches[511]
- 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.

Infants adjust more quickly to solids introduced at around 6 months. In a longitudinal study (n=506), infants took a median of 28 days from the introduction of solid foods to consumption of more than 10 mL daily and 46 days to the consumption of 100 mL daily.[512] The younger the infant at the time solid foods were introduced, the longer it took to establish the new pattern.[512]

Advice for parents

- Introducing solid foods at around 6 months is necessary to meet the infant's increasing nutritional and developmental needs.

Although exclusive breastfeeding to around 6 months of age is recommended, more evidence is needed to identify any subgroups that require earlier introduction of solid foods. Around 6 months should be regarded as a population recommendation.

9.2.2 Problems associated with earlier or later introduction of solid foods

Introducing solid foods too soon can lead to several problems:

- if less time is spent on the breast, maternal milk production may decline because of reduced stimulation[164] and under-nutrition may result in extreme cases[513]
- if solid foods are introduced while the tongue-extrusion reflex is still strong, the infant will reject the spoon (a hard object) – the mother might then feel that the infant is rejecting the food, when in fact he or she is rejecting the object in the mouth
- exclusive breastfeeding for at least 6 months reduces food allergies (see Section 1.2.1)[514-516]
- exposure to pathogens present in foods can cause increased rates of diarrhoeal diseases.[20]

Introducing solid foods too late can also cause problems:

- growth can falter because breast milk or infant formula alone is insufficient after 6 months
- immune protection can be compromised
- micronutrient deficiencies, especially of iron and zinc, can develop – iron stores are likely to become depleted if a bioavailable source of iron from complementary foods is not provided[517]
- optimal development of motor skills such as chewing can be delayed and the infant may be unwilling to accept new tastes and textures
- there is an association with increased risk of developing allergic syndromes (see Section 9.3.4).

Evidence of an association between age of introduction of solid foods and risk of overweight in children younger than 7 years of age is inconclusive.[518-520] A cohort study found no association in breastfed children but increased BMI at 3 years of age in formula-fed infants who received solid foods before 4 months or after 6 months of age compared to receiving solid foods at 4–5 months.[521]

9.3 What foods should be introduced?

There is no universal model of feeding for infants aged over 6 months as different cultures introduce different foods at varying ages and, providing nutritional requirements are met, there are no adverse consequences. Solid foods are introduced in the same way for breastfed and formula-fed infants. Nutrient requirements for the 6–12 months age group are detailed in the *Nutrient reference values for Australians*.[230] A range of dietary patterns providing these nutrient requirements have been described in the new *Food Modelling System* to inform the revision of the *Australian Guide to Healthy Eating*.[522] Culturally appropriate foods and preparation methods should be encouraged when they are nutritionally suitable.

9.3.1 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.[523] Fruit and vegetable purees should be varied even at this early age to ensure adequate energy and nutrient supply.

Advice for parents

- 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.

9.3.2 Healthy foods in the first 12 months

As the infant moves towards 12 months of age, continued exposure and opportunity to sample a wide variety of healthy foods results in adequate nutrient intakes and healthy diets in childhood and through to adulthood.[524] It may assist in the choice of a broader range of foods later in life. Offering family foods can help the infant accept that special 'kids' foods' are not needed. Suggestions for suitable foods and dietary patterns are included in the *Australian Dietary Guidelines*.[4]

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 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 has been mashed with a fork or minced. Encouraging the infant to chew is important. Infants not given 'lumpy' textured food until after 10 months of age have greater

feeding difficulties at 15 months than those introduced to lumpy food before 6 months or between 6 and 9 months of age.[525] It appears there is a 'critical window' of opportunity for introducing these textured foods to reduce the risk of later feeding difficulties.

Small, hard pieces of food should be avoided as they can cause choking (see Section 9.4.1). Salt should not be added to food, as infant kidneys are immature and unable to excrete excess salt. Frequent consumption of added sugars is associated with increased risk of dental caries (Evidence Grade C).[526-530] Infants given salty or very sweet foods may also acquire a taste for them, resulting in poor food choices later in life.[531]

Continued breastfeeding (or use of infant formula) until 12 months of age is important for good nutrition. Other drinks – including cow's milk (see Section 9.4.3), fruit juice and sugar-sweetened drinks (see Section 9.4.5) – should not be given as they may interfere with intake of breast milk or formula.

Advice for parents

- 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 normal textures during the 6–12 month period.
- Solid foods should be of acceptable taste without added sugar, honey or salt.

Table 9.1: Developmental stages and examples of foods

Stage	Reflexes and skills	Examples of foods that can be consumed
Birth–6 months	**Suckling, sucking and swallowing**	**Breast milk**
First foods (from around 6 months)	Increased strength of suck Appearance of early chewing Movement of gag reflex from mid to posterior third of tongue	Fortified cereals (e.g. rice), vegetables (e.g. legumes, soy beans, lentils), fish, liver, meat and poultry, cooked plain tofu
Other nutritious foods to be introduced before 12 months	Clearing spoon with lips, biting and chewing Lateral movements of tongue and movement of food to teeth	Cooked or raw vegetables (e.g. carrot, potato, tomato), fruit (e.g. apple, banana, melon), whole egg, cereals (e.g. wheat, oats), bread, pasta, nut pastes, toast fingers and rusks, dairy foods such as full-fat cheese, custards and yoghurt
From 12 to 24 months	Rotary chewing movement, jaw stability	Family foods Full-cream pasteurised milk

Source: Adapted from WHO European Region 2003.49

9.3.3 Transition from infancy to toddler

Solid foods should provide an increasing proportion of energy intake after 12 months. Offering a variety of nutritious foods is likely to meet most nutrient needs and provides a basis for healthy eating habits.

Small, frequent and nutrient-dense feedings of a variety of foods from the five food groups are important to meet nutrient and energy needs during the second year of life. From 12 months of age and beyond, toddlers should be consuming family foods consistent with the *Australian Dietary Guidelines*.[4] Special complementary foods or milks for toddlers are not required for healthy children.[522]

In the second year of life, water and pasteurised full-cream milk are preferred drinks and should be offered in a cup rather than a feeding bottle. Sugar-sweetened drinks and fruit juice should be limited (see Section 9.4.5) and tea, coffee and other caffeinated drinks are unsuitable (see Section 9.4.5).

Advice for parents

- From 12 months of age and beyond, toddlers should be consuming family foods consistent with the *Australian Dietary Guidelines*.
- Iron-fortified foods and meat or iron-rich alternatives should continue to be offered.
- Special complementary foods or milks for toddlers are not required for healthy children.
- Milk and water should be offered in a cup rather than a feeding bottle.

Table 9.2: Meeting the nutritional needs of infants and young children aged 6 to 24 months

• Continue to breastfeed as often as the infant desires and the mother is able – this helps to avoid displacement of breast milk by solid foods and to maximise nutrients and immunological benefits, particularly in the first 12 months
• Aim for a variety of complementary solid foods – fruit, vegetables, meat, fish, poultry, cooked plain tofu and eggs
• Iron-fortified infant cereals and meat are good sources of iron – the iron in meat is bioavailable and meat is also a good source of zinc and vitamin B_{12}
• The best source of calcium for infants is breast milk or infant formula – cow's milk should not be given as a main drink to infants under the age of 12 months, small quantities may be given as part of solid foods, such as custards and on cereal. Pastuerised full-cream milk may be given as the main drink in the second year of life.
• Dietary fat is an important source of energy and essential fatty acids and promotes the absorption of essential fat-soluble vitamins – restriction in infancy may adversely affect growth, development and myelination of the central nervous system
• Infants eating a balanced, varied diet do not usually require nutritional supplements – low birth weight infants may be an exception and individual clinical advice should be sought
• Infants should always be supervised when eating
• Meals are to be enjoyed – parents who model enjoyment of nutritious dietary practices set the scene for good nutrition throughout childhood and beyond
• Seek advice if the infant's appetite, growth or developmental milestones are impaired and further assessment is required
Food safety
• Attention to food hygiene is very important when preparing foods for infants and children (see the *Australian Dietary Guidelines)*
• To prevent salmonella poisoning, cook all eggs thoroughly (i.e. until the white is completely set and yolk begins to thicken) and do not use uncooked products containing raw eggs, such as home-made ice cream or mayonnaise
• Reduce the transfer of cariogenic bacteria from carer to infant by avoiding inappropriate feeding practices such as sharing spoons and other utensils, or tasting infant's food with shared utensils

Advice for parents

- Consumption of nutrient-poor foods with high levels of fat/ saturated fat, sugar, and/or salt (e.g. cakes, biscuits, confectionery and potato chips) should be avoided or limited.

9.3.4 Infants with a family history of allergy

Food allergies have become a concern in recent decades, particularly in western societies.[532,533] A recent systematic review suggested that introducing some foods earlier than 6 months may reduce the risk of some allergies.[534] However, the scientific basis of this has been challenged[535-538] due to the association between exclusive breastfeeding to around 6 months and optimum morbidity and mortality in the long and short term (see Section 1.2.1).[20,510,539]

Delaying the introduction of solid foods until after the age of 6 months is associated with increased risk of developing allergic syndromes (Evidence Grade D).[540-547] It is hypothesised that there is a window of tolerance around age 6 months when introducing foods decreases the prevalence of allergy. For example, an Australian study found that delaying introduction of egg until after 12 months was associated with a significant increase in allergy in high-risk children.[548]

The Australasian Society of Clinical Immunology and Allergy has found:[532]

- little evidence that delaying introducing solid foods beyond 6 months reduces the risk of allergy
- some suggestion that delaying introducing foods may increase (rather than decrease) allergy
- insufficient evidence to support previous advice to specifically delay or avoid potentially allergenic foods such as egg, peanuts, nuts, wheat, cow's milk and fish to prevent food allergy or eczema (this also applies to infants with siblings who already have allergies to these foods)
- a need for more research to determine the optimal time to start complementary solid foods.

The AAP and the EFSA also concluded that there is no reason to delay the introduction of foods to prevent allergies, including nuts in suitable form.[76,539]

Breastfeeding should be continued while solid foods (allergens) are introduced to the infant and has many advantages to the health of the infant. Commercially prepared packaged infant formula products and infant foods must comply with mandatory allergen declaration requirements in Standard 1.2.3 of the Australia New Zealand Food Standards Code.

Treatment of proven food allergies involves avoiding foods known to cause symptoms.

Advice for parents

- If food choices are restricted for medical reasons, the advice of a dietitian or appropriate health professional should be sought to ensure that the dietary intake meets nutrient and energy needs.

Table 9.3: Introducing solids in infants with a family history of allergy

• Solid foods should be introduced at about 6 months of age
• Introduce a variety of foods – foods can be introduced in any order although iron-rich foods should be offered first
• Continue breastfeeding while introducing solid foods

9.3.5 Infants on plant-based or vegan diets

Vegetarian diets do not provide sufficient iron for infants without the use of iron-fortified cereals, milks or other foods.[549] Vegan diets are also low in iron and in vitamin B_{12}, which is only found in animal foods.

Advice for parents

- 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 vital for neurocognitive development.
- Mothers who follow a vegan diet should breastfeed their infants for as long as possible, 2 years or more is desirable. For infants being fed a vegan diet 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 on vegan diets may require nutritional supplements, especially iron and vitamin B_{12}.

9.4 Foods and beverages not suitable for infants or that should be used with care

9.4.1 Nuts and other hard foods

Foods with a high risk of choking such as whole nuts, seeds, raw carrot, celery sticks and chunks of apple should be avoided for the first 3 years as their size and/or consistency increases the risk of inhalation and choking. However nut pastes and nut spreads can be offered to infants from around 6 months of age.

Advice for parents

- Avoid giving whole nuts and similar hard foods to young children aged less than 3 years to reduce the risk of choking.

Peanuts, while technically legumes not nuts, are included in this discussion for convenience. In the US, peanut allergy, tree nut allergy or both are reported by more than 1% of the population (e.g. >3 million people) and the prevalence has increased among children over the past decade.[76,550] At the time of the previous edition of the NHMRC *Australian Dietary Guidelines*, the expert consensus was that the introduction of allergenic foods should be delayed.[5] However, as discussed in Section 9.3.4, the evidence now supports treating peanuts the same as any other foods and introducing them at around 6 months of age (assuming that peanut is fed in a suitable physical form, such as a paste, and not as the whole nut).

9.4.2 Honey

Honey can contain the spores of *Clostridium botulinum*, and should not be given to infants aged under 12 months. More than 1,500 cases of infant botulism have been confirmed in the US since it was recognised in 1976.[551] Of these, 95% occurred in infants between 6 weeks and 6 months of age. While other foods may contain spores of *Cl. botulinum*, the consumption of honey has been repeatedly associated with infant botulism. Pacifiers and teats should never be coated with honey before being given to infants (see Section 3.3.1).

Advice for parents

- To prevent botulism, do not feed honey to infants aged under 12 months.

9.4.3 Milk from animal sources

Any unmodified milk from non-human species, including cow's, goat's and sheep's milk, is not suitable for infants due to differences in protein and electrolyte concentrations.

Unpasteurised milks have additional infectious risks and have been associated with the development of infections such as Q fever, toxoplasmosis, brucellosis and *E. coli* O157:H7–associated haemolytic uremic syndrome.[485,552]

Advice for parents

- Unmodified milk from animal sources should not be given as a main drink before 12 months.
- Unpasteurised milk should not be used.

Cow's milk (full cream cow's milk)

Cow's milk has high electrolyte and protein concentrations giving it a high renal solute load. Cow's milk contains 23 mmol/L of sodium and 3.4 g/100 mL of protein.[553] Feeding infants with whole cow's milk before 12 months of age is associated with an increased incidence of iron deficiency. The AAP first recommended against the use of cow's milk under 12 months of age in 1992.[554] This position has been reconfirmed by more recent studies and reviews.

Although cow's milk should not be given as a main drink to infants under the age of 12 months, small quantities may be given as part of solid foods, such as custards and on cereal. After 12 months of age the consumption of cow's milk should be limited to around 500 mL because of the high protein and low iron content (see Table 2.1; page 27) and the risk of reducing diversity in the diet.

Advice for parents

- Cow's milk should not be given as the main drink to infants under 12 months.
- Pasteurised cow's milk is an excellent source of protein, calcium and other nutrients and may be introduced as a drink at around 12 months of age and be continued throughout the second year of life, and beyond.

Goat's milk

Goat's milk is not recommended for infants under the age of 12 months for reasons similar to those given for whole cow's milk above and for the additional reasons below.

Goat's milk is not superior to cow's milk. An exclusive, whole goat's milk diet can cause severe morbidity and potentially mortality in infants, including electrolyte imbalances, metabolic acidosis[555] and antigenicity. Various internet sources claim that goat's milk is less allergenic than cows' milk and is a suitable substitute for infants with cow's milk allergy, but there is no evidence to support this claim. *In vitro* studies have revealed extensive cross-reactivity between cow's milk and goat's milk protein.[485]

Like cow's milk, goat's milk has high electrolyte and protein concentrations giving it a high renal solute load. Goat's milk contains 50 mg of sodium and 3.56 g of protein per 100 mL, approximately three times the respective values in breast milk of 17 mg and 1.03 g per 100 mL. The recommended adequate intakes for sodium and protein for infants below 6 months of age are 120 mg per day and 10 g per day, respectively.[230] Newborn infants have immature kidneys, putting them at substantive risk for hypernatraemia and azotaemia, especially if they are dehydrated.

Due to its very low levels of folate and vitamin B_{12}, consuming goat's milk during infancy can result in severe megaloblastic anaemia.[556] Goat's milk has 6 µg of folate per litre compared with 50 µg per litre in breast milk. Infantile vitamin B_{12} deficiency is a medical emergency due to the potential for severe, irreversible neurological damage.

Systematic evaluation of feeding unmodified goat's milk to infants less than 12 months of age is lacking, but the current literature is consistent in advocating against this practice.

Advice for parents

- Due to potential dangers associated with feeding goat's milk to infants, its use is not recommended.

Low-fat and reduced-fat milk

Low-fat and reduced-fat milks (including skim milk) have a fat content of 0.1–2.5% compared to the usual 4% in full cream milks. In nutritional terms the 4% of fat in milk contributes up to 50% of its energy content. These lower energy and fat levels are not nutritionally suitable for children aged less than 2 years. After 2 years of age children can drink reduced-fat milks with the rest of the family.

Advice for parents

- Low-fat and reduced-fat milks are not recommended in the first 2 years of life.

9.4.4 Plant-based milk substitutes

Plant-based milks (e.g. soy, rice, oat) are not an appropriate source of nutrition for infants. Calcium-enriched rice and oat drinks can be used after 12 months, as long as a full-fat variety is used and alternative forms of protein and vitamin B_{12} are included in the diet. These products are suitable when used under health professional supervision.

Advice for parents

- Soy (except soy follow-on formula) and other nutritionally incomplete plant-based milks (e.g. rice, oat, coconut or almond milk) are inappropriate alternatives to breast milk or formula in the first 12 months.
- Fortified soy drink or calcium-enriched rice and oat beverages can be used after 12 months under health professional supervision, as long as a full-fat variety is used and other sources of protein and vitamin B_{12} are included in the diet.

9.4.5 Non-milk beverages

Breast milk or infant formula should be the main drink in the first 12 months. Exclusively breastfed infants do not require additional fluids up to 6 months of age. For formula-fed infants, cooled boiled tap water may be used if additional fluids are needed. From around 6 months, small amounts of cooled boiled water can supplement breast milk or infant formula. Consuming any other drinks in the first 12 months may interfere with an infant's intake of breast milk or infant formula.

After 12 months, water and whole cow's milk should be the main drinks offered. Where available, clean and safe tap water should be offered, especially if it contains fluoride.

Fruit juice and fruit drink

Fruit juices should not be given to infants[522] and should not be considered as a replacement for fruit at any age. Juices made from compressed fruit contain many of the nutrients present in fruits but not the dietary fibre. They have historically been given to children to prevent vitamin C deficiency and scurvy because cow's milk is low in vitamin C. However, both breast milk and infant formulas contain adequate amounts of this nutrient. Vitamin C is also found in whole fruits, some vegetables and fortified foods.

Studies in Australia show a high prevalence of inclusion of juice in infants' diets. A 1994 study found that, in addition to milk, fruit juice and water were the main fluids given to infants aged less than 8 months, especially formula-fed infants, and 85% of the infants on juice had begun drinking it by the age of 6 months.[557] A later study found that 23% of infants consumed juice by 6 months and 67% by 12 months.[558] Juice was consumed by 89% of Aboriginal infants at 12 months.[559]

For infants over 6 months of age, drinking water is preferable to fruit juices and fruit drinks.[560] Excess consumption of fruit juice by young children has been associated with gastrointestinal symptoms, failure to thrive, decreased appetite, loose stools, failure to gain weight, and obesity.[561] Fruit juice is also acidic and can increase the risk of dental caries and erosion.

The AAP summarised the evidence on fruit juice and infants as follows:[560]

- fruit juice offers no nutritional benefit for infants younger than 6 months and no nutritional benefits over whole fruit for infants older than 6 months and children
- 100% fruit juice or reconstituted juice can be a healthy part of the diet when consumed as part of a well-balanced diet – fruit drinks often contain only a small quantity of fruit juice and are not nutritionally equivalent to fruit juice (or fruit)
- juice is not appropriate in treating dehydration or managing diarrhoea
- excessive juice consumption may be associated with malnutrition (overnutrition and undernutrition) and with a variety of gastrointestinal symptoms including diarrhoea, flatulence, abdominal distention, and dental caries.

The AAP recommends:[560]

- juice should not be introduced into the diet of infants before 6 months of age
- infants should not be given juice from bottles or easily transportable covered cups that allow them to consume juice easily throughout the day
- infants should not be given juice at bedtime
- children should be encouraged to eat whole fruits to meet their recommended daily fruit intake
- fruit juice be limited to 120–180 mL per day for children aged over 12 months.

A more recent systematic review has confirmed the strength of these recommendations.[562] Health professionals should routinely discuss the use of fruit juice and fruit drinks and educate parents about differences between the two. Juice should never replace an infant's breast milk or infant formula intake.

The *Australian Dietary Guidelines* state that fruit juice should only be used occasionally as a substitute for whole fruit, if fruit juice is consumed, it should be within the recommended quantities for each age and gender group. Fruit juice is not recommended for infants. When additional liquids are required for infants, cooled boiled tap water is preferable.[4]

Further information on recommended quantities for children over 12 months of age is available in the associated companion resources to the *Eat for Health Program*.

Advice for parents

- Fruit juice and fruit drinks are not necessary or recommended for infants under 12 months.

Caffeinated and sugar-sweetened drinks

Tea is the most widely used beverage in the world; it is of great cultural importance in many societies and is commonly given to infants, sometimes even as a prelacteal feed.[446] Tea contains tannins and other compounds that bind iron and other minerals, thereby reducing their bioavailability.[563,564] As well, sugar is often added to tea, increasing the risk of dental caries. For these reasons, tea is not recommended as a drink for infants – it is of no known benefit to infants and could possibly be harmful.

Coffee and other caffeinated drinks are also unsuitable for infants. Sweetened drinks should be avoided.

Advice for parents

- Do not offer infants tea, herbal teas, coffee or sugar-sweetened drinks (soft drinks, cordials).

10. Interpretation of the WHO Code for Health Workers in Australia

10.1 The WHO Code

The WHO Code[9] was formulated in response to concerns over the effects on infant health of unfettered promotion of infant formula throughout the world. The drive for the WHO Code came from recognition of the increased risks of morbidity and mortality in infants who are not breastfed.

The aim of the WHO Code is to contribute to the provision of safe and adequate nutrition for infants by protecting and promoting breastfeeding and by ensuring the correct use of breast-milk substitutes, when these are necessary, on the basis of adequate information and through appropriate marketing and distribution.

The WHO Code itself, as approved by the WHA, is not legally binding unless individual nations enact specific legislation. The WHO Code has not been updated, but a number of supplementary resolutions have been passed by the WHA.[565] As recently as May 2010 the WHA passed a resolution urging countries to strengthen their commitments to the WHO Code and the companion BFHI.[566]

10.1.1 Australia's Implementation of the WHO Code

Under the WHO Code:

- governments have the responsibility to ensure that objective and consistent information is provided on infant and young child feeding for use by families and those involved in the field of infant and young child nutrition
- feeding with infant formula should be demonstrated only by health workers, or other community workers if necessary, and only to the mothers or family members who need to use it.

Those aspects of the WHO Code that are appropriate to Australia's social, legal and economic environment are implemented through:

- the *Marketing in Australia of Infant Formulas Agreement: Manufacturers' and Importers Agreement 1992* (MAIF Agreement) (see Section 10.2)
- food labelling laws (Standard 2.9.1 of the Australia New Zealand Food Standards Code) (see Sections 8.1 and 8.2)
- the NHMRC *Infant Feeding Guidelines,* which were developed as a part of the Australian response to the WHO Code and stated 'The guidelines aim to help all health workers understand how the WHO Code and MAIF Agreement affect their work in both breastfeeding and using infant formula.'[25]

10.1.2 Health workers' role

All health workers in Australia have an important role in promoting and supporting breastfeeding. Some aspects of the WHO Code are the responsibility of other parties, such as government or industry, but it is important that health workers are able to support and understand the objectives of the WHO Code as appropriate to Australian conditions.

In keeping with the aims of the WHO Code, and its application in Australia, all health workers should:

- promote optimal infant nutrition by promoting breastfeeding
- provide information about infant formula when required and support families who are using infant formula
- understand the intent of the MAIF Agreement in limiting the marketing of infant formula, particularly in regard to gifts and samples from infant formula companies.

Advice for health workers

- Continue to implement the WHO Code and be aware of health professional obligations under the MAIF Agreement.

10.2 The Marketing in Australia of Infant Formulas Agreement

The MAIF Agreement is a voluntary, self-regulatory code of conduct between manufacturers and importers of infant formula in Australia. It was developed in 1992 as an arrangement authorised under the then *Trade Practices Act 1974*.

The aim of the MAIF Agreement is to contribute to the provision of safe and adequate nutrition for infants, by the protection and promotion of breastfeeding and by ensuring the proper use of breast-milk substitutes, when they are necessary, on the basis of adequate information and through appropriate marketing and distribution (as per Article 11.1 of the WHO Code). A copy of the MAIF Agreement is provided in Appendix L.

10.2.1 Application

The MAIF agreement applies to the marketing and promotion of formulas for infants up to 12 months of age by Australian manufacturers and importers of infant formula who are signatories. As at 2011, the six signatories to the MAIF Agreement represented most of the infant formula market in Australia:

- Abbott Australasia Pty Ltd
- Bayer Australia Ltd
- HJ Heinz Company Australia Ltd
- Nestlé Australia Ltd
- Nutricia Australia Pty Ltd
- Pfizer Nutrition.

The marketing activities of distributors and retailers including pharmacies and supermarkets are outside the scope of the MAIF Agreement. Health workers do not have obligations under the MAIF.

In relation to the products, the MAIF Agreement applies to:

- infant formula i.e. formula that is suitable for babies from birth (e.g Starter, Stage 1 or All Ages infant formulas)
- follow-on formula i.e. formula that is suitable for babies from 6 months.

The MAIF Agreement does not apply to:

- toddler milk drinks suitable from 12 months (sometimes called Growing Up milks)
- complementary foods (i.e. baby cereal and packaged baby foods)
- feeding bottles and teats.

10.2.2 Advisory Panel on the Marketing in Australia of Infant Formula

The Advisory Panel on the Marketing in Australia of Infant Formula (APMAIF) monitors compliance with, and advises the government on, the MAIF Agreement. The APMAIF assesses complaints, which may be submitted by the public (including industry participants or other interested stakeholders) and determines whether a breach of the MAIF Agreement has occurred.

Membership of the APMAIF comprises an independent Chair, an industry representative, a community and consumer representative, a public health and nutrition expert and a legal expert. Members are appointed by the Parliamentary Secretary for Health and Ageing. The Department of Health and Ageing acts as official observer and provides secretariat services.

Terms of reference of the APMAIF are to:

- receive and investigate complaints regarding the marketing in Australia of infant formulas
- act as a liaison point for issues relating to the marketing in Australia of infant formulas
- develop guidelines on the interpretation and application of the MAIF Agreement
- provide advice on the operation of the MAIF Agreement to the Australian Government Minister for Health and Ageing.

The APMAIF has no statutory or formal regulatory powers, either to obtain information from industry participants or other parties or to enforce the MAIF Agreement. Reliance is placed upon the cooperation of the industry participants and other stakeholders to provide information, and on the commitment of industry participants to implement any changes to marketing practices that are requested by the APMAIF.

While there are no financial or legal sanctions associated with breaches of the MAIF Agreement, if the APMAIF determines that a breach of the MAIF Agreement has occurred, the Minister (or Parliamentary Secretary) is informed and details of the breach are published in the APMAIF's annual report. The annual report is normally tabled in Parliament and copies made available to stakeholders. Reports are also available from the APMAIF website.[567]

In accordance with its terms of reference, the APMAIF occasionally develops guidelines on the interpretation and application of the MAIF Agreement. These guidelines are made available on the APMAIF website as a reference source for stakeholders.

10.3 Differences between the MAIF Agreement and the WHO Code

The MAIF Agreement only operates in Australia and does not implement all aspects of the WHO Code. It is part of Australia's response to becoming a signatory to the WHO Code. It applies only to manufacturers and importers of infant formulas and does not include other milk products, foods, beverages or feeding bottles and teats. Only manufacturers and importers are signatories to the MAIF agreement, which therefore excludes retail activities.

Due to the need to cover a wider range of social and economic circumstances, the WHO Code applies to all marketing and related practices of the following products: breast-milk substitutes including infant formula, other milk products, feeding bottles and teats and foods and beverages - including bottle fed complementary foods, when marketed to be suitable for use as a partial or total replacement of breast milk. It also applies to their quality and availability and to information concerning their use.

It should also be noted that the WHO Code applies to 'health workers' who may or may not have a professional qualification whereas the MAIF Agreement refers to 'health care professionals'. For this reason the MAIF Agreement differs from the WHO Code in that it allows for the distribution of samples for professional evaluation and research purposes, through health care professionals including pharmacists.

Appendices

Appendix A
Development of the *Infant Feeding Guidelines*

Literature Review

The search and guideline development strategies used for the *Infant Feeding Guidelines* is identical to that used for the *Australian Dietary Guidelines*.[4] *The Infant Feeding Guidelines* are based on the 2003 edition.

Since the last set of guidelines were published in 2003, developments in infant feeding have required revision, updated references and consideration of the Australian context.

The NHMRC commissioned systematic literature reviews to guide the development of the *Australian Dietary Guidelines*:

- a systematic literature review for the *Australian Dietary Guidelines* (the *NHMRC A review of the evidence to address targeted questions to inform the revision of the Australian Dietary Guidelines*[568])
- an additional systematic literature review for the *Infant Feeding Guidelines* (the *NHMRC Infant Feeding Guidelines Literature Review*[569]).

The methodology for the literature review and the criteria for levels of evidence are described in detail in Appendix B of the *Australian Dietary Guidelines* 2012 edition.[4] Infant feeding guidelines from authoritative bodies in Australia and internationally were also obtained and are listed in the literature review. The countries included in the literature review are the birth countries of most Australian infants as detailed in the literature review. More details of the search strategy and the countries covered are in the literature review. The literature reviews are available at **www.eatforhealth.gov.au**.

Contributors

The *Infant Feeding Guidelines* were developed utilising a collaborative approach, combining the content expertise of the Dietary Guidelines Working Committee with expert technical writers. The NHMRC managed the entire process and representatives from DoHA participated as observers. DoHA provided a significant proportion of the funding that developed these Guidelines.

Curtin University of Technology was commissioned in June 2010 by NHMRC through a Request for Quote process to review the evidence and revise the 2003 guidelines accordingly. The *Infant Feeding Guidelines* were developed by the following technical team:

- Professor Colin Binns*, Curtin University
- Professor Jane Scott, Flinders University
- Professor David Forbes, University of Western Australia
- Katie Hewitt (Research Officer)
- Maria Pasalich (Research Officer)

*Professor Binns is Deputy Chair of the Australian Dietary Guidelines Committee

The Infant Feeding Subcommittee[2] of the NHMRC Dietary Guidelines Working Committee provided oversight to the process and made many useful suggestions:

- Professor Amanda Lee, Dietary Guidelines Working Committee Chair, Queensland Health
- Professor Peter Davies, University of Queensland
- Professor Dorothy Mackerras, Food Standards Australia New Zealand (as at end March 2011)
- Dr Rosemary Stanton, Nutrition Consultant

Targeted Review

The *Infant Feeding Guidelines* underwent a comprehensive targeted review to assess the useability by health workers and general content, as relevant to the Australian context.

This review was completed by:

- Professor Karen Simmer
  School of Women's and Infants' Health, The University of Western Australia
  School of Paediatrics and Child Health, The University of Western Australia

Public Consultation

The Council of NHMRC considered the draft guidelines on 16 June 2011 and 6 October 2011. On 6 October 2011 the Council agreed to recommend the Chief Executive Officer (CEO) of NHMRC release the *Guidelines* for public consultation.

Public consultation on the draft guidelines was undertaken from 24 October 2011 to 5 December 2011. This process was conducted in accordance with Section 13 of the *NHMRC Act 1992*. The public consultation was advertised in major Australian newspapers and on the NHMRC website. Invitations were also sent to a large number of key stakeholders and those with a known interest in nutrition. Over 130 submissions were received from a variety of stakeholders including individuals, professionals and industry.

The Infant Feeding Subcommittee of the NHMRC Dietary Guidelines Working Committee met on 6 and 7 March 2012 to consider the submissions. More information and/or consideration were requested around:

- recommended period for breastfeeding
- allergy prevention
- introduction of solid foods
- growth charts
- MAIF agreement
- WHO code

Expert Review

The *Infant Feeding Guidelines* also underwent independent expert review, primarily on the evidence base used. The expert reviewers were required to declare any conflicts of interest as per the process outlined in Appendix B of the *Australian Dietary Guidelines* 2012 edition.

The expert reviewers were:

- Dr Adriano Cattaneo
  Unit for Health Services Research and International Health, Institute of Child Health, Trieste, Italy
- Professor Kim F Michaelsen
  Department of Human Nutrition, Faculty of Science, University of Copenhagen, Denmark

2 The Infant Feeding Subcommittee are all practising health professionals in paediatrics, dietetics, general practice and public health. We would like to thank the countless thousands of mothers, fathers and infants that we have delivered and cared for during our careers. They have provided us with all kinds of practical information and hints, and inspired us to research where the answers have not been clear.

Editing

Ampersand Health and Science Writing were selected through a Request for Quote process from the NHMRC Technical Writers and Editors Panel to complete the final editing.

Endorsement

The *Infant Feeding Guidelines* were considered by the Council on 20 November 2012 for recommendation to the CEO for issuing. The CEO was pleased to accept the Council's advice and agreed to issue the Guidelines under Section 7(1a) of the *National Health and Medical Research Council Act 1992.*

Review

In line with NHMRC policy, Council will look at the current Guidelines after five years and recommend to NHMRC's CEO if they need to be reviewed.

Appendix B
Infant feeding evidence statements

The evidence statements below have been graded according to standard NHMRC protocols:

- Grade A (convincing association) indicates that the body of evidence can be trusted to guide practice
- Grade B (probable association) indicates that the body of evidence can be trusted to guide practice in most situations
- Grade C (suggestive association) indicates that the body of evidence provides some support for the recommendations but care should be taken in its application
- Grade D indicates that the body of evidence is weak and any recommendation must be applied with caution.

Evidence extracted from the NHMRC Infant Feeding Literature Review[569]

Initiating, establishing and maintaining breastfeeding

Question	Grade	Statement
What is the relationship between breastfeeding in the first hour after delivery and breastfeeding outcomes?	C	Breastfeeding in the first hour after delivery is associated with improved breastfeeding outcomes.
What is the effect of delivering by Caesarean section on breastfeeding outcomes?	D	Delivery by Caesarean section may be negatively associated with the initiation of breastfeeding, particularly exclusive breastfeeding, and to a lesser extent breastfeeding duration.
What is the association between rate of breastfeeding and birth weight?	No grade given	If the infant is not admitted to the neonatal intensive care unit, the rate of breastfeeding is not related to birth weight.
What is the impact of prelacteal feeds on breastfeeding outcomes?	C	There is consistent evidence to support the hypothesis that the use of prelacteal feeds negatively affects breastfeeding duration.
What is the association between ethnicity and breastfeeding type and duration?	No grade given	Insufficient evidence to make a formal evidence statement on ethnicity and breastfeeding in Australia. There appears to be no association between ethnicity and breastfeeding duration.
What is the association between fathers supporting the decision to breastfeed and breastfeeding outcomes?	B	When the infant's father is supportive of breastfeeding, initiation of breastfeeding is more likely and the duration will be longer for any breastfeeding.
Social support (other than fathers) and breastfeeding.	No grade given	Insufficient evidence to support a statement.
What is the relationship between infant gender and breastfeeding initiation and duration?	No grade given	Insufficient evidence to make a formal evidence statement. The available evidence suggests that infant gender is not an important factor in breastfeeding initiation and breastfeeding duration.
What is the relationship between infant health status and breastfeeding initiation and duration?	No grade given	Insufficient evidence to make an evidence statement.
What is the relationship between location (rural vs. urban) and breastfeeding?	C	In Australia, there is no difference or a slight increase in rural areas in the smaller cohort studies. Cross sectional studies (e.g. ABS) show higher ever breastfed rates in rural areas.
What is the relationship between socioeconomic status and breastfeeding?	C	The 1995 National Health Survey shows higher socioeconomic status is associated with higher rates of breastfeeding in Australia.
What is the evidence that maternal obesity is negatively associated with breastfeeding outcomes?	B	There is evidence that maternal obesity is negatively associated with the initiation of breastfeeding and probably breastfeeding duration.

Question	Grade	Statement
What is the relationship between parity and breastfeeding?	No grade given	As parity has become a difficult variable to study no evidence statement has been developed.
What is the association between maternal age and breastfeeding outcomes?	B	Younger maternal age, particularly less than 20 years, may be negatively associated with both the initiation of breastfeeding and breastfeeding duration.
What is the association between maternal education and breastfeeding outcomes?	C	In Australia, and other Western countries, higher levels of education are associated with better breastfeeding outcomes. In Asian countries, such as China the reverse is the case.

Breastfeeding: early days

Question	Grade	Statement
What is the association between demand feeding and 'rooming in'?	No grade given	Demand feeding and the associated "Rooming Policies" are now standard practice in Australian hospitals. Due to the lack of variation in exposure variable no evidence statement has been developed.
Does exercise by mothers in the postpartum period affect breastfeeding performance?	B	Exercise by mothers does not affect breastfeeding performance.
Is the implementation of the Baby Friendly Hospital Initiative (BFHI) associated with breastfeeding performance and duration?	B	Implementation of the BFHI improves breastfeeding outcomes.
What is the impact of pacifier use on the prevention of SIDS?	B	The use of a pacifier reduces the risk of SIDS.
Is pacifier use negatively associated with breastfeeding duration?	C	The use of a pacifier before 4 weeks is associated with a reduced duration of breastfeeding (any, predominant and exclusive).

Breastfeeding: common problems and their management

Question	Grade	Statement
What are the best forms of treatment for women who experience nipple pain/trauma during lactation?	D	No single intervention offers a significant improvement in the symptoms or duration of nipple pain/trauma.
What interventions are recommended for the prevention of nipple pain/trauma during lactation?	D	No single intervention provides a significant effect in preventing nipple pain/trauma.
What is the prevalence of nipple variation (at least one flat, inverted or non-protractile nipple) in lactating women?	D	Approximately 8–10% of lactating women have at least one flat, inverted or non-protractile nipple.
What is the physiological response to nipple shield use?	D	Nipple shield use is associated with a decrease in milk transfer however more research investigating this association is required.
Management of eczema and dermatitis of the nipple.	No grade given	Insufficient evidence to develop a body of evidence statement.
Nipple piercings during breastfeeding.	No grade given	Insufficient evidence to develop a body of evidence statement.
Nipple vasospasm (Raynaud's phenomenon)	No grade given	Insufficient evidence to develop a body of evidence statement
How does a mother's perceived breast milk insufficiency affect breastfeeding level and duration?	D	Approximately 25–35% of lactating women reduce breastfeeding duration or level due to perceived breast milk insufficiency.

Question	Grade	Statement
What are the best forms of treatment for women who experience breast engorgement during lactation?	D	No pharmacological or non-pharmacological treatments for breast engorgement are associated with significant improvement in symptoms.
What is the prevalence of breast engorgement in lactating women?	D	Approximately 40% of lactating women experience moderate-severe symptoms of breast engorgement.
What is the prevalence of mastitis in lactating women?	D	Approximately 10–25% of lactating women experience at least one episode of mastitis.
What preventative strategies are effective in reducing the incidence and recurrence of mastitis in lactating women?	D	No pharmacological or non-pharmacological preventative methods are associated with a reduced occurrence of mastitis in breastfeeding women.
What is the prevalence of breast abscess in lactating women?	D	Approximately 0.1 – 0.5% of lactating women develop a breast abscess in developed countries, including Australia.
What is the incidence of breast abscess in lactating women with inflammatory symptoms of the breast??	D	Approximately 3–10% of lactating women with inflammatory symptoms of the breast later developed a breast abscess.
What is the prevalence of maternal postnatal depression?	B	Approximately 10–15% of women experience depression (EPDS score ≥ 12) within 12 months of delivery.
What is the association between postnatal depression and shorter breastfeeding duration?	C	Postnatal depression is associated with shorter breastfeeding duration.
What is the relationship between infant breast refusal and breastfeeding duration?	No grade given	Evidence was not strong enough to develop a body of evidence statement.
Prevalence and management of infant crying.	No grade given	Evidence was not strong enough to develop a body of evidence statement.
Regurgitation, gastro-oesophageal reflux and feeding related behaviours.	No grade given	No evidence statement developed.
What is the prevalence of ankyloglossia (tongue-tie) in infants?	D	Approximately 4–10% of infants are born with ankyloglossia.
Does ankyloglossia (tongue-tie) affect breastfeeding outcomes?	D	Ankyloglossia is associated with an increased risk of breastfeeding difficulties.
How effective is frenotomy in the treatment of ankyloglossia (tongue-tie)?	D	Frenotomy is an effective treatment for ankyloglossia.
What impact does breastfeeding have on postpartum weight loss?	No grade given	Insufficient evidence to make a statement on the effects of breastfeeding alone on postpartum weight loss.

Breastfeeding in specific situations

Question	Grade	Statement
What is the effect of maternal and paternal smoking on breastfeeding outcomes?	A	Maternal and paternal smoking is negatively associated with breastfeeding outcomes.
What is the association between mothers returning to work and breastfeeding outcomes?	B	Intention to work or return to paid employment is negatively associated with both the initiation of breastfeeding and breastfeeding duration.
What is the risk of mother-to-child-transmission of hepatitis C through breastfeeding?	C	There is no association between transmission of hepatitis C and mode of infant feeding.
What is the risk of mother-to-child-transmission of hepatitis C through breastfeeding in hepatitis C and HIV co-infected mothers?	D	Hepatitis C mothers co-infected with HIV are at an increased risk of transmitting hepatitis C through breast milk.

Expressing and storing breast milk

Question	Grade	Statement
What is the optimum storage time of expressed breast milk?	C	The maximum (optimum) storage time of breast milk under clean conditions in a refrigerator 0–4°C is around 96 hours.
What is the association between breast milk expression and breastfeeding outcomes?	No grade given	An insufficient number of studies were available to make a formal evidence statement.

Introducing solid foods

Question	Grade	Statement
Is the age of solid food introduction in children associated with the development of overweight later in life?	C	Introducing solid foods before 4 months is associated with increasing risk of overweight in children.

Foods not suitable or that should be used with care

Question	Grade	Statement
How many infants are fed unmodified cow's milk before 12 months of age?	D	The majority of infants are given cow's milk before the recommended age of 12 months.
What factors are predictive of the introduction of cow's milk before 12 months of age?	C	Low maternal educational and low socioeconomic status are associated with the introduction of unmodified cow's milk to infants less than 12 months of age.
What are the risks associated with feeding unmodified cow's milk to infants less than 12 months of age?	D	Feeding infants with whole cow's milk before 12 months of age is associated with an increased incidence of iron deficiency.

Infant feeding and later outcomes

Question	Grade	Statement
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	C	Breastfeeding is associated with a reduced risk of asthma and atopic disease.
Is the duration of breastfeeding associated with lower rates of development of Inflammatory Bowel Disease and Coeliac Disease?	C	Breastfeeding is associated with lower rates of coeliac disease and inflammatory bowel disease (Crohn's disease and ulcerative colitis).

Evidence extracted from the NHMRC literature review for the Australian Dietary Guidelines

Breastfeeding: early days

Question	Grade	Statement
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	C	Not breastfeeding is associated with an increased risk of SIDS.

Life course food consumption and breastfeeding

Question	Grade	Statement
Is breastfeeding associated with children adopting appropriate life course consumption and dietary patterns?	A	Compared to infants who are formula fed, being breastfed is associated with reduced risk of becoming obese in childhood, adolescence, and early adulthood.

Breastfeeding and adult disease outcomes

Question	Grade	Statement
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	C	Being breastfed initially, particularly exclusively breastfed is associated with lower blood cholesterol concentrations in adult life.
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	B	Being breastfed in infancy is associated with lower systolic and diastolic blood pressure up to adolescence.

Breastfeeding and maternal and infant outcomes

Question	Grade	Statement
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	B	Infants who are exclusively breastfed for 6 months experience less morbidity from gastrointestinal infection than those who are mixed breastfed as of 3 or 4 months.
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	B	Infants, from either developing or developed countries, who are exclusively breastfed for 6 months or longer do not have deficits in growth compared to those who are not exclusively breastfed.
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	B	There are no apparent risks in a general recommendation for exclusive breastfeeding for the first 6 months of life, in both developing and developed countries. However, infants should still be managed individually in order to achieve sufficient growth and minimise adverse outcomes.
What are the benefits of breastfeeding (partial and exclusive) and the risks of not breastfeeding (any and exclusive), to infants and mothers, both in the short term and long term?	B	Mothers of infants exclusively breastfed for 6 months or more have more prolonged lactational amenorrhea.

Optimising breastfeeding outcomes

Question	Grade	Statement
What nutritional factors are important in optimising breastfeeding outcomes?	B	Consumption of alcohol by lactating women in the range of 0.3–0.8 g/kg body weight is associated with increased risk of adverse infant outcomes.
What nutritional factors are important in optimising breastfeeding outcomes?	C	Breastfeeding is associated with higher infant selenium status compared to formula feeding.
What factors are important in optimising breastfeeding outcomes?	A	Antenatal and perinatal support for breastfeeding can increase the proportion of women breastfeeding (both exclusive and non-exclusive) up to age 6 months.
What factors are important in optimising breastfeeding outcomes?	B	Breastfeeding support (any type) increases duration of both exclusive and non-exclusive breastfeeding both in the immediate post-natal period and at 6 months of age.
What factors are important in optimising breastfeeding outcomes?	C	Maternal perceived insufficient milk supply is associated with increased risk of early cessation of lactation.

Introduction of solid foods

Question	Grade	Statement
Does a particular intake of sugars affect the risk of dental disease?	C	Frequent consumption of added sugars is associated with increased risk of dental caries.
Is the age of solid food introduction in children associated with the development of overweight later in life?	D	Age of introduction of solid foods is not associated with risk of overweight in children younger than 7 years of age.
Is age of introduction of solid foods associated with risk of developing allergic syndromes?	D	Delay in the introduction of solid foods until after the age of 6 months is associated with increased risk of developing allergic syndromes.

Appendix C
Considerations in interpretation of the breastfeeding evidence base

Breastfeeding provides major public health benefits in Australia and hence it is important that it be monitored accurately. Breastfeeding is a dynamic process that lasts for a long period of time, often for longer than 12 months. Measurement involves frequent measurements (for example interviews, records, diaries) or must rely on memory.

In comparing breastfeeding rates the following factors need to be considered:

- *Definitions used* – The standard definitions are given on page 129. While most studies acknowledge standard definitions, they are not always used.[570] This particularly applies to 'exclusive breastfeeding'. Some reports have not included prelacteal feeds and supplementary feeds given in hospital. This can be important as these feeds can alter the human microbiome and future health. In other cases, exclusive breastfeeding rates are calculated on the past 24 hours experience. This measures exactly what it says – breastfeeding status in the past 24 hours – and should not be referred to as exclusive breastfeeding.
- *Recall of past events* – Some events are remembered more accurately than others. Recall periods should be as short as possible. A cohort study, where questionnaires are answered approximately every month or diaries are completed, provides the most accurate data.
- *Accuracy of duration* – Some surveys ask the mother for the date that breastfeeding ceased or changed. Duration can then be ascertained and rounded to the nearest week. Other surveys are less accurate and record breastfeeding to the nearest month. The degree of accuracy of recording duration influences the way the data can be reported and compared to other breastfeeding data. Ideally, breastfeeding events should be recorded to within a week of occurrence.
- *Sample selection* – The same constraints on sample selection apply to all epidemiological studies. In assessing the study ask the question: what population does this sample represent?
- *Response rates* – The same constraints on response rates apply to all epidemiological studies. Why do potential subjects not participate? Is it more likely that non-breastfeeding mothers will refuse to participate? Perhaps working mothers will be under–represented because they are too busy.
- *Sample size* – How was the sample size calculated? Is it big enough?
- *Comparison of studies* – Rates from studies using different methods should be compared with caution. The accuracy of breastfeeding rates is also influenced by the method of collection, e.g. by cross sectional, retrospective or cohort studies.[570,571]

The *National Breastfeeding Strategy 2010–2015* requires detailed data that is representative, accurate and reproducible for program development and monitoring using the standard definitions of categories of breastfeeding. To date all monitoring of breastfeeding in Australia has been done by cross-sectional, retrospective or small regional cohort studies. While useful data are available, many studies use different definitions and sampling methods that make comparisons difficult.[570] Problems with length of memory affect cross-sectional and retrospective breastfeeding statistics. The proportion of infants ever breastfed is usually accurately reported. The duration of 'any breastfeeding' is less accurate and the exclusive breastfeeding rate is unreliable.[571-573]

The largest and most recent survey of breastfeeding in Australia is the 2010 Australian National Infant Feeding Survey, a cross sectional study of 29,000 infants (response rate 56%).[3] Analysis as a synthetic cohort effectively reduces the sample size to around 3,000, but this is larger than any other study in Australia and provides very stable estimates of variables such as the proportion of infants ever breastfed.

Appendix D
National authorities' position statements on infant feeding

Canadian Pediatric Society

The Canadian Pediatric Society recognises…. that promoting exclusive breastfeeding to 6 months has the potential to improve health for infants who are economically and socially disadvantaged. We must acknowledge the need to provide adequate social and nutritional support to lactating women.[574]

America Academy of Pediatrics

Pediatricians and parents should be aware that exclusive breastfeeding is sufficient to support optimal growth and development for approximately the first 6 months of life and provides continuing protection against diarrhea and respiratory tract infection. Breastfeeding should be continued for at least the first year of life and beyond for as long as mutually desired by mother and child.[547,575]

American Dietetic Association

It is the position of the American Dietetic Association that exclusive breastfeeding provides optimal nutrition and health protection for the first 6 months of life and breastfeeding with complementary foods from 6 months until at least 12 months of age is the ideal feeding pattern for infants.[381]

Australian College of Midwifery

Breastfeeding provides the normal food of choice – breast milk - for infants in the first 6 months of life and requires no supplementation. Thereafter infants should receive appropriate complementary foods with continued breastfeeding for up to 2 years and beyond.[576]

Australian Medical Association

There is strong evidence supporting the current recommendations for exclusive breastfeeding to 6 months, followed by the introduction of complementary food and continued breastfeeding until 12 months.[577]

Royal Australian College of General Practitioners

Encourage exclusive breastfeeding for the first 6 months and then gradual introduction of suitable foods. Breastfeeding should continue until the child is 12 months of age, and then as long as the mother and child wish to continue, and weaning should be gradual.[578]

The Paediatrics and Child Health Division of The Royal Australasian College of Physicians

Exclusive breastfeeding is recommended to 6 months with introduction of complementary foods and continued breastfeeding until 12 months of age, and beyond if mother and infant wish.[579]

The Public Health Association of Australia

Whilst, exclusive breastfeeding for 6 months is optimal, breastfeeding for even a few weeks, or partially, is beneficial and has definite advantages over not breastfeeding at all.[580]

European Society for Paediatric Gastroenterology, Hepatology and Nutrition

Exclusive or full breast-feeding for about 6 months is a desirable goal. Complementary feeding should not be introduced in any infant before 17 weeks, and all infants should start complementary feeding by 26 weeks. Continuation of breast-feeding after the introduction of complementary feeding is to be encouraged as long as mutually desired by mother and child.[581,582]

Appendix E
Royal Australasian College of Physicians Breastfeeding Position Statement

The RACP position statement on breastfeeding was endorsed in June 2007. It reads as follows.

The target audience for this policy document are Fellows and trainees of the College and other health care professionals, organisations and community groups in Australia and New Zealand involved in the promotion of breastfeeding.

The Paediatrics and Child Health Division (Division) of the RACP recognises the recent advances in the scientific knowledge and extensive research in epidemiological and physiological studies, which document compelling advantages from breastfeeding and the use of human milk for infant feeding. The RACP policy recognises the role of paediatricians to protect, encourage, support and promote breastfeeding. Breastfeeding is the biological norm. Breastfed infants when compared to formula fed infants have improved neurodevelopmental outcomes[1,2,3,4] and a lower incidence of infections,[5,6,7] obesity[8] and diabetes.[9,10] Breastfed infants also have better feed tolerance, less physiological gastro-oesophageal reflux[11] and a lower incidence of necrotising enterocolitis.[12,13] Most of these benefits have been demonstrated in randomised clinical trials although there remains the possibility that some are due to factors associated with the choice to breastfeed rather than breast milk itself. Other benefits are social, economic and environmental and improved maternal health including some protection against breast cancer.[14]

The effect of breastfeeding on atopic disease is controversial.[7,15,16] There is considerable evidence that breastfeeding may have benefits in the prevention of atopic disease in early life during the preschool years, however it does not appear that the protective effect extends to the teenage years or adult life.[17]

Breast milk is superior to formula. The nutritional composition of breast milk is unique with narrow ranges for most nutrients, and many additional factors that are not in formula. The International Code of Marketing of Breast-milk substitutes[18] endorsed by subsequent World Health Assembly Resolutions, aims to protect the well-being of all infants through the protection, promotion and support of breastfeeding.

Breastfeeding is almost universally successful when there is good management and no medical intervention or exposure to alternative feeding methods. The Baby Friendly Hospital Initiative supports practices, such as keeping mothers and babies together skin-to-skin, which promote successful breastfeeding.[19,20] There is evidence that offering a breastfeed within the first few hours of birth is good for mothers, infants and for ongoing breastfeeding,[21,21] "Rooming-in", or keeping the infant with the mother for 24 hours a day, has been shown to facilitate breastfeeding and promote bonding.[23,24] Infants should be fed on demand in recognition that mothers have varying breast capacities and milk production rates. Offering complementary feeds, whether water, glucose or formula, when there is no medical reason, has been shown to adversely affect the establishment and maintenance of successful breastfeeding.[25,26] There is also a need to recognise the possible dangers associated with infant formula feeding such as possible contamination of feeds, infection and incorrect reconstitution.[27]

The early use of bottles and dummies/pacifiers can interfere with the establishment of breastfeeding altering the infant's sucking capacity and reducing stimulation of the breasts, with the likely result of poor establishment or maintenance of lactation.[28] Randomised trials have reported conflicting results on the use of dummies/pacifiers and duration of breastfeeding with some showing a decrease[29] and some no effect.[30] Dummies/pacifiers, if used, should be after breastfeeding is established. Mothers should be taught baby feeding cues of mouthing, searching, rooting, sucking fingers and fists and breastfeeds should be offered for early signs of hunger 8–12/day. Dummies/pacifiers may be appropriate for some preterm infants during tube-feeding in the special care nursery.

Co-sleeping or bed-sharing is common and associated with increased breastfeeding rates, longer and more restful sleep, and a protective posture and synchrony of mother with baby.[31,32] However, co-sleeping has been associated with infant death if mother is a smoker or when mother is fatigued or sedated with drugs or alcohol. Recommendations for preventing Sudden Infant Death Syndrome (SIDS) and endorsed by the RACP, caution parents that there is an increased risk of SIDS for infants co-sleeping with adults if they get caught under bedding or between the wall and bed, fall out of bed or are rolled on by someone who sleeps very deeply or is affected by drugs or alcohol, or their mothers smoke.[33] All parents should be informed about how to safely co-sleep with their infants. UNICEF UK Baby Friendly Initiative with the Foundation for the Study of Infant Deaths produce a useful document for breastfeeding mothers on bed-sharing.[34]

Promotion of successful breastfeeding increases breastfeeding rates and normal development and growth.[7] Promotion is hindered by existing barriers, such as community attitudes towards breastfeeding in public places, and lack of role models in our society. Breastfeeding is not always easy and therefore some mothers may need support and assistance. Inadequate milk supply is often given as a reason for ceasing breastfeeding, even if the infant is thriving when weight is plotted on growth curves. This perception of inadequate supply is especially common in the first six weeks, before the infant has established a pattern of feeding and sleeping, and when parents may have unrealistic expectations of normal infant behaviour and needs. There are good mother-to-mother support groups available in Australia and New Zealand such as the ABA[35] and La Leche League New Zealand.[36] Health professional support is available through midwives, lactation consultants and the Royal New Zealand Plunket Society.[37] Public interest groups such as the International Baby-food Action Network[38] and the World Alliance for Breastfeeding Action[39] work to protect promote and support breastfeeding and optimal infant feeding practices.

The weight percentiles and body composition of breastfed infants differ from those of infants who are formula fed. In general breastfed infants tend to grow rapidly in the first few months and then grow at a slower rate than current percentiles. Therefore their weight may appear to be faltering after three months when plotted on current growth charts even when they are healthy.[40] The World Health Organization (WHO) Multicentre Growth Reference Study plan to release international growth curves for breastfed infants in 2006. Current National Health and Medical Research Council (NHMRC) recommendations for weight gain in infancy are 150–200g/wk 0–3 months, 100–150g/wk 3–6 months and 70–90g/wk 6–12 months.[41]

Healthy breastfed babies do not need other fluids. The NHMRC recommends exclusive breastfeeding to 6 months based upon WHO and Cochrane reviews that demonstrated no disadvantage to growth associated with exclusive breastfeeding and evidence demonstrating some protection from gastrointestinal infection in exclusively breast fed infants. However the introduction of complementary foods between 4 and 6 months, for healthy infants who are developmentally ready has not proven deleterious.

All infants should receive vitamin K on the first day of life.[42] Breastfed infants whose mothers are exposed to little direct sunlight including cultures where mothers are veiled may require vitamin D supplements to prevent rickets. Preterm breastfed infants require iron supplements from 4–8 weeks of age. Those born <32 weeks gestation usually require fortification of breast milk with protein and calories in the preterm period to allow adequate growth.[43]

There are a few contraindications to breastfeeding and these include active tuberculosis and, in developed countries where there is a relatively safe alternative, HIV infection.[44] In many poorer countries, such as sub-Saharan countries, HIV may not be an absolute contraindication to breastfeeding as the morbidity and mortality associated with infant formula feeding may be much higher than that associated with the risk of HIV transmission.[45] The use of a small number of maternal medications prohibits breastfeeding (e.g. cytotoxic and immuno-suppressive drugs and gold salts). Almost all drugs will pass from the maternal blood to the breast milk but, for most, only about 1–2% of the maternal dose appears. The use of some drugs may require the concentrations in breast milk or infant blood to be monitored.[46] Antidepressants are generally not considered a contraindication to breastfeeding. Advice will vary depending on the dose and duration of treatment and is readily available from Drug Information Centres at Women's and Children's Hospitals, online[47,48,49,50] or from standard texts.[51]

Recommendations

- The Division supports the *International code of marketing of breast-milk substitutes* (1981) and the Voluntary Agreement of the Marketing in Australia of Infant Formulae (1992).
- The Division supports the NHMRC *Infant Feeding Guidelines for Health Workers.* These guidelines outline methods for the encouragement and promotion of breastfeeding and the management of feeding difficulties in the Australian community. They include guidelines for safe bottle-feeding.
- Paediatricians should encourage the critical evaluation at each step in health care during pregnancy, the intra-partum and postnatal periods, to determine any factors that may benefit or hinder the establishment of successful breastfeeding and refer women to expert help as needed.
- Where appropriate, they should encourage the development of local practice guidelines, in particular the introduction of the Baby Friendly Hospital Initiative and the Baby Friendly Community Initiative, which increase the chance of successful breastfeeding.
- All paediatricians who treat children in the early years of life or teach about child health should know in detail the physiology and techniques of breastfeeding and should be able to discuss and assist the mother with any related clinical problems.

- Paediatricians should encourage the inclusion of the breastfeeding topics in the undergraduate medical curriculum, and in postgraduate courses for paediatricians, obstetricians, general practitioners, midwives, pharmacists, dietitians, maternal and child health nurses and relevant others.
- Paediatricians should be advocates in encouraging the community to value breastfeeding and to welcome breastfeeding in public places and the workplace. They should promote social and industrial changes that make it easier for working mothers to continue breastfeeding e.g. these might include work-based facilities for expressing breast milk or feeding, and encouragement or incentive for employers to provide work-based facilities for child care.
- Exclusive breastfeeding is recommended to 6 months with introduction of complementary foods and continued breastfeeding until 12 months of age, and beyond if mother and infant wish.
- As part of postnatal care, mothers should be taught how to hand express breast milk and the appropriate use of breast pumps. Information on how to safely clean any equipment and store their expressed breast milk should also be given.
- All infants should receive vitamin K on the first day of life.
- Breastfed preterm infants (<32 weeks) usually require fortification with protein and calories in the preterm period and with iron from 4–8 weeks of age.
- Infants weaned from the breast before 12 months should receive an iron-supplemented formula.
- Paediatricians should be able to assist in exploring barriers to breastfeeding. When a mother makes an informed decision not to breastfeed, paediatricians need to provide advice about appropriate use of formula.
- Paediatricians should encourage flexibility and maternal autonomy in breastfeeding. Where assistance is necessary, paediatricians should be aware of services that provide such support and where possible refer mothers for additional support from qualified advisers experienced in the management of lactation.
- Paediatricians should consult their local drug information centre before suggesting that breastfeeding be interrupted or ceased because of maternal medications.
- Any baby who is persistently unsettled and/or has inadequate weight gain should be seen by a medical practitioner and, if necessary, referred to a paediatrician for further assessment. If the problem is related to breastfeeding, the advice of a lactation consultant may be useful.

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Appendix F
Australian National Breastfeeding Strategy: extract of the executive summary 2010–2015

Available from **www.health.gov.au/breastfeeding**

The framework for the Australian National Breastfeeding Strategy includes the following vision, objective, and underlying principles.

Vision

Australia is a nation in which breastfeeding is protected, promoted, supported and valued by the whole of society.

Breastfeeding is viewed as the biological and social norm for infant and young child feeding.

Mothers, families, health professionals and other caregivers are fully informed about the value of breastfeeding.

Objective

To increase the percentage of babies who are fully breastfed from birth to 6 months of age, with continued breastfeeding and complementary foods to 12 months and beyond.

Principles

1. Mother and Child: The mother and child relationship is the heart and focal point of all breastfeeding related activities.
2. Ecological Context: Breastfeeding is influenced by a range of family, social, cultural and environmental factors that inform promotion and support activity across the breastfeeding continuum.
3. Access: All members of a community have universal access to appropriate information and affordable services that protect, promote and support breastfeeding.
4. Diversity: The diversity of Australian families is recognised through breastfeeding promotion and support activities that are sensitive and responsive to individual circumstances.
5. Collaborative Care: Services and health professionals work in collaborative partnership to provide holistic care to breastfeeding women and their families that strengthens and maintains existing support services
6. Continuity of Care: Continuity of support at key transition points between birthing and community services and into the broader community is seamless from the perspective of mothers and their families.
7. Evidence Based: Protection, promotion and support activities are consistently informed by the best available evidence, the percentage of babies breastfed is regularly monitored, and activities are evaluated.
8. Effective Governance: There is a clear accountability for breastfeeding protection, promotion, support and monitoring activities at state/territory and national levels, and appropriate consultation and collaboration with the community sector.

Appendix G
Australian nutrition and breastfeeding resources and websites

The following websites provide relevant nutrition information in Australia.

National Health and Medical Research Council	
Nutrition and diet publications	www.nhmrc.gov.au/publications/subjects/nutrition.htm
Clinical practice publications	www.nhmrc.gov.au/publications/subjects/clinical.htm
Australian Department of Health and Ageing	
Population health strategies	www.health.gov.au
National Breastfeeding Strategy	www.health.gov.au/breastfeeding
Other government sites	
New South Wales Health	www.health.nsw.gov.au
Breastfeeding in NSW: Promotion, Protection and Support	www.health.nsw.gov.au/policies/pd/2011/pdf/PD2011_042.pdf
Victorian Department of Human Services	www.dhs.vic.gov.au/home www.education.vic.gov.au/healthwellbeing/childyouth/breastfeeding/default.htm
South Australian Department of Human Services	www.sahealth.sa.gov.au www.cyh.com/
Australian Capital Territory Health	www.health.act.gov.au www.health.act.gov.au/c health?a=dlpubpoldoc&document=2169
West Australian Department of Health	www.health.wa.gov.au www.public.health.wa.gov.au
Northern Territory Department of Health	www.health.nt.gov.au www.health.nt.gov.au/Nutrition_and_Physical_Activity/index.aspx
Queensland Health	www.health.qld.gov.au www.health.qld.gov.au/breastfeeding
Tasmanian Department of Health and Human Services	www.dhhs.tas.gov.au www.breastfeedingtas.org/
Food Standards Australia New Zealand	www.foodstandards.gov.au
Australian Institute of Health and Welfare	www.aihw.gov.au
Australian Bureau of Statistics (ABS)	www.abs.gov.au
Office for Aboriginal and Torres Strait Islander Health	www.health.gov.au/oatsih
New Zealand Ministry of Health	www.moh.govt.nz/moh.nsf www.moh.govt.nz/moh.nsf/indexmh/breastfeeding

Breastfeeding	
Australian Breastfeeding Association	www.breastfeeding.asn.au
Lactation Consultants Australia New Zealand Ltd (LCANZ)	www.lcanz.org
Royal Australian College of General Practitioners (RACGP)	www.racgp.org.au/policy/Breastfeeding_Position_Statement.pdf
UNICEF Innocenti Research Centre	www.unicef-irc.org
International websites	
UNICEF	www.UNICEF.org
American Academy of Pediatrics breastfeeding newsletter	www.aap.org/breastfeeding/sectionOnBreastfeeding.html
Academy of Breastfeeding Medicine	www.bfmed.org/
La Leche League International	www.llli.org/
International Baby Food Action Network	www.ibfan.org/
World Health Organization	www.who.int/en/

Appendix H
State and Territory policies on informing parents about supplementary feeds

New South Wales

NSW Department of Health 2011, Breastfeeding in NSW: Promotion, protection and support. Sydney: NSW Government. www.health.nsw.gov.au/policies/pd/2011/pdf/PD2011_042.pdf

Priority area 4: Support for breastfeeding in health care settings

The BFHI has been shown to be an effective intervention, both as a whole and for many of the individual 'Ten Steps'. The presence of a written breastfeeding policy and communication to staff (Step 1), early skin-to-skin contact (Step 4) and not giving supplementary fluids while in hospital, unless medically indicated (Step 6), appear to be particularly important practices in improving breastfeeding practices.

Queensland

Queensland Health 2010, Queensland health standard: Statewide breastfeeding policy. Brisbane: Queensland Government. www.health.qld.gov.au/qhpolicy/docs/pol/qh-pol-073.pdf

Implementation of the Statewide Breastfeeding Policy is facilitated by the following minimum requirements.

5.4 Guide health care practices, health service infrastructure, workplaces and public places to create environments that protect, promote and support optimal infant and young child feeding

5.4.4 Complementary feeds will only be given for medical indications, such as, but not limited to, those listed in the WHO *Acceptable medical reasons for breast-milk substitutes*, or at the mother's informed request, and will be appropriately documented in the clinical record.

5.4.5 Where an infant is given a complementary feed by staff without informed consent aPRIME report should be generated.

Western Australia

Department of Health Western Australia 2009, Baby friendly hospital initiative: Hospital breastfeeding policy. Perth: Department of Health Western Australia. www.health.wa.gov.au/circularsnew/attachments/411.pdf

5 Policy Principles

5.6 Step 6: Give newborn infants no food or drink other than breast milk, unless medically indicated

5.6.3 Parents must be consulted if formula is recommended and the reasons discussed in full. Any formula prescribed must be recorded in the baby's hospital notes or health record along with the reason for supplementation and accompanied by a consent form signed by the parent.

South Australia, Victoria, Australian Capital Territory, Northern Territory, Tasmania

These states/territories all support the Australian Baby Friendly Hospital Initiative 7 Point Plan for the Protection, Promotion and Support of Breastfeeding in Community Health Services, which includes point 3: Inform women and their families about breastfeeding being the biologically normal way to feed a baby and about the risks associated with not breastfeeding.

Appendix I
Sample supplementary feeds information and approval form

At *(name of hospital)*, we believe that breast milk is the best food for infants and want to support you in your choice to breastfeed. We believe that it is important for you to know the possible effects of giving your infant supplementary feeds (for example additional water or formula), so that you can make an informed choice for your infant.

The effects of supplementary feeds

Introducing supplementary feeds may have an effect on your infant. Breastfeeding works on a demand–supply basis. The more your infant stimulates your breast by sucking, the earlier your breasts will begin to produce milk. When your infant is given supplementary feeds, your breasts have less stimulation and this may mean that less milk will be made. For a small number of mothers giving supplementary feeds may make it difficult for you to continue breastfeeding, with some disadvantages for your infant. However, you should be assured that we will make every effort to help you re-establish breastfeeding once the reason for requiring the supplementary feed has been overcome, should you wish to do so.

In the event of supplementary feeding being needed for medical reasons, the potential for these problems can be minimised by:

- expressing regularly to maintain supply and to prevent engorgement
- using expressed breast milk – it's the best for your infant.

This information sheet was issued to.....

on..... and discussed with me by.....

Approval to give supplementary feed(s) to a new-born infant

I,....., wish/have been advised to give the following supplementary feed to my infant.

Name of supplement.....

I have read and understand this information sheet for mothers.

Date.....Time.....

Reason supplement to be given:.....

.....

Signed by mother.....

Signed by health worker.....

The above approval applies only for supplementary feed(s) necessary for the above stated reason. Each time the reason for a supplement changes, a new approval form should be filled out.

Appendix J
Using a growth reference chart in Australia

The early nutrition and growth of infants has an important effect on early morbidity and mortality and there is increasing evidence of the medium and long-term effects on health. Infant growth is now recognised as one of the influences on health and longevity later in life and breastfeeding is the backbone of early nutrition. Evidence continues to accumulate about the role of early growth and the benefits of breastfeeding in the development of adult disease.[583] Monitoring of growth is the most common paediatric intervention and hence it is important to interpret the data correctly and to adjust where necessary for the use of different references, measurement and cut-off levels for categories of nutritional status.

Birth weight is an important public health indicator that is related to immediate and later outcomes. Classifications used are:

- low birth weight ≤2500 g
- normal birth weight 2500–4500 g
- macrosomia >4500 g.

Risk associated with birth weight has a U-shaped distribution for both short and long-term outcomes.

Growth charts contain a number of lines representing percentiles of the population. By definition, 50% of the population will fall below the 50th percentile (median) and 5% of the population will be below the 5th percentile. Health workers need to remind parents of this basic fact and emphasise that the pattern of growth (trajectory) is more important than the position of one point on the reference chart.

The choice of growth reference chart requires consideration of whether one chart promotes optimal health and breastfeeding rates above another. Health worker education in the use of growth charts will facilitate their correct application and monitoring of growth in infants and children.

Growth reference charts in Australia

In Australia, a number of different data sets and the associated growth reference charts are currently used in different settings for the measurement of growth.[225,584]

In 2012, all Australian jurisdictions agreed to adopt the WHO 2006 growth charts as the standard for Australian children aged 0–2 years. The WHO growth standards for this age group are already in use in the Northern Territory and Victoria. They will be phased in by other states and territories for use at the primary health care level in children health records. Education and training materials to assist Australian health professionals in using the WHO Charts are being developed and will become available in 2013. Other specialised growth charts may still be used by clinicians for groups with particular needs or characteristics.

In children and adolescents (2–18 years of age), BMI is used to represent underweight, overweight and obesity using age-related cut-off values as proposed by Cole et al[585,586] or Z-scores (or standard deviation scores).[584] In 2003, NHMRC endorsed use of BMI percentile charts from the CDC[225] for the monitoring of growth.[5] For children and adolescents, growth should approximately follow the curve in the chart. If the line of growth crosses a number of percentiles or tends towards or crosses the 10th or 85th percentiles, the advice of health professionals should be sought.

Table J1: Practical points in the use of growth reference charts

• Health professionals should use a growth reference chart appropriate to the age and sex of the infant or child
• In using the WHO growth reference charts, it is important to note that the 2nd percentile corresponds approximately to the 5th percentile on the CDC growth chart for infants under 6 months and that lower positions on the growth reference chart are acceptable
• In determining whether breast milk production or infant formula consumption is adequate (or for infants fed formula the amount is excessive), growth trajectory is more important than position on the growth reference chart

Appendix K
Edinburgh Postnatal Depression Scale

Name: .....Address: .....

Your date of birth:.....

Baby's date of birth: .....Phone:.....

As you are pregnant or have recently had a baby, we would like to know how you are feeling. Please check the answer that comes closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today. Here is an example, already completed.

I have felt happy:

- ☐ Yes, all the time
- ☐ Yes, most of the time — This would mean: "I have felt happy most of the time" during the past week.
- ☐ No, not very often
- ☐ No, not at all

Please complete the other questions in the same way.

In the past 7 days:

1. I have been able to laugh and see the funny side of things
   - ☐ As much as I always could
   - ☐ Not quite so much now
   - ☐ Definitely not so much now
   - ☐ Not at all

2. I have looked forward with enjoyment to things
   - ☐ As much as I ever did
   - ☐ Rather less than I used to
   - ☐ Definitely less than I used to
   - ☐ Hardly at all

3. I have blamed myself unnecessarily when things went wrong
   - ☐ Yes, most of the time
   - ☐ Yes, some of the time
   - ☐ Not very often
   - ☐ No, never

4. I have been anxious or worried for no good reason
   - ☐ No, not at all
   - ☐ Hardly ever
   - ☐ Yes, sometimes
   - ☐ Yes, very often

5. I have felt scared or panicky for no very good reason
   - ☐ Yes, quite a lot
   - ☐ Yes, sometimes
   - ☐ No, not much
   - ☐ No, not at all

6. Things have been getting on top of me
   - ☐ Yes, most of the time I haven't been able to cope at all
   - ☐ Yes, sometimes I haven't been coping as well as usual
   - ☐ No, most of the time I have coped quite well
   - ☐ No, I have been coping as well as even

7. I have been so unhappy that I have had difficulty sleeping
   - ☐ Yes, most of the time
   - ☐ Yes, sometimes
   - ☐ Not very often
   - ☐ No, not at all

8. I have felt sad or miserable
   - ☐ Yes, most of the time
   - ☐ Yes, quite often
   - ☐ Not very often
   - ☐ No, not at all

9. I have been so unhappy that I have been crying
   - ☐ Yes, most of the time
   - ☐ Yes, quite often
   - ☐ Only occasionally
   - ☐ No, never

10. The thought of harming myself has occurred to me
    - ☐ Yes, quite often
    - ☐ Sometimes
    - ☐ Hardly ever
    - ☐ Never

Administered/Reviewed by .....Date.....

Using the EPDS

Postnatal depression is the most common complication of childbearing. The 10-question EPDS is a valuable and efficient way of identifying women at risk for "perinatal" depression. The EPDS is easy to administer and has proven to be an effective screening tool.

Users may reproduce the scale without further permission, providing they respect copyright by quoting the names of the authors, the title, and the source of the paper in all reproduced copies

Instructions

- The mother is asked to check the response that comes closest to how she has been feeling in the previous 7 days.
- All the items must be completed.
- Care should be taken to avoid the possibility of the mother discussing her answers with others. (Answers come from the mother or pregnant woman.)
- The mother should complete the scale herself, unless she has limited English or has difficulty with reading.

Scoring

- Questions 1, 2, and 4 (without an *) – are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.
- Questions 3, 5–10 (marked with an *) – are reverse scored, with the top box scored as a 3 and the bottom box scored as 0.
- Maximum score: 30
- Possible Depression: 10 or greater
- Always look at item 10 (suicidal thoughts)
- Mothers who score above 13 are likely to be suffering from a depressive illness of varying severity. The EPDS score should not override clinical judgment. A careful clinical assessment should be carried out to confirm the diagnosis. The scale indicates how the mother has felt during the previous week. In doubtful cases it may be useful to repeat the tool after 2 weeks. The scale will not detect mothers with anxiety neuroses, phobias or personality disorders.

Support

Women with postpartum depression need not feel alone. They may find useful information on the web sites of the National Women's Health Information Center (**www.mchb.hrsa.gov/pregnancyand beyond/depression/morethanblues.html**) and from groups such as Beyond Babyblues (**www.beyondblue.org.au/index.aspx?link_id=94**), Postpartum Support International (**www.healthieryou.com/postpart.html**), and Depression after Delivery (www.depressionafterdelivery.com).

Sources

Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. Brit J Psychiatr 1987;150:782–86.

Wisner KL, Parry BL, Piontek CM. Postpartum depression. N Engl J Med 2002;347(3):194–99.

Appendix L
MAIF Agreement

Preamble

This document sets out the obligations of manufacturers in and importers to Australia of infant formulas and gives effect in Australia to the principles of the WHO Code.

Clause 1: Aim

The aim is to contribute to the provision of safe and adequate nutrition for infants, by the protection and promotion of breastfeeding and by ensuring the proper use of breast-milk substitutes, when they are necessary, on the basis of adequate information and through appropriate marketing and distribution. (WHO Code Article 1)

Clause 2: Scope

This document applies to the marketing in Australia of infant formulas when such products are marketed or otherwise represented to be suitable, with or without modification, for use as a partial or total replacement for breast milk. It also applies to their quality and availability, and to information concerning their use. (WHO Code Article 2)

Clause 3: Definitions

- *Breast-milk substitute* – any food marketed or otherwise represented as a partial or total replacement for breast milk, whether or not suitable for that purpose.
- *Container* – any form of packaging of infant formulas for sale as a normal retail unit, including wrappers.
- *Health care system* – governmental, non-governmental or private institutions engaged, directly or indirectly, in health care for mothers, infants and pregnant women and nurseries or child-care institutions. It also includes health workers in private practice. For the purposes of this document, the health care system does not include pharmacies or other retail outlets.
- *Health care professional* – a professional or other appropriately trained person working in a component of the health care system, including pharmacists and voluntary workers.
- *Infant formula* – any food described or sold as an alternative for human milk for the feeding of infants up to the age of 12 months and formulated in accordance with Australian Food Standard R7 – Infant Formula.[3]
- *Label* – any tag, brand, mark, pictorial or other descriptive matter written, printed, stencilled, marked, embossed or impressed on, or attached to, a container of infant formula.
- *Marketing* – includes the promotion, distribution, selling, advertising, public relations and information services related to infant formulas.
- *Marketing personnel* – any persons whose functions include the marketing of infant formulas.
- *Samples* – single or small quantities of an infant formula provided without cost. (WHO Code Article 3)

Clause 4: Information and education

4(a) Manufacturers and importers of infant formulas in Australia agree that informational and educational materials, whether written, audio or visual, dealing with the feeding of infants and intended to reach pregnant women and parents of infants and young children, should always include clear information on all the following points:

(i) the benefits and superiority of breastfeeding

(ii) maternal nutrition, and the preparation for and maintenance of breastfeeding

(iii) the negative effect on breastfeeding of introducing partial bottle-feeding

(iv) the difficulty of reversing the decision not to breastfeed

(v) where needed, the proper use of infant formula, whether manufactured industrially or home prepared. (WHO Code Article 4.2).

3 The Standard has since been updated and is now called Standard 2.9.1.

4(b) When such materials contain information about the use of infant formulas, they should include the social and financial implications of its use, the health hazards of inappropriate foods or feeding methods and, in particular, the health hazards of unnecessary or improper use of infant formulas. Such materials should not use any pictures or text that may idealise the use of infant formulas. (WHO Code Article 4.2)

4(c) Manufacturers and importers of infant formulas should not donate informational or educational equipment or materials unless it is at the request of, and with the written approval of, the appropriate government authority or within guidelines given by the Commonwealth, State or Territory Governments for this purpose. Such equipment or materials may bear the donating company's name or logo, but should not refer to a proprietary infant formula, and should be distributed only through the health care system. (WHO Code Article 4.3)

Clause 5: The general public and mothers

5(a) Manufacturers and importers of infant formulas should not advertise or in any other way promote infant formulas to the general public. (WHO Code Article 5.1)

5(b) Manufacturers and importers of infant formulas should not provide samples of infant formulas to the general public, pregnant women, parents or members of their families. (WHO Code Article 5.2)

5(c) Manufacturers and importers of infant formulas should not distribute to pregnant women, or parents of infants and young children, any gifts of articles or utensils which may promote the use of breast-milk substitutes or bottle-feeding. (WHO Code Article 5.4)

5(d) Marketing personnel, in their business capacity, should not seek direct or indirect contact with pregnant women or with parents of infants and young children. This does not prevent appropriately qualified personnel from responding to complaints or unsolicited requests for information. For these requests, parents should be referred to a health care professional whenever health advice is required. (WHO Code Article 5.5)

Clause 6: Health care system

6(a) Manufacturers and importers of infant formulas should not use any facility of the health care system for the purpose of promoting infant formulas. This does not, however, preclude the dissemination of information to health care professionals as provided in clause 7(a). (WHO Code Article 6.2)

6(b) Manufacturers and importers of infant formulas should be aware that facilities of health care systems should not be used for the display of products within the scope of this document, for placards or posters concerning such products, or for the distribution of material provided by a manufacturer or distributor other than that specified in clause 4(c) above. (WHO Code Article 6.3)

6(c) The use by the health care system of pharmacies or retail outlets, 'professional service representatives', 'mothercraft nurses', or similar personnel, provided or paid for by manufacturers or importers of infant formulas is not permitted. (WHO Code Article 6.4)

6(d) Manufacturers and importers of infant formulas should be aware that feeding with infant formulas, whether manufactured or home prepared, should be demonstrated only by health care professionals. Such demonstrations should be made only to the parents or other persons who need to use it, and the information given should include a clear explanation of the hazards of improper use. (WHO Code Article 6.5)

6(e) Manufacturers and importers of infant formulas may make donations, or low-priced sales, of infant formulas to institutions or organisations, whether for use in the institutions or for distribution outside them. Such provisions should only be used or distributed for infants who have to be fed on breast-milk substitutes. If these provisions are distributed for use outside the institutions, this should be done only by the institutions or organisations concerned. Manufacturers or importers should not use such donations or low-price sales as a sales inducement. (WHO Code Article 6.6)

6(f) Manufacturers and importers of infant formulas should note that, where donated infant formulas are distributed outside an institution, the institution or organisation should take steps to ensure that these provisions can be continued as long as the infants concerned need them. Donors, as well as the institutions or organisations concerned should bear in mind this responsibility. (WHO Code Article 6.7)

6(g) Equipment and materials, in addition to those referred to in clause 4(c), donated to a health care system may bear a company's name or logo, but should not refer to any proprietary infant formulas. (WHO Code Article 6.8)

Clause 7: Health care professionals

7(a) Manufacturers and importers of infant formulas providing information about the formulas to health care professionals should restrict the information to scientific and factual matters. Such information should not imply or create a belief that bottle-feeding is equivalent or superior to breastfeeding. It should also include the information specified in clause 4(a) above. (WHO Code Article 7.2)

7(b) Manufacturers and importers of infant formulas should provide members of the medical profession and related health care professionals with information about the products, and this information should accurately reflect current knowledge and responsible opinion. Such material should be clearly identified with the name of the manufacturer or importer, the brand names of the infant formulas, and the date of publication.

7(c) Manufacturers and importers of infant formulas should not offer any financial or material inducement to health care professionals or members of their families to promote infant formulas, nor should such inducements be accepted by health care professionals or members of their families. (WHO Code Article 7.3)

7(d) Manufacturers and importers of infant formulas should not provide samples of infant formulas, or of equipment or utensils for their preparation or use, to health care professionals except when necessary for the purpose of professional evaluation or research at the institutional level. (WHO Code Article 7.4)

7(e) Manufacturers and importers of infant formulas should disclose to institutions, to which a recipient health care professional is affiliated, any contribution made to him/her, or on his/her behalf, for fellowships, study tours, research grants, attendance at professional conferences, or the like. (WHO Code Article 7.5)

Clause 8: Persons employed by manufacturers and importers

8(a) In systems of sales incentives for marketing personnel, the volume of sales of infant formulas should not be included in the calculation of bonuses, nor should quotas be set specifically for sales of these products. This should not be understood to prevent the payment of bonuses based on the overall sales by a company of other products marketed by it. (WHO Code Article 8.1)

8(b) Personnel employed in marketing infant formulas should not, as part of their job responsibilities, perform educational functions in relation to pregnant women or parents of infants and young children. This does not prevent such personnel from being used for other functions by the health care system. (WHO Code Article 8.2)

Clause 9: Quality and Labelling

9(a) Manufacturers and importers of infant formulas must ensure that infant formulas sold in Australia conform to Australian Food Standard R7 – Infant Formula.[4] (WHO Code Articles 9.2, 9.4, 10.1 and 10.2)

9(b) Manufacturers and importers of infant formulas must ensure that labels provide the information required to be provided by the Australian Food Standard A1 – Labelling and Advertising and Standard R7 – Infant Formula, and also provide the necessary information about the appropriate use of infant formula and should not discourage breastfeeding. (WHO Code Article 9.1)

Clause 10: Implementation and monitoring

10(a) Independently of any other measures taken to implement their obligations under this document, each manufacturer and importer of infant formulas should regard itself as responsible for monitoring its marketing practices according to the principles and aim of this document, and for taking steps to ensure that its conduct at every level conforms to those principles and aims. (WHO Code Article 11.3)

10(b) Manufacturers and importers of infant formulas agree to be represented on the APMAIF and to participate fully in the work of the Advisory Panel.

10(c) Each manufacturer and importer of infant formulas should apprise its personnel of the existence of this document and of their responsibilities under it. (WHO Code Article 11.5).

4 The Standard has since been updated and is now called Standard 2.9.1.

Glossary

The definitions of breastfeeding used in this document are consistent with the *Australian National Breastfeeding Strategy 2010–2015,* the WHO *Global strategy for infant and young child feeding* and are in general use in Australia.[2,570,587]

Breastfeeding definitions

Category of infant feeding	Requires that the infant receive	Allows the infant to receive	Does not allow the infant to receive
Exclusive breastfeeding	Breast milk (including milk expressed or from wet nurse or breast milk donor)	Prescribed drops or syrups (vitamins, minerals, medicines)	Anything else
Predominant (Full) breastfeeding	Breast milk (including milk expressed or from wet nurse or breast milk donor) as the predominant source of nourishment	Liquids (water, and water-based drinks, fruit juice, oral rehydration solutions), ritual fluids and drops or syrups (vitamins, minerals, medicines)	Anything else (in particular: non-human milk, solid foods, food-based fluids)
Complementary breastfeeding	Breast milk and solid or semi-solid foods	Any food or liquid including non-human milk	
Any breastfeeding	Some breast milk	Any food or liquid including non-human milk	
Ever breastfed	Received breast milk or colostrum on at least one occasion		
Bottle-feeding	Any liquid from a bottle with nipple/teat	Also allows breast milk by bottle	

Infant formula definitions

Breast-milk substitute – Any food being marketed or otherwise represented as a partial or total replacement for breast milk, whether or not it is suitable for that purpose [9]. As this term has the potential to imply an equivalence to breast milk, it is not used in this document. The term 'infant formula' or 'commercial infant formula' is used instead throughout this document. 'Infant formula' is the term used in the Australia New Zealand Food Standard Code.[197]

*Infant formula i*s defined in Standard 2.9.1 of FSANZ. The standard includes the following definitions:

- *Infant formula product* – A product based on milk or other edible food constituents of animal or plant origin which is nutritionally adequate to serve as the principal liquid source of nourishment for infants.
- *Infant formula* – An infant formula product represented as a breast-milk substitute for infants and which satisfies the nutritional requirements of infants aged up to 4 to 6 months.
- *Follow-on formula* – An infant formula product represented as either a breast milk substitute or replacement for infant formula and which constitutes the principal liquid source of nourishment in a progressively diversified diet for infants aged from 6 months.
- *Lactose-free formula and low lactose formula* – Infant formula products that satisfy the needs of lactose intolerant infants.
- *Preterm formula* – An infant formula product specifically formulated to satisfy particular needs of infants born preterm or of low birth weight.
- *Soy-based formula* – An infant formula product in which soy protein isolate is the sole source of protein.
- *Specialty/specialised formulas* (i.e. infant formula products for special dietary use) – Includes:
  - infant formula products formulated for preterm or low birth weight infants
  - infant formula products for metabolic, immunological, renal, hepatic, and malabsorptive conditions
  - infant formula products for specific dietary use based on protein substitutes.

Other definitions

Breastfeeding duration – The total length of time during which an infant receives any breast milk at all, from initiation until breastfeeding has ceased.

Breastfeeding initiation – An infant's first intake of breast milk (or colostrum).

Breast milk – Human milk, including colostrum.[588] The United Nations Children's Fund (UNICEF)/ WHO definition specifically includes breast milk given directly from the breast and expressed breast milk given by other means.

Complementary food – Any food, manufactured or locally prepared, suitable as a complement to breast milk or infant formula, if either becomes insufficient to satisfy the nutritional requirements of the infant. In the *Infant Feeding Guidelines* the following working definition is used: any nutrient-containing foods or semi-solid given to infants in addition to breast milk or commercial infant formula.

Constipation – Refers to the hard, dry consistency of the stools, not the frequency of bowel motions.

Container – Any form of packaging of products for sale as a normal retail unit, including wrappers.[9]

Distributor – A person, corporation or other entity in the public or private sector engaged, directly or indirectly, in the business of marketing at the wholesale or retail level a product within the scope of the WHO Code. A 'primary distributor' is a manufacturer's sales agent, representative, national distributor or broke.[9]

Health care system – Government, non-government and private institutions or organisations engaged, directly or indirectly, in providing health care for mothers, infants and pregnant women. Also includes nurseries, health workers in private practice, and, for the purpose of this document, child-care facilities. For the purposes of the WHO Code, the term does not include pharmacies or other established sales outlets.

Health worker – A professional or non-professional person working in a component of a health care system. This includes voluntary unpaid workers.[9]

Infant – A child aged less than 12 months.

Label – Any tag, brand, mark, pictorial or other descriptive matter written, printed, stencilled, marked, embossed or impressed on, or attached to, a container of any product within the scope of the WHO Code.

Manufacturer – A corporation or other entity in the public or private sector engaged in the business or function (whether directly, through an agent, or through an entity controlled by or under contract with it) of manufacturing a product within the scope of the WHO Code.

Marketing – Product promotion, distribution, selling and advertising, product public relations, and product information services.[9]

Marketing personnel – Any people whose functions involve the marketing of a product or products coming within the scope of the WHO Code.

Nursing staff – The terms used for nursing staff associated with infant care change from time to time and in different localities. In this document the term encompasses all staff involved in infant and maternal care, regardless of their current or former titles.

Samples – Single or small quantities of a product provided without cost.[9] For the purposes of this document, and in the Australian context, free or subsidised samples or supplies of infant formula are those given by manufacturers to health care facilities at no cost or at a cost that is substantially less than the normal retail or wholesale cost.

Solid foods – All foods other than liquids includes semi-solid/ pureed foods, finger foods and family foods.

Supplementary – Additional liquids given to the infant during the first 7 days after birth, including glucose solutions, water and commercial infant formula (definition used in this document).

Supplies – Quantities of a product provided for use over an extended period, free or at a low price, for social purposes, including those provided to families in need.[9]

Toddler – A child aged from 12 months to 3 years.

Weaning – The period during which an infant is introduced to breast milk substitute or solid foods, or both, with the intention of ceasing breastfeeding (this term should be used with care as in the literature, 'weaning', 'weaning foods' and 'weaned' are used in several different ways).

Weaned – The infant or child no longer receives any breast milk.

Abbreviations

AAP	American Academy of Pediatrics
ABA	Australian Breastfeeding Association
ABM	Academy of Breastfeeding Medicine
ABS	Australian Bureau of Statistics
APMAIF	Advisory Panel on the Marketing in Australia of Infant Formula
ASIEM	Australasian Society for Inborn Errors of Metabolism
BFHI	Baby Friendly Hospital Initiative
BFWA	Breastfeeding Friendly Workplace Accreditation
BPA	bisphenol A
CDC	Centers for Disease Control and Prevention (US)
CI	confidence interval
DHA	docosahexaenoic acid
EFSA	European Food Safety Authority
EPDS	Edinburgh Postnatal Depression Scale
EPHN	European Paediatric Hepatitis C Network
ESPGHAN	European Society for Paediatric Gastroenterology, Hepatology and Nutrition
FAO	Food and Agriculture Organisation of the United Nations
FSANZ	Food Standards Australia New Zealand
GDP	Gross Domestic Product
GOR	gastro-oesophageal reflux
GORD	gastro-oesophageal reflux disease
GP	general practitioner
HIV	human immunodeficiency virus
HSV-1	herpes simplex virus type 1
IFMAA	Infant Formula Manufacturers' Association of Australia
INC	Infant Nutrition Council
IU	International Unit
LCANZ	Lactation Consultants Australia New Zealand Ltd
LDL	low-density lipoprotein
MAIF	Marketing in Australia of Infant Formula
NHMRC	National Health and Medical Research Council
NICE	National Institute for Health and Clinical Excellence (UK)
NLM	National Library of Medicines
NUTTAB	Nutrient Tables for Use in Australia
NZIFMA	New Zealand Infant Formula Marketers' Association

OECD	Organisation for Economic Co-operation and Development
OR	odds ratio
PKU	phenylketonuria
PPIs	proton pump inhibitors
RACGP	Royal Australian College of General Practitioners
RACP	Royal Australasian College of Physicians
SIDS	sudden infant death syndrome
SSRIs	selective serotonin reuptake inhibitors
TGFß	transforming growth factor-beta
UK	United Kingdom
UNICEF	United Nations Children's Fund
US	United States
USDA	United States Department of Agriculture
WHA	World Health Assembly
WHO	World Health Organization

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Notes

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www.nhmrc.gov.au

GPO Box 1421, Canberra ACT 2601
16 Marcus Clarke Street, Canberra City ACT
T. 13 000 NHMRC (13 000 64672) or +61 2 6217 9000 F. 61 2 6217 9100 E. nhmrc@nhmrc.gov.au