



Royal College of Nursing

# Formula feeds

*RCN guidance for nurses caring for infants and mothers*



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## Introduction

This publication aims to provide an overview of formula feeding to enable health professionals to support mothers who, for whatever reason, have made this choice of feeding. It provides basic information to enable safe formula feeding, whether in hospital or community settings, and details the different types of both standard formula, and formula adapted for minor gastro conditions, that are widely available in the UK. The scope of the guidance is restricted to formula feeds suitable during the first year of life.

It outlines the legislation which governs the composition, advertising and labelling of formula milks. It also provides a summary of formula suitable for pre-term, allergy and faltering growth. Rarer clinical conditions, such as inborn errors of metabolism and kidney disease, are beyond its scope. Feeding guidelines, and an introduction to tube feeding, has also been provided.

This publication's target audience includes children's nurses, neonatal nurses, adult nurses, midwives, health visitors and health care support workers. The benefits of breastfeeding are unquestionable and this guidance takes this as its starting point.

## RCN position on formula feeding

The RCN unequivocally endorses the current recommendations of the World Health Organization (WHO) that exclusive breastfeeding is the optimal means of feeding for the first six months of an infant's life. For the majority of infants, breastmilk is the perfect first food.

## **The application of the Nursing and Midwifery Council (NMC) Code of professional standards of practice and behaviour for nurses and midwives (2015)**

The NMC Code (2015) makes it clear that nurses can interpret the values and principles set out in the Code in a range of different practice settings, but makes it clear that the standards are not negotiable or discretionary. The NMC states clearly that the 2015 Code signifies what good nursing and midwifery practice looks like. It advocates that the interests of patients and service users are put first. Nurses must ensure that care is safe and effective and, as professionals, promote trust through their actions. When considering infant feeding, the best interests of the family have to be considered and when mothers choose to feed formula they should be treated with respect; these families need to have their rights and choices upheld and any discriminatory attitudes and behaviours must be challenged.

The Code makes no reference to formula feeding but does require professional behaviour with regards to accepting gifts, hospitality and calls for financial integrity. The Code also cautions registrants that their professional status should never be used to propose causes that are not related to health. When interpreting the Code in relation to the practicalities of infant feeding, the registrant and health care professional should be mindful of the United Nations International Children's Emergency Fund (UNICEF) guidance on the importance of working within *WHO's International Code of Marketing of Breast-milk Substitutes* (UNICEF, 2015).

## **The Baby Friendly Initiative position on formula feeding**

The Baby Friendly Initiative is a worldwide programme by WHO and UNICEF. The programme advises parents that while there is significant reliable evidence that shows breastfeeding has important advantages for both infant and mother, if they choose not to breastfeed then health care professionals will support them in that choice. The UNICEF UK guidance to the Baby Friendly Initiative standards advise that health professionals should ask if the parents want to be taught how to make up a bottle properly, and should be on hand to answer any questions the parents have, both ante and postnatally (UNICEF UK, 2012).

## Benefits of breastfeeding

Breastfeeding is how nature intended babies to be fed and it is undisputedly the best way to feed a baby. The WHO and UNICEF recommend that a baby is exclusively breastfed for the first six months of life, and that breastfeeding should continue, along with appropriate complementary foods, up to two years of age.

Breastfeeding offers benefits to both mothers and their babies.

In mothers, studies (Jordan et al., 2012; Ballard and Morrow, 2013) show that breastfeeding decreases the risk of:

- breast and ovarian cancer
- type 2 diabetes
- cardiovascular disease.

Breastfeeding plays a central role in mobilising the fat stores accumulated during pregnancy, and may help a mother return to her pre-pregnancy weight. Furthermore, breastfeeding 'resets' maternal metabolism; in doing so it reduces maternal risk of metabolic disease. When a woman does not lactate, adverse metabolic changes persist for longer, thus increasing her disease risk (Stuebe and Schwarz, 2010).

In babies, breastfeeding offers short-term benefits such as protection against gastrointestinal and respiratory infection and allergy (Fisk et al., 2011; Quigley et al., 2007). In the long term, breastfeeding is associated with a lifelong decreased risk of developing a range of disease and conditions (WHO, 2007; Robinson and Fall, 2012; Stuebe, 2009).

Studies (Kramer et al., 2001; Owen et al., 2005) have found that breastfeeding is associated with:

- lower incidence of obesity
- lower incidence of diabetes
- lower levels of cholesterol and blood pressure
- higher performance in intelligence tests.

Not all studies, however, have demonstrated benefits conclusively and most of the evidence is observational from historical cohorts (Robinson, 2015). This variation in

study results can be explained to some extent by differences in sample size, timings of end point measurement and confounding variables; for example, the characteristics of some women who breastfeed may be different to those who do not in terms of dietary habits and/or socio-economic class.

It is apparent that the growth velocity of breastfed children is less than that of bottle fed children, which appears to confer benefits to the former. Breastfeeding may also promote self-regulation in contrast to babies fed via a bottle, regardless of whether the bottle contains formula or breast milk (Li et al., 2010).

Breastfeeding is such an important indicator of health that it has been included in the *Public Health Outcomes Framework for England* (DH, 2012).

### Breastmilk composition

Breastmilk has a unique composition of ingredients that provide optimal nutritional and complex bioactive components which have functional benefits (Ballard and Morrow, 2013). There are three stages of lactation, during which the composition of breast milk changes; there can be marked variation in breastmilk composition within and between individuals.

<b>Colostrum 1-5 days post-delivery</b>	<b>Transitional milk 6-15 days post-delivery</b>	<b>Mature milk 15+ days post-delivery</b>
Relatively high in protein, rich in constituents of benefit to the immune system.	High in fat and lactose.	Composition varies during a feed, starting with foremilk and then fat-rich hind milk.  Composition will vary over the lactation period but will always be adequate to nourish the infant.

### Functional components in breastmilk

- Immunological compounds, such as sIgA and lactoferrin.
- Long chain poly-unsaturated fatty acids.

- Hormones.
- Growth factors.
- Enzymes.
- Human milk oligosaccharides.
- Anti-microbial.

## Infant feeding in the UK

Since 1975, the UK *Infant Feeding Survey* has been conducted every five years. The 2010 *Infant Feeding Survey* (HSCIC, 2012) demonstrated that 81% of mothers initiated breastfeeding their infants; however the prevalence fell to 69% at one week and by six months only 34% were still breastfeeding. As a consequence, infant formula is an important source of nutrition for many infants. To feed formula successfully, parents need education and support to ensure their infant's safety. As respected professionals, nurses are ideally placed to help and support families in making their choices and advising as to safe formula feeding.

While nurses should continue to provide advice and to promote and support breastfeeding, they should also be able to advise parents and help with formula feeding. Whilst recognising that breastfeeding is the preferred option for feeding an infant, the Baby Friendly Initiative is clear that parents should be receiving all the information and support they need to make an informed choice about their baby's nutrition.

Nurses need to have knowledge and skill with regard to the safe preparation and storage of formula and, without bias or promoting any brands, have a good knowledge of the different formulas available and the different situations in which these may be used.

However, nurses are also reminded that if they work in an area that has achieved the 'Baby Friendly' accreditation status, or if their employers are seeking 'Baby Friendly' status, then they must ensure that, as stipulated by the *International Code of Marketing of Breastmilk Substitutes* (WHO, 1981), mothers or their families are not exposed to adverts promoting formula milk, bottles, teats or solid food for infants under six months old. Consideration must also be given to the fact that the use of

branded gifts with familiar logos, in front of mothers, may carry a subtle message that the health care professional is endorsing a product.

## Formula feeding

### **Making the choice to formula feed**

There are many reasons why mothers stop breastfeeding before they might have wished to. These include lack of support, concerns about maternal or child health (infant nutrition, maternal illness or the need for medicine, and infant illness) and processes associated with breastfeeding; specifically, lactation and milk-pumping problems (Odom et al., 2013). Some parents choose to introduce formula feeds either exclusively, or in addition to breastfeeding, perhaps as a result of returning to work; although supporting the mum at study or work may prolong breastfeeding (UNICEF, 2008). Parents have a right to choose how to feed their baby and a nurse's knowledge of different formulas can help families to make a suitable choice.

Infant factors may include some inborn errors of metabolism; sucking difficulties; in cases of prematurity, where there is insufficient breast milk or the breast milk contains insufficient calories for growth a special 'fortifier' can be added to breast milk that has been expressed.

Maternal factors can make formula feeding desirable; the age of the mother can influence feeding decisions (Dyson et al., 2010); pharmacotherapy; maternal ill health; infectious or transmissible diseases, for example to prevent the transmission of HIV infection during the postpartum period.

The British HIV Association and Children's HIV Association (BHIVA/CHIVA) continue to recommend the complete avoidance of breastfeeding for infants born to HIV-infected mothers, regardless of maternal disease status, viral load or treatment (Taylor et al., 2011); nurses who work abroad may like to refer to the guidelines produced by the World Health Organization (WHO, 2010). Breastfeeding can also be contraindicated where mothers are substance users, and may pose a challenge to mothers who have mental health problems (Gagliardi et al., 2012).

The Twins and Multiple Birth Association has expressed concerns that twins are more likely to be artificially fed than single babies. It is possible to successfully



breastfeed twins and triplets, but some mothers choose to supplement with formula when their pregnancy has resulted in multiple births.

## **Provision of information about bottle feeding**

Health professionals have a responsibility to inform parents about infant nutrition and it is important that mothers are informed, during pregnancy, about the benefits of breastfeeding and the risks of artificial feeding. However, should the mother choose to bottle feed then she should be given every support to do so as safely as possible and in a non-judgemental way.

Because of the overwhelming evidence and emphasis on the benefits of breastfeeding, mothers who use formula can feel that they have failed (Lee and Furedi, 2005). A 2011 investigation (Hoddinott et al., 2011) of the perspectives of women and their wider family and social network on infant feeding, from pregnancy until six months after birth, identified a clash between idealism and realism. A similar finding was acknowledged in the findings of a survey undertaken by the Royal College of Midwives (RCM, 2014) which recommends that support is given to women equally, regardless of their chosen infant feeding method.

Inadequate or inaccurate information may result in a range of serious risks to infant health. For example, unhygienic preparation of equipment, reconstitution, storage and administration of feeds may result in a risk of infection, dehydration, malnutrition and hypernatraemia. The RCM recommends that all parents who have chosen to bottle feed are shown how to sterilise bottle feeding equipment and that they have a one-to-one demonstration on making up formula feeds safely before they leave hospital, in line with national standards.

## **Introduction to formula feeds**

Infant milk is an umbrella term to describe formula milk suitable for babies under 12 months of age. There are two types of infant milk designed to meet the nutritional needs of young and older babies:

- infant formula – intended for babies from birth to 12 months
- follow-on formula – intended for babies aged over six months until 12 months.

Infant formula is defined as the only processed foodstuff which completely satisfies the nutritional requirements of infants during the first months of life until the

introduction of appropriate complementary feeding. Its energy and nutritional composition satisfies the requirements of growth and development in healthy infants aged between 12 months.

Follow-on formula is a food intended for use as the liquid part of a weaning diet in an infant aged six months onwards.

### **Legislation governing the composition of infant milk**

Strict legislation governs the composition, advertising and labelling of infant milks. Infant formula and follow-on formula fall under the framework legislation of the EC Directive 2006/141/EC on *Infant Formula and Follow-on Formula*. The Directive, originally adopted in 1991, was revised in 2006. Although the sources of protein for infant milks were originally limited to cow's milk and soya, a review by the European Food Safety Authority (EFSA) of a study by Zhou et., al concluded that goat's milk was also a suitable source (EFSA, 2012; Zhou et al, 2014). In 2013 the Directive was amended to include goat's milk as an approved protein source.

The legislation is in the process of being updated; in 2014 EFSA published its scientific opinion on the composition of infant and follow-on formula (EFSA, 2014) as a precursor to this. In July 2016 the *Regulation on Foods for Specific Groups* (Regulation (EC) 609/2013) repealed the *European Framework Directive on Foods for Particular Nutritional Uses* (also called 'PARNUTs foods'). Certain aspects of the specific vertical Directives under PARNUTS, including Directive 2006/141/EC on *Infant Formula and Follow-on Formula*, will be replaced by new legislation applicable fully from 2020. Regulation (EC) 2016/127, comes into effect in February 2020 in the case of standard infant and follow-on formulae, and in February 2021 in the case of formulae based on hydrolysed proteins; Directive 2006/141 remains in force until then, the transition period being necessary to allow manufacturers to reformulate their products to meet the new requirements.

### **Composition of infant milk**

Current legislation provides specific criteria for the levels of macronutrients (protein, fat, carbohydrate and energy) and micronutrients (vitamins and minerals) which should be present in infant milk. Requirements for nutrient levels in the new legislation have changed slightly to reflect latest nutritional recommendations including a new requirement that the long chain polyunsaturated fatty acid DHA be

added to both infant formula and follow-on formula from the date it comes fully into effect in February 2020; until then it remains an optional ingredient in infant and follow-on formulae.

In the 2014, EFSA opinion on the composition of infant formula, the minimum values are target values and the maximum values should be regarded as upper limits not to be exceeded. The energy and protein composition of infant formula has reduced in recent years to resemble that of human milk more closely. The faster rate of growth seen in formula fed babies, compared to those breastfed, is thought to have been due to the higher levels of energy and protein in formula compared with breast milk (Koleztko et al., 2009).

There are a number of ingredients that are not mandatory for inclusion in infant formula, which means there is no obligation for manufacturers to include these in their products. These include nucleotides, non-digestible carbohydrates, 'probiotics', 'synbiotics' (a combination of pre- and pro-biotics) and taurine.

## Types of infant milks

### First milks

The major brands call their infant formula 'first' milk; in other words, the milk that a baby can start with from birth. The legislation allows first milks (and also follow-on formulae) to be based on cow's milk, goat's milk or soy protein. (For soya protein-based milks, see additional note in section below). The proteins in formulae based on cow's milk tend to be whey dominant, (rather than casein dominant). Breast milk is whey dominant.

There are no requirements in the current or new upcoming legislation on the whey/casein ratio which should be present in infant and follow-on formulae.

### Hungry milks

Brands based on cow's milk offer a casein dominant infant formula within their portfolio aimed at 'hungrier babies', as theoretically cow's milk casein is more slowly digestible than whey protein and so will keep a baby full for longer. These milks can be used from birth or after the first milk until six months of age.

There is no strong evidence to support the claims that these milks keep babies full for longer and there are no high quality trials which demonstrate their effect. They

may be slightly higher in total protein, although not higher in calories or fat; there is much discussion on wanting to avoid excessive protein in infants due to its link with obesity (Koletzko et al., 2009; Martin et al., 2014).

In recent years most manufacturers have removed ‘hungry milks’ from their core milk range; previously these were marketed as second milk product, prior to follow-on milk.

### **Follow-on formulas**

Compared to formula designed to be given from birth, these products feature increased levels of iron and vitamin D and are intended to address the fact that UK infants aged over six months are often lacking in these nutrients.

Utilised from six months of age and as part of a weaning diet, follow-on formula are not regarded as breast milk substitutes and are not regulated by the same advertising restrictions; however, a recent recommendation by an expert committee convened by the Early Academy of Nutrition has challenged this (Koletzko et al., 2013).

In 1986, WHO stated that follow-on formula were not necessary, as breast milk should continue to be a substantial part of the weaning infant’s diet. However, for the mother who chooses to use these and seeks advice from the nurse, they are reconstituted in the same way as first feeds.

### **“Good night” formula**

Good night milks are a type of follow-on formula that initially had cereal or other ingredients – such as pre-gelatinised rice flour or flakes, whole-grain oatmeal and potato or corn starch combinations – added to make these more viscous than other formula milks.

Good night milks came under heavy scrutiny some years ago due to the lack of scientific evidence from robust clinical trials to support claims and concern that the addition of cereal could increase the calorie level of such products (SACN, 2008).

## Soya protein-based formula

Current advice in the UK is that babies should not have a soya formula unless advised by a GP or health visitor; there was concern some years ago that the phytoestrogen content of such products could affect a baby's reproductive development (see the NHS Choices guidance for parents on soya-based infant formula, available at [www.nhs.uk/chq/Pages/can-I-give-my-baby-soya-based-infant-formula.aspx?CategoryID=62&SubCategoryID=63](http://www.nhs.uk/chq/Pages/can-I-give-my-baby-soya-based-infant-formula.aspx?CategoryID=62&SubCategoryID=63))

However, a soya formula is the only option for a baby who is to follow a vegetarian diet and can also be used in infants with galactosemia or galactokinase deficiency (BDA, 2010). The Scientific Advisory Committee on Nutrition (SACN, 2008) has stated that extensively hydrolysed protein formulae were more appropriate for babies sensitive to cow's milk based formula however, if extensively hydrolysed formula are not tolerated, a soya-based formula can be used (BDA, 2010).

## Safety and quality of formula feeds

Although all powdered infant formula is manufactured under strict hygienic conditions, it is not sterile. Therefore, health care professionals and carers should follow good hygiene when making up feeds and strictly follow the manufacturer's instructions on the label.

In the UK the Department of Health also recommends that powdered formula is made up with water that has cooled to no less than 70°C; this will reduce the chance of babies becoming ill through poor hygienic practices. In hospital pre-term and LBW infants received a liquid ready-to-feed formula, as this is sterile. However, on discharge, if formula feeding, pre-term infants are routinely recommended powder. Detailed guidance on preparing feeds is available from the Department of Health (DH, 2013).

Manufacturers have stringent quality control measures in place in their production sites to ensure that the end product is of a high quality and safe from a microbiological perspective. The 2006/141/EC regulations for infant and follow-on formula state specific pesticides that cannot be used in production of these milks and list specific maximum residue levels of pesticides, or metabolites of pesticides in infant and follow-on formula.

## Preparation and storage of formula including cleaning and sterilisation of equipment

It is vital that all equipment used for feeding and preparing feeds has been thoroughly cleaned and sterilised before use.

- Hands must be thoroughly cleaned before touching sterilising or feeding equipment.
- The feeding equipment and the preparation equipment must be thoroughly washed in hot soapy water.
- Bottle and teat brushes should be used to scrub inside and outside of bottles and teats to ensure that all remaining feed residue is removed.
- After washing feeding equipment, rinse it thoroughly under the tap.
- If using chemicals or a commercial steriliser, follow the manufacturer's instructions.
- It is best to remove the bottles from the steriliser just before these are used; bottles not being used immediately should be fully assembled with the teat and lid in place to prevent the inside of the sterilised bottle and the inside and outside of the teat from being contaminated (abridged from NHS Choices, 2012a).

## Preparing a feed using powdered infant formula

Normally, each bottle should be made up fresh for each feed. Storing made-up formula milk may increase the chance of a baby becoming ill and should be avoided.

- Clean the surface thoroughly on which to prepare the feed.
- Wash hands with soap and water and then dry.
- Boil fresh tap water in a full kettle. Alternatively, bottled water that is suitable for infants (low sodium less than 200mg per litre and sulphate less than 250 mg per litre) can be used for making up feeds but should be boiled in the same way as tap water.
- Allow the boiled water **to cool to no less than 70°C**. In practice, this means using water that has been left covered for less than 30 minutes after boiling (some specialist formulas may require different preparation so always refer to manufacturers' instructions).

- Pour the amount of boiled water required into the sterilised bottle.
- Add the exact amount of formula powder as instructed by the manufacturer on the label. Do not add more or less powder, as this constitutes a risk to the infant.
- Reassemble the bottle, keeping the teat contained within the bottle cap, and shake gently until contents are mixed.
- The contents can be cooled to a feeding temperature by holding the lower part of the bottle under a running tap, ensuring that the tap water does not come into contact with the cap.
- Check the temperature before giving it to the baby. The temperature should be lukewarm, not hot. Discard any feed that has not been used within two hours or, if in a hospital environment, as soon as the baby has fed.

Abridged from NHS Choices 2010 and NHS 2012.

If the making up of individual feeds is not possible or practical, feeds should be prepared in separate bottles and stored in a fridge at a temperature below 5°C for no more than 24 hours. Remove from the fridge just before needed and then warm in a bottle warmer or with warm water. Do not use a microwave.

## Formula feeds available in the UK

There are subtle differences between types and brands of formulas. Nurses need to be aware of these differences so that accurate advice can be given to parents. It is important to be familiar with manufacturer brands so that if invitations are received, or promotional material offered, the professional is clear as to how these are connected with the makers of infant formula (UNICEF, 2013).

## Feeding guidelines

All babies should be fed according to their individual needs, regardless of the milk they are receiving. However, as a guide, for a term baby receiving all its nutrition from a feed, the fluid requirement from about one week to three months is 150 ml/kg body weight.

Newborn infants gradually increase their intake from about 20-30 ml/kg on the first day of life to 150 ml/kg by seven days (Dixon et al., 2008) – although this will vary

from baby to baby – until they are six months old. This reflects the increase in the capacity of the infant’s stomach. Formula powder containers feature tables that show the typical volume to use, based on the age and weight of the infant.

Whenever possible, home routines should be continued in hospital. Infants should be fed on demand if their condition allows it, and offered the amount required to satisfy their hunger and growth needs. Notwithstanding individual variations, most term infants will initially need to be fed every two to four hours, day and night.

All parents should have a discussion about responsive bottle feeding, to ensure that their baby has as pleasant an experience as possible. Holding baby close, inviting him to take the teat by gently rubbing it against his upper lip to encourage him to open his mouth and pacing the feed will help the baby to retain some control.

Limiting the number of people involved with feeding will also help the baby feel secure and support a stronger bond between mother and baby. If others are involved with feeding, encourage parents to make sure those helping use the same feeding technique. Parents may need to be advised against overfeeding and, in particular, advised against giving lots of milk in one feed in the hope that the baby will go longer between feeds. The baby is more likely to put on too much weight (or to be sick) if they are given more milk than they want.

It has been shown that infants fed from a bottle (regardless of whether it contained formula or breast milk) were more likely to empty the bottle or cup in late infancy (Ruowei et al., 2010). This novel 2010 study was the first to suggest that babies fed from a bottle per se lacked self-regulation compared with breast fed infants. In this context, responsive feeding and attending carefully to the cues of hunger and satiety the baby is showing may be important to prevent overfeeding and putting the baby at risk of excessive weight gain.

This is a relatively new area of research but a recent systematic review concluded that non-responsive feeding was associated with higher child BMI or overweight/obesity and that more research was needed to test the efficacy of responsive feeding interventions in the prevention and treatment of child overweight/obesity (Hurley, Cross and Hughes, 2011).



## Hot weather

Completely breastfed infants should not be given water until after they have started eating solid food. Infants fed on formula milk should be offered extra drinks of freshly boiled and cooled water in very hot weather (NHS Choices, 2011).

## Weaning

The recommended age at which solid foods should be introduced is about six months old. However, breastfeeding and/or formula should continue after six months, in addition to solid foods. Cow's milk should not be used as a main drink until after 12 months of age. Mothers who are unable, or choose not to follow these recommendations should be supported to optimise their infant's nutrition.

# Specialist formulas: foods for special medical purposes

Foods for special medical purposes (FSMPs) are foods specially formulated, processed and intended for the dietary management of diseases, disorders or medical conditions of individuals who are being treated under medical supervision. FSMPs are also known as medical nutrition products.

The composition of FSMPs is laid down in EC Directive 1999/21/EC and the manganese level in these products intended for infants and young children in Directive 2006/141/EC. The new legislation on FSMP, Regulation EU No 2016/128, published in 2016 brings the marketing provisions of FSMPs for infants in line with those for infant formulas, with some composition and labelling changes, and will apply from 2020. The reader is directed to the British Specialist Nutrition Association website [www.bsna.co.uk](http://www.bsna.co.uk) for further and current information.

## FSMPs for relatively minor gastro conditions

Apart from follow-on formula, the formula covered in this section are all suitable to be used from birth and can be continued for the first year of life or thereafter if indicated. Nutritionally complete until the age of six months, details of the nutritional composition and ingredients of these formulae are available on the manufacturers' websites.

## Anti-reflux

The terms possetting, regurgitation or spitting up are also used to describe Gastro-oesophageal reflux (GOR). It is common for regurgitation to occur in babies during and immediately after feeding and this usually resolves by 12-15 months. However, when the volumes of returned feed are significant and the baby has additional symptoms such as excessive crying, poor growth, regular vomiting, poor sleep or food refusal, it may be appropriate to treat the condition. This may include recommending an anti-reflux formula or a thickener for the infant's current feed. NICE 2015 guidance recommend a stepped-care approach to managing GOR. For formula fed infants NICE recommends a stepped-care approach:

1. parental reassurance
2. review feeding history and reduce feed volumes if excessive for infant's weight
3. offer a trial of smaller more frequent feeds (while maintaining normal total daily volume of milk)
4. offer a trial of thickened formula.

If thickened formula does work, then consider a 1-2 week trial of alginate therapy.

It is worth noting that alginate therapy is recommended if thickened formula does not work and cannot be used with an anti-reflux formula.

GOR is never an indication to stop breastfeeding.

For breastfed infants:

1. assessment of breastfeeding and infant attachment
2. a special thickener can be given on a spoon before or after a feed.

## Lactose free

It is difficult to ascertain the prevalence of lactose intolerance in infants as this is often a short-term problem and is most commonly secondary to a bout of gastroenteritis, most often referred to as transient lactose intolerance; it has also been implicated in colic. Lactose intolerance results when there is decreased or absent lactase activity, typically lasting for a few days or up to a few weeks only.

Congenital lactase deficiency is a very rare condition. It tends to develop after the age of two but symptoms may not be noticeable until adulthood; it is much more common in Asian populations.

The symptoms of lactose intolerance are gastrointestinal, caused by unabsorbed lactose moving to the colon. There bacteria ferment or break down the lactose producing fatty acids and gases causing loose stools, abdominal pain, flatulence, bloating, and discomfort.

Manufacturers of lactose free formula use an alternative carbohydrate source to normal infant formula, for example glucose syrup, and are indicated in cases of suspected lactose intolerance.

### **Colic and constipation**

The main brands also produce so called ‘comfort’ milks, which have been developed to manage minor everyday feeding problems such as wind, crying, symptoms of colic and being generally unsettled. These products have relatively minor alterations to their ingredients, compared to standard formula, and could include:

- partially hydrolysed protein
- adapted fat blend
- reduced lactose content
- prebiotic oligosaccharides.

Please note, some of these formulae contain thickeners which will require a faster flow teat. However, it is important that a fast flow teat is not used in a comfort formula without a thickener.

## Clinical conditions

### Feeding the pre-term infant

Specific guidelines from the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) on the feeding of pre-term babies (Agostoni et al., 2010) recognise the differing needs of pre-term infants of different weights. The preferred food for premature infants is fortified human milk (expressed) from the infant's own mother, or, alternatively, formula designed for premature infants.

Mothers of pre-term babies are typically under a lot of stress and suffering from anxiety; this may detrimentally affect their milk supply, resulting in the use of a special formula. The ESPGHAN guidelines provide recommendations for the nutritional composition of formula feeds used in pre-term infants. The composition reflects the higher requirements of these infants and the formula typically have higher levels of energy, a higher protein/energy ratio, higher levels of LCPs and higher levels of key micronutrients, such as iron and vitamin D, compared to full-term formula.

### Post-discharge formula

A post-discharge formula (PDF) is a nutritionally complete catch-up formula specifically designed to provide nutritional support for pre-term and low birthweight infants when discharged from hospital; these products are indicated for up to six months corrected age and when a low birthweight formula is no longer indicated.

ESPGHAN recommends PDFs for low birth weight pre-term infants with subnormal weight at discharge until at least 40 weeks, but possibly up to 52 weeks. Careful monitoring of weight gain is recommended when on a PDF to ensure that transition to a standard-term formula occurs in a timely manner. The length of time an infant is on a PDF is dependent on his/her nutritional status and growth progress. PDF formulae have more energy, protein calcium and other nutrients than standard formula.

### Food allergy

Cow's milk allergy (CMA) is the most common food allergy in infants and young children and affects between 2% and 7.5% of infants – although up to 15% may exhibit symptoms, suggesting a CMA experience at some time (NICE, 2011).

The symptoms of CMA are variable, which may delay diagnosis. Symptoms can include diarrhoea, vomiting, rashes and/or itchy skin, wheezing, rhinitis or colic – and may be a very distressing experience for a baby and their families. CMA usually presents when cow's milk is introduced into the diet via formula or at weaning, but it can appear in exclusively breastfed babies due to cow's milk protein from the maternal diet passing to the infant via breast milk. There are two types of CMA:

- immediate or IgE-mediated allergy
- delayed or non IgE-mediated allergy.

The dietary treatment of CMA is the removal of cow's milk protein from the diet; if a child is breastfed, the mother should follow a cow's milk protein-free diet. The British Society of Allergy and Clinical Immunology (BASCI) has recently published a guideline for the diagnosis and management of cow's milk allergy intended for clinicians in secondary and tertiary care (Luyt et al., 2014).

### **Indication for, and composition of, special allergy formula**

Infants who are formula-fed, either solely or partially, should be prescribed a suitable hypoallergenic formula and receive cow's milk free weaning advice.

1. **Extensively hydrolysed**, which means the proteins are broken down to small particles known as peptides.
2. **Amino acid formula**, where the protein present is the basic element of amino acids only.

Extensively hydrolysed formulae are available either as whey-based or casein-based and may differ in the degree of hydrolysis, nutritional profile, lactose content, probiotics and the presence of prebiotic oligosaccharides. Clinically, there is insufficient data to suggest the benefit of whey versus casein formula (du Toit et al., 2010); in practice whey-based formula are more palatable, which may be an important factor in older infants who have been weaned.

Amino acid formulae are often used in more severe CMA, where a continued reaction to extensively hydrolysed formula occurs due to residual allergenicity of the peptides. Amino acid formulae are also indicated if there is severe presentation of another atopic condition, such as eczema, or multiple food allergies have been

diagnosed. Amino acid formulae have a very distinct taste which may be unpalatable for infants and young children, so the transition to these formulae should be managed under the care of a health care professional.

In the UK, soya formulae are not recommended in infants less than 12 months (DH, 2004) but can be useful in older infants who are refusing hypoallergenic formula. About 10% to 14% children with Ige-mediated CMA are also allergic to soya (Klemola et al., 2002).

Milk from other mammals – for example, sheep, goats, water buffalo – are not recommended for the management of CMA because of the similarity of their proteins to that contained in cow's milk (Fiocchi et al., 2010).

## **Prevention of food allergy**

The subject of allergy prevention has been contentious for a number of years, with conflicting findings from scientific studies. The rationale is that in high risk infants who are not breast fed, it is possible to prevent the onset of an allergy by feeding either an extensively or partially hydrolysed formula. At risk infants are determined by family history, generally said to be indicated by the presence of allergy in at least one parent and/or sibling. Despite remaining a divisive topic, a recent review (Vandenplas et al., 2014) of the systematic reviews on the topic concluded that “in high risk infants where breastfeeding is not possible, hydrolysates of documented safety and efficacy have an indication in infant feeding up to the age of 4 to 6 months.” The review stated that the use of hydrolysed formula in low risk infants was not recommended.

The protein in a partially hydrolysed formula is broken down, but not to the extent of that found in extensively hydrolysed formula. It is important to distinguish between these products, as partially hydrolysed formula should never be used in the management of CMA. Such formulae are also known as hypoallergenic formula (or 'HA formula'). EFSA (2014) has recognised that not all hydrolysed proteins are the same and therefore clinicians should be directed to the individual companies for specific information on the 'HA' formulas.

## **Feeding the sick infant**

Breastfeeding may be suitable for sick infants with a variety of clinical conditions and should be encouraged where possible; expressed breast milk may be modified to

suit the infant's requirements. When caring for a formula-fed infant, nurses should aim to continue to use the same feed as at home, unless this is medically contraindicated.

When cost and turnover influences the type of feed that may be stocked on a ward, any change in formula should be with the mother's consent and, where possible, the advice of a paediatric dietitian. There are many different types of specialised formulae and supplements that can be prescribed for specific conditions; for example, metabolic disorders or kidney disease. It is important to select and appropriate formula for each condition as without careful selection, the child could become unwell. A list of items that can be prescribed for paediatric use appears in the BNF (British National Formulary) for children under the *Borderline Substances Appendix* and is also available online at [www.bnf.org](http://www.bnf.org).

## Faltering growth

Infants who have faltering growth have increased nutritional requirements, and therefore a high energy infant formula may be used; these are available for use in both hospital and in the community. These nutrient-dense formulae have more energy, protein and nutrients than a standard formula; for example 100kcal/100ml, compared to a standard feed which is typically 66-67kcal/100ml. Such formulae are available in liquid format and are suitable from birth.

Alternatively, infants with faltering growth may have supplements added to a standard energy formula or have their feed concentrated. The supplements that can be added include glucose polymers, fat emulsions, combined fat and carbohydrate supplement, or whey protein.

Formula made up according to manufacturer's instructions typically have a dilution of 13%; a concentrated feed has a concentration of 15%; in other words, 15 g of powder per 100ml water. Attention needs to be paid to the osmotic load which a supplemented or concentrated feed presents and it should not exceed 500mOsm/kg (Shaw and McCarthy, 2014). High energy and/or more concentrated feeds may also be suitable for infants requiring fluid restriction.

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100kcal/100ml, compared to a standard feed which is typically 66-67kcal/100ml. Such formulae are available in liquid format and are suitable from birth.

## Enteral feeding

### Indications for enteral (tube) feeding

There are a number of situations where enteral (tube) feeding may be considered; for example, an inability to suck or swallow, anorexia due to chronic illness, increased requirements, congenital abnormalities, primary disease management or food refusal. Where there is no clinical contraindication and the infant has normal nutritional requirements, expressed breastmilk, a standard infant formula or follow on formula may be tube-fed. Otherwise a specialised formula, a high energy or adapted standard formula is indicated; seek advice from a paediatric dietician.

### Routes of feed administration

The following routes are available for enteral feeding (Johnson, 2014):

- nasogastric – this is the most common route of feeding and is indicated when the feeding will be short term
- gastrostomy – this is widely used when longer-term enteral feeding is indicated
- feeding into the jejunum – this may be via a naso-jejunal tube or a gastrostomy device with a jejunal tube; a naso-jejunal tube is difficult to place and maintain in position; feeding straight into the jejunum can cause dumping syndrome due to the rapid delivery of a hyperosmolar feed
- orogastric – mainly used in neonates where nasal access is not feasible or breathing would be compromised.

### Feeding regimen

Enteral feeds can be given continuously via a pump, or as boluses, or a combination of both. The regimen will be influenced by the clinical condition to an extent, but more by what is feasible and practical for a family to manage at home or within the ward routine in hospital.



## Feeding guidance in infants with increased needs

### Guide to increased oral and enteral requirements (Shaw and McCarthy, 2014)

	<b>Infants 0-1 year*</b>
<b>Energy</b>	High: 130–150 kcal (545–630 kJ)/kg/day Very high: 150–180 kcal (630–750 kJ)/kg/day
<b>Protein</b>	High: 3–4.5 g/kg/day Very high: 6 g/kg/day

\*based on actual, not expected, weight.

## Where can I find out more?

Midwives and specialist community public health nurses have specific expertise in infant feeding. They can assist in giving optimum care to a particular infant, and support to the mother. Similarly, a paediatric dietitian will be able to give advice on breastfeeding, formula feeding and weaning.

Advice, guidance and further information can also be found on the following organisation's websites:

- Baby Friendly Initiative: [www.babyfriendly.org.uk](http://www.babyfriendly.org.uk) – the website includes sections on latest news, research and training.
- Breastfeeding at study or work: [www.unicef.org.uk/BabyFriendly/Resources/Resources-for-parents/Breastfeeding-and-work](http://www.unicef.org.uk/BabyFriendly/Resources/Resources-for-parents/Breastfeeding-and-work)
- British Specialist Nutrition Association: [www.bsna.co.uk](http://www.bsna.co.uk) – the BSNA is a trade association representing some of the infant formula manufacturers.
- Department of Health: [www.dh.gov.uk](http://www.dh.gov.uk)
- Food Standards Agency: [www.food.gov.uk](http://www.food.gov.uk) – the FSA website includes sections on safety, hygiene and nutrition.
- Nursing and Midwifery Council: [www.nmc-uk.org](http://www.nmc-uk.org)
- Breastfeeding Twins and Multiple Birth Babies: [www.tamba.org.uk/Parenting/First-Year/Feeding](http://www.tamba.org.uk/Parenting/First-Year/Feeding)
- Start4life leaflets: [www.nhs.uk/start4life](http://www.nhs.uk/start4life)
- Best Beginnings: [www.bestbeginnings.org.uk](http://www.bestbeginnings.org.uk)
- UNICEF formula guidance: [www.unicef.org.uk/formulaguide](http://www.unicef.org.uk/formulaguide)
- Infant Milks in the UK (First Steps Nutrition Trust): [www.firststepsnutrition.org](http://www.firststepsnutrition.org)

The RCN believes that breastfeeding gives infants the best start in life, providing them with the optimal source of nourishment. The RCN strives to see a society where:

- women feel enabled to initiate and continue breastfeeding for as long as they wish
- parents are supported to make informed choices about feeding their infants and that everyone is aware of the significant benefits associated with breastfeeding.

To learn more about the RCN's commitment to breastfeeding and participation in breastfeeding related initiatives, please visit [www.rcn.org.uk](http://www.rcn.org.uk)

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