Spotlight on infant nutrition
Understand infant feeding to best support mothers’ choices

It is important that nurses provide support and advice to help breast or bottle feeding, says Judy More.

Breast milk is the optimal milk feed for infants until 12 months of age. It provides the complete nutritional requirements, except vitamin D, for infants up to about 6 months of age and protection against illness via the antibodies it contains, which are produced in response to environmental factors.

Guidelines from the Department of Health (DH) and UNICEF Baby Friendly Initiative state that mothers should be advised so that they can make an informed choice on how they feed their infant. They should then be supported in that choice to feed safely (UNICEF UK, 2010).

Both breastfeeding and bottle-feeding mothers will have questions and need support.

Types of formula

Formula composition must comply with government regulations according to European Union (EU) directives. Formulas are made from skimmed milk powder (to provide protein and carbohydrate), a blend of vegetable oils, added vitamins and minerals, and additives found in breast milk such as nucleotides, prebiotics and long-chain fatty acids. The regulations only allow protein from cows’ milk, goats’ milk or soya beans.

Infant formula is the only breast milk substitute suitable from birth. It is nutritionally adequate, but does not contain the antibodies to provide protection against illness.

Follow-on formula is an option from 6 months onwards, but it is not necessary to change to these formulas. However, infants who are making slow progress with weaning onto solid food may benefit from the higher iron content in a follow-on formula.

The different types of formula milks are outlined in Boxes 1 and 2.

Breastfeeding advantages

Exclusive breastfeeding is recommended for 6 months. However, only 1% of mothers in the UK achieve this (Table 1) (Health and Social Care Information Centre, 2010). The advantages of breastfeeding for the infant are (Quigley et al, 2007; Ip et al, 2007; Horta et al, 2007; Quigley et al, 2009):

- Optimal growth and development—breastfed babies have a different growth pattern to bottle-fed babies. This may be due to the latter consuming more milk or the higher energy content of formula compared with breast milk (Dollberg et al, 2001; Hosoi et al, 2005; Hester et al, 2012)
- Reduced incidence of gastrointestinal, urinary tract and respiratory infections
- Reduced risk of otitis media until 5–7 years of age
- Reduced incidence of both type 1 and type 2 diabetes
- Growth factors, which enhance the infant’s gut development and maturation
- Reduced risk of constipation
- Reduced incidence of some childhood cancers (leukaemia and lymphomas e.g. Hodgkin’s disease)
- Reduced risk of sudden infant death syndrome
- Fewer doctor’s visits in the first 2 years of life
- Taste sensitisation—limited research indicates that infants may become accustomed to the flavours of foods within the mother’s diet improving their acceptance of those foods when being weaned onto solid food.

The evidence is unclear on whether breastfeeding reduces the risk of childhood obesity (Li et al, 2003; Michels et al, 2007), or asthma and eczema severity (Kramer et al, 2012; Al-Makoshi et al, 2013).

Benefits of breastfeeding for the mother include (Quigley et al, 2007; Michels et al, 2007):

- Delay in return to menstruation, allowing maternal iron stores to replenish following pregnancy and childbirth
- Reduced risk of breast and ovarian cancer
- Helps the return to pre-pregnancy weight
- Lower risk of postnatal depression
- Lower incidence of osteoporosis and hip fractures later in life.

The few contraindications to breastfeeding are:

- The mother is taking certain medications, receiving radiotherapy or chemotherapy, is a drug abuser or drinks excessive alcohol. Medications unsuitable for use during breastfeeding are listed in the British National Formulary.
The baby has classical galactosaemia, a long-chain fatty acid oxidation defect or glucose-galactose malabsorption. The mother is HIV positive, because HIV transmission from mother to infant can occur via breast milk. However, in developing countries, where formula feeding may greatly increase the risk of gastrointestinal infections and mortality, breastfeeding is preferable. The baby has classical galactosaemia, a long-chain fatty acid oxidation defect or glucose-galactose malabsorption. Supporting mothers to breastfeed longer

Breastfeeding is not an instinctive process and most new mothers need support and advice to overcome any difficulties and problems that arise. Without appropriate support, many give up before they wish to, citing various reasons for substituting some or all breastfeeding with formula milk (Bolling et al, 2007):

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Box 1. Choosing a formula milk

First infant milks
- The protein has a whey:casein ratio = 60:40 which is the same as mature breast milk
- The carbohydrate is all lactose
- Number on the package: 1
- Brands based on cows’ milk: Aptamil, Cow & Gate, Hipp Organic, SMA
- Brands based on goats’ milk: Kabrita, Nannycare (casein:whey ratio = 80:20)

Comfort milks
- Promoted for babies with digestive problems such as colic and mild constipation
- Partially hydrolysed whey protein and no casein
- Lower lactose content as some starch is added
- Different fat blends
- No number on the package
- Brands: Aptamil, Cow & Gate, SMA

Hungry infant formulas
- The protein has a whey:casein ratio = 20:80 which is the same as cows’ milk
- They do not have more energy (calories) than first infant milks as their name implies. The higher casein level slows down gastric emptying and, theoretically, should keep the baby satisfied for longer
- Babies changing to this milk from a first infant milk sometimes become more constipated
- No number on the package
- Brands: Aptamil, Cow & Gate, Hipp Organic, SMA

Soya infant formula
- The protein all comes from soya beans
- Carbohydrate is glucose, it is lactose-free
- It is suitable from birth, but the Department of Health does not recommend its use in babies under 6 months old because it contains low levels of phytoestrogens. This is very cautionary advice as research shows that these do not cause problems for male or female babies (McCarver et al, 2011)
- No number on the package
- Brands: SMA Wysoy

Follow-on milks
- Suitable from 6 months of age with higher levels of protein, minerals and some vitamins than the infant formulas designed for feeding from birth
- Most mothers choose to use them, but it is not necessary to do so. However, because of their higher iron content they are useful for infants who do not progress with solid foods
- Recent research suggests their protein content is too high and predisposes infants to a risk of later obesity
- Number on the package: 2
- Brands based on cows’ milk: Aptamil, Cow & Gate, Hipp Organic, SMA
- Brands based on goats’ milk: Kabrita, Nannycare

- The higher casein level slows down gastric emptying and, theoretically, should keep the baby satisfied for longer
- Breastfeeding is not an instinctive process and most new mothers need support and advice to overcome any difficulties and problems that arise. Without appropriate support, many give up before they wish to, citing various reasons for substituting some or all breastfeeding with formula milk (Bolling et al, 2007):

- The mother is HIV positive, because HIV transmission from mother to infant can occur via breast milk. However, in developing countries, where formula feeding may greatly increase the risk of gastrointestinal infections and mortality, breastfeeding is preferable.

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Establishing breastfeeding
Placing and keeping the infant in direct skin-to-skin contact
with the mother until the first feeding is accomplished may
help establish breastfeeding (Mikeli-Kostyra et al, 2002).

Table 1. Breastfeeding rates in the UK

<table>
<thead>
<tr>
<th>Age</th>
<th>Exclusively breastfed</th>
<th>Receiving some breast milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>At birth</td>
<td>81%</td>
<td>81%</td>
</tr>
<tr>
<td>1 week</td>
<td>46%</td>
<td>69%</td>
</tr>
<tr>
<td>6 weeks</td>
<td>23%</td>
<td>55%</td>
</tr>
<tr>
<td>4 months</td>
<td>12%</td>
<td>42%</td>
</tr>
<tr>
<td>6 months</td>
<td>1%</td>
<td>34%</td>
</tr>
<tr>
<td>9 months</td>
<td>&lt;1%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Mothers need reassurance that newborn infants only
need, and take, very small volumes infrequently of
colostrum: e.g. a total of 3–5tsp (17–25ml) over the first
24 hours after birth (Hester et al, 2012). The supply is under hormonal control and frequent feeding is not required to stimulate production. Colostrum is high in proteins, especially immunoglobulins, which confer immunity against infection. It is low in fat and energy and over these first few days a net weight loss, mostly fluid, of up to about 10% of birth weight is normal.

Following the same routine each time the mother feeds will be reassuring for the infant as the baby will know what to expect. For example, feeding from one breast, followed by a nappy change and then a feed from the second breast.

Allowing infants to feed from each breast until they are satisfied will ensure they are taking the higher-energy milk at the end of the feed. Less milk (or none at all) may be taken from the second breast offered. At each feed the first breast offered should be alternated so that both breasts receive equal stimulation and drainage.

After the third day postpartum the supply of transitional, and later mature, breast milk is determined largely by demand and is stimulated by regular, rather than prolonged, suckling. During the early weeks, infants may demand feeding every 2–3 hours or 8 to 12 times a day. Once lactation has become fully established after about 3–4 weeks, the time between feeds usually increases, although some infants continue to prefer smaller more frequent feeds.

If the baby is unable to suckle at birth, the mother can express milk. Expressing 8–12 times a day is necessary to establish a good milk supply. Practical and emotional support should be important for these mothers.

**Maintaining breastfeeding**

Good positioning and attachment is essential for successful breastfeeding and helps resolve issues of pain and insufficient milk supply. The infant should be held so that:

- It is close and facing the mother with its tummy towards her
- The infant’s back, shoulders and neck are supported
- It can easily tilt its head back
- The infant’s head should be in line with the body so the neck is not twisted.

The baby’s mouth will gape wide open in response to the rooting reflex to accept the nipple. It is important the baby takes in the nipple and much of the areola. The lower lip should be turned out and the tongue under the mother’s nipple.

Persistent crying or fussing by infants may be the reason mothers believe their breast milk is not satisfying their baby, but infants do not only cry because they are hungry. They may be communicating that they are uncomfortable, cold, lonely or bored and just need comforting or someone to talk and interact with them.

Some infants experience more discomfort than others, such as those with colic. Comforting an infant who has colic or some other cause for discomfort other than hunger can be very time-consuming and tiring.

Signs that breast milk intake is adequate are that the infant is:

- Alert, responsive and of a healthy appearance
- Taking six or more feeds in 24 hours during the day and night
- Producing six or more wet nappies and two or more yellow stools daily

These signs should be used to reassure the mother rather than frequent weighing, which is no longer recommended. Provided there is no restriction on how often an infant can feed (i.e. demand feeding is practised), no extra water is needed, even in very hot weather, as the infant will simply feed more frequently to obtain more fluid when thirsty.

Factors which increase breastfeeding rates include:

- Maternity units accredited with UNICEF Baby Friendly Initiative status
- Local peer support groups are particularly effective (Chapman et al, 2010). NICE recommends that when mothers leave a maternity unit they should be given contact details of breastfeeding counsellors and information on local peer support groups (National Institute for Health and Care Excellence (NICE), 2008)
- Family support and encouragement
- Supportive communities where breastfeeding is seen as the norm and facilities are available for women to breastfeed. Both England and Scotland have legislated against discrimination towards mothers feeding infants in public places.

**Expressing breast milk**

NICE recommends that all mothers are taught to hand-express their milk (NICE, 2008). Hand and electric pumps are also available. Bottles, containers for storage and other utensils must be sterilised until the infant is 12 months of age.

Expressed breast milk (EBM) should be labelled and stored correctly to minimise the risk of infection. EBM can be stored in a refrigerator for up to 5 days if parents are confident that the fridge remains at 4°C or lower. It should be stored at the back of the fridge where it is colder. A domestic fridge that is opened frequently may not maintain a low enough temperature; it is preferable to freeze EBM if it is not going to be used within 48 hours. EBM can be stored in the freezer compartment of a fridge for up to 2 weeks or in a domestic freezer at −18°C for up to 6 months.

Frozen EBM should be thawed in a fridge and then used within 24 hours. It must not be reheated in a microwave oven because of the risk of hot spots occurring and causing burns. Standing the bottle in warm water is a suitable way of reheating milk if necessary. Some babies will drink it cold from the fridge.

**Mixed feeding**

Introducing any formula milk is likely to decrease an infant’s breast milk intake and subsequently the mother’s...
supply of breast milk. In some cases, this may lead to the mother discontinuing breastfeeding altogether. However, offering one feed of formula milk per day about the same time each day, will have less effect on the supply of breast milk at other times throughout the day than topping-up with formula milk after every breastfeed.

The advantage of mixed feeding with both breastfeeding and formula feeding over changing all formula feeds is that the protective effects of breast milk are continued for the infant.

**Supporting bottle-feeding**

Health professionals can advise mothers who bottle-feed their babies. Bottle-fed babies should be demand fed just as breastfed babies are: offered a feed when they are hungry and allowed to stop feeding when they have indicated they have had enough. An average daily intake from about 1 week to 4–5 months of age is about 150 ml/kg bodyweight per day. The number of feeds per day and the volume taken at each feed will vary, as in breastfeeding.

Holding infants in a supportive, semi-upright position when bottle feeding encourages eye contact and bonding with the caregiver. Angling the bottle so that the teat is always full of milk minimises the amount of air consumed. It is usual to ‘wind’ bottle-fed babies halfway through and after a feed.

Advice on how to sterilise feeding equipment and make up formula feeds safely is essential. Various types of bottles are available, some with air-release devices to reduce colic. Different teats have varying flow rates according to the size and number of holes, and they also vary in size and shape.

Constipation is more likely in formula-fed infants. Changing to a comfort formula may help, but NICE recommends that the feed preparation, quantity, frequency and composition is reviewed first. A constipated baby may need to be given laxatives to prevent behavioural problems developing as a consequence of withholding to prevent pain. A GP or nurse prescriber can prescribe an osmotic laxative for infants with constipation.

Formula-fed infants may become thirsty between feeds in very hot weather and additional drinks of cooled boiled water can be given, so long as these do not interfere with the required intake of formula. Fruit juices are not necessary as formula milks, like breast milk, contain adequate vitamin C.

Mothers who feed their infant with formula milk for whatever reason may feel guilty that they are not feeding their infant optimally or might feel a sense of failure. However, they can be reassured that their infant’s growth and development, while slightly different to breastfed babies, will be within normal parameters if the infant is fed safely and responsively.


Reassuring parents about gastro-oesophageal reflux in infancy

How to manage this common malady and to spot when it becomes more serious.

By Louise Cremonesini

Gastro-oesophageal reflux (GOR) is a common problem experienced by infants and is, for most, a benign condition (Bhavsar et al, 2011). It is described as the passage of gastric contents into the oesophagus with or without regurgitation or vomiting (Vandenplas et al, 2009).

However, from the outset it is important to differentiate between the normal physiological process of regurgitation in infants (GOR) and the more serious concern of gastro-oesophageal reflux disease (GORD). Up to 40% of infants are thought to regurgitate within the first few weeks of life. In 90% of infants such regurgitation is likely to resolve before the age of one (Vandenplas et al, 2009) (Box 1).

In contrast, children suffering with GORD present with a more complex picture of symptoms and potential complications which can, in turn, be linked with significant morbidity (Lightdale and Gremse, 2013).

The publication of National Institute for Health and Care Excellence (NICE) guidelines (2015) enabled practitioners to provide evidence-based advice to parents and, in doing so, help to reduce previous inconsistency in the diagnosis, treatment and management of GOR/GORD.

Louise Cremonesini, senior lecturer in child nursing/health visiting, University of Northampton

### Diagnosis

It is important that health professionals recognise regurgitation as common and normal, thus not necessarily requiring investigation or treatment. They must, however, be aware that a small number of infants will develop complications that will require referral and further clinical management (Box 2). Practitioners also need to be mindful that among infants presenting with vomiting and regurgitation, other red flag symptoms may be described or observed that indicate potential GORD. These will need referral and investigations (Box 3).

### Non-IgE-mediated cows’ milk protein allergy

As with GORD, vomiting and regurgitation are also common symptoms for children who suffer from cows milk protein allergy. Thus if a child presents with other symptoms of atopy and/or family history, it is advisable to follow the NICE food allergy guidelines (NICE, 2011).

### Treatment

When thinking about possible treatment it is useful to consider that some key features have been associated with an increase risk of GORD:

- Premature birth
- Parental history of acid regurgitation
- Obesity
- Hiatus hernia
- Congenital diaphragmatic hernia
- Congenital oesophageal atresia
- Neurodisability.

### Positioning

Though anecdotally parents report being advised to alter their infant’s sleeping position to reduce GOR/GORD symptoms, NICE emphatically reiterates that positional management must not be used to treat GOR in sleeping infants. As per NHS advice, all babies should be placed on their backs to sleep, in order to reduce the risk of sudden infant death (NHS Choices, 2014).

NICE suggest that treatment of GOR and GORD should follow a stepped care approach, which includes reviewing the feeding history, then reducing feed volumes if thought
reassuring parents about the diagnosis, treatment and management of GOR/GORD. Practitioners to provide evidence-based advice to parents mindful that among infants presenting with vomiting and diarrhoea (Box 1) and the more serious concern of gastro-oesophageal reflux disease (GOR), a diagnosis of GORD often becomes a possibility if vomiting is frequent and has been associated with marked distress despite investigation. For example, if a child presents with symptoms of GORD, if appropriate medical treatment has proved unsuccessful or in a situation where feeding regimens prescribed to manage GORD have proven to be impractical (NICE, 2015).

Emotional support for parents

It is essential that parents are given reassurance and tips for symptom management. Few studies have examined the emotional element of GOR/GORD in children but a key study (Kurth et al, 2009) found that the amount of infant crying in the first 3 months of life is directly linked with the mother’s experience of tiredness and exhaustion. The effect of this, if it continues, can be deleterious to the parent–child relationship and can increase the likelihood of maternal depression.

Breastfed infants

In the breastfed infant who continues to regurgitate frequently and has associated marked distress despite assessment and advice, consider alginate therapy for a trial period of 1 or 2 weeks.

Formula-fed infants

Similarly, if the formula-fed infant continues to regurgitate despite the stepped approach being followed, offer alginate therapy for a trial period of 1 or 2 weeks.

Pharmacological treatment of GORD

NICE guidelines advocate that prescribers do not offer acid suppressing drugs such as proton pump inhibitors (PPIs) or H2 receptor antagonists (H2RA) to treat overt regurgitation in infants and children occurring as an isolated symptom. Consider a 4-week trial of a PPI or H2RA for those who are too young to tell you about their symptoms and who have overt regurgitation with one or more of the following: unexplained feeding difficulties (refusing, gagging, choking), distressed behaviour, and falttering growth. If after a 4-week trial symptoms persist, consider referral for specialist assessment and possible endoscopy.

When considering definitions of faltering growth Wright and Garcia (2012) suggest that it represents a fall through two centile spaces on the UK–WHO charts—although for infants with birth weights below the ninth centile, a fall through one centile space should trigger concern, while infants above the 91st centile could be allowed to cross three centile spaces.

Surgery

Fundoplication surgery is rarely indicated; it should only be considered in infants and children with severe, intractable GORD, if appropriate medical treatment has proved unsuccessful or in a situation where feeding regimens prescribed to manage GORD have proven to be impractical (NICE, 2015).

Box 3. Red flag symptoms of disorders other than gastro-oesophageal reflux

- Frequent/forceful (projectile) vomiting
- Bile stained vomit
- Heamatemesis
- Onset of regurgitation/vomiting after 6 months of age or continuing after 1 year

Box 1. Gastro-oesophageal reflux

- Reflux is common, affecting at least 40% of infants
- Onset usually in the first 8 weeks of life
- May be frequent: > 6 episodes in 24 hours
- Usually becomes less frequent with time
- Does not require further investigation or treatment

Box 2. Potential complications of gastro-oesophageal reflux in infants and children

- Reflux oesophagitis
- Recurrent aspiration pneumonia
- Frequent otitis media
- Dental erosion

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Emotional support for parents

It is essential that parents are supported when they present with infants and children who exhibit symptoms of GOR/GORD. A crying baby can create high levels of anxiety for parents and a strong sense of hopelessness. It is important that parents are given reassurance and tips for symptom management.

Few studies have examined the emotional element of GOR/GORD in children but a key study (Kurth et al, 2009) found that the amount of infant crying in the first 3 months of life is directly linked with the mother’s experience of tiredness and exhaustion. The effect of this, if it continues, can be deleterious to the parent–child relationship and can increase the likelihood of maternal depression.

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Promoting vitamin D uptake in infants and children

Sara Patience discusses manifestations of vitamin D deficiency, the identification of at-risk groups and recommendations for supplementation

Despite it being thought of as a disease of the past, children in the UK, particularly those from high-risk groups, are at risk of rickets. The latest National Diet and Nutrition Survey estimated that 7.5% of 1½–3-year-olds were deficient in vitamin D (Bates et al, 2014). Vitamin D deficiency presents with skeletal and non-skeletal manifestations. With the sun being the main source of vitamin D, there is a reliance on supplementation across most of the UK.

Health professionals in contact with new parents are well-placed to identify children at risk of vitamin D deficiency, advise on supplementation and raise awareness of the importance of vitamin D. The Department of Health (DH, 2015) has mandated five core contacts for health visitors to have with families during the first 2½ years of a child’s life; this provides an ongoing opportunity to deliver public health messages such as the benefits of vitamin D. This article looks at how vitamin D deficiency may manifest in infants and children, how to identify those most at risk and how to ensure children up to 5 years old are vitamin D sufficient.

Vitamin D deficiency in children

The prevalence of vitamin D deficiency has been highlighted in National Diet and Nutrition Surveys (NDNS), with 7.5% of 1½–3-year-olds being vitamin D deficient (Bates et al, 2014).

A deficiency in vitamin D affects the absorption of calcium and phosphorus, which leads to poor bone mineralisation. This can manifest as bone pain and/or skeletal deformity (Scientific Advisory Committee on Nutrition (SACN), 2007). Skeletal manifestations include increased risk of fracture and poor growth, caused by a failure of the skeleton to properly develop (NHS Choices, 2013).

Despite nutritional rickets being considered a disease of the past, there have been increasing numbers of infants and children diagnosed with rickets in the UK according to reports from paediatricians (Pearce and Cheetham, 2010). Children of South Asian origin are particularly at risk (Callaghan et al, 2006). The classic ‘bowed leg’ presentation of rickets occurs as a child begins to bear weight on soft bones. As the child gets older, he or she may be reluctant to walk and complain of pain and muscle weakness. In cases where there is hypocalcaemia, the child may have twitching, tingling, cramps and fits (NHS Choices, 2013; Shaw and Mughal, 2013).

Hypocalcaemia is the presence of low serum calcium levels in the blood. Basatemur and Sutcliffe (2014) estimated there were 91 cases of hypocalcaemic seizures secondary to vitamin D deficiency in the UK and Ireland between 2011–13. In a study on children with rickets by Ladhani et al (2004), 17 of 65 children had hypocalcaemic symptoms but no radiological evidence of rickets. The study authors speculate that this non-skeletal presentation of rickets is more likely during periods of rapid growth such as that experienced by infants, toddlers or adolescents.

Children are usually vitamin D deficient for many months before rickets is diagnosed (Greer, 2008) and, therefore, may be in pain for some time prior to diagnosis. Other signs and symptoms of vitamin D deficiency may include dental problems, with delay in tooth eruption and increased risk of cavities (NHS Choices, 2013).

Ensuring vitamin D intake

To ensure adequate vitamin D intake in children, various factors need to be considered, including maternal vitamin D status, whether the child and family are at higher risk of vitamin D deficiency, exposure to sunlight, diet and supplementation.

The main source of vitamin D is the sun, which provides 80–90% of the body’s requirement (Holick, 2014; Poole et al, 2014). It is also found in limited foods such as oily fish and fortified foods such as margarine and some cereals, but vitamin D requirement cannot be met through diet alone (Cribb et al, 2014).

Children at high-risk

Some children are considered to be at greater risk of vitamin D deficiency (SACN, 2007; National Institute for...
Health and Care Excellence (NICE), 2014:
- Those who cover their skin for religious or cultural reasons
- Those who are housebound or confined indoors for long periods
- Those with darker skin pigmentation e.g. children of African, African-Caribbean or South Asian family origin.

NICE (2014) has made a number of recommendations to increase supplement use, including increasing awareness of the importance of vitamin D, improving local availability and access to the Healthy Start scheme, and encouraging manufacturers of multivitamin supplements to include the recommended reference nutrient intake for vitamin D in their preparations.

**Maternal vitamin D status**

The vitamin D status of an infant is linked to the status of the mother during pregnancy, so infants born to mothers deficient in vitamin D may need supplementation from 1 month of age. Exclusively breastfed babies are at greater risk of deficiency (Wagner et al, 2008). Health professionals should consider the mother’s vitamin D status and feeding method when assessing the child’s risk of vitamin D deficiency.

If a midwife or health visitor suspects a child may have rickets, they should refer them immediately to the GP for an urgent appointment and onward referral to a paediatrician. Treatment would include vitamin D supplementation, the level of which would be guided by the degree of deficiency. It is likely that further investigations will be required to identify the underlying cause of vitamin D deficiency (Pearce and Cheetham, 2010).

**Supplementation**

It is recommended that all children aged 6 months to 5 years are given vitamin D supplements (NHS Choices, 2015). If the mother has taken daily supplements of 10 μg vitamin D throughout pregnancy, infants should not need a supplement until they are aged 6 months. Consideration needs to be given to earlier supplementation for high-risk mothers and infants. Formula-fed infants do not require additional vitamin D supplementation until they are having less than 500 ml of formula per day. Breastfed infants under 6 months may benefit from supplementation earlier—from 1 month of age—particularly if the mother did not take vitamin D throughout her pregnancy or if the family are at high risk of deficiency. The requirement for daily vitamin D supplements is 8.5 μg for infants aged up to 6 months and 7 μg for children aged >6 months to 5 years (DH, 1991; NHS Choices, 2015).

SACN (2015) is currently reviewing reference nutrient intakes of vitamin D (including the contribution of foods, fortifications and supplements). It is likely that further recommendations will follow.

Healthy Start is a government means-tested scheme to provide vouchers for milk, fruit and vegetables, infant formula and vitamins (Healthy Start, 2015). Health professionals should encourage eligible families to apply for vouchers and give information on how the vouchers can be exchanged. The uptake of Healthy Start is low; a study by McFadden et al (2015) identified an uptake of Healthy Start vitamins at less than 10% of those eligible. Vitamin supplementation is available on prescription for those families who are not eligible for Healthy Start. Vitamin products can also be purchased in pharmacies and supermarkets but these dietary supplements are considered foods rather than drugs, so they are not subject to stringent regulation.

Health professionals should ensure that pregnant women and children have access to vitamin D supplementation on prescription to ensure that they receive the recommended dose, as there have been instances of vitamin D toxicity from unregulated products (Kara et al, 2014).
Sun exposure

The main source of vitamin D is exposure to the sun. However, this can be affected by a number of factors, such as cloudiness or air pollution. In the UK, adequate vitamin D is available only from the sun in the summer months (April to September) during the day between 11am and 3pm. It is necessary for the skin to be exposed to the sun without sun protection for 5-30 minutes—but not long enough to burn—two to three times a week (Holick, 2004; SACN, 2007; Yu et al, 2009).

The ability to produce vitamin D from the sun can be affected by skin colour, with darker skins needing increased exposure to the sun. Sunscreen also reduces the skin’s ability to produce vitamin D, with SPF 8 reducing vitamin D synthesis by >95% (Holick, 2014).

Prolonged sun exposure does not result in vitamin D toxicity (SACN, 2007) but does risk sunburn and related skin damage. The British Association of Dermatologists (2010) has cautioned that sun exposure is the main cause of skin cancer, and that the amount of sun required for vitamin D synthesis is less than it takes to burn. NICE (2016) recently published guidelines for safe sun exposure. Currently, the NHS advises that children under 6 months of age should not be placed in direct sunlight, and that older children should play in the shade, wear sunscreen of at least SPF 15 and cover their skin with T-shirts and hats (NHS Choices, 2014). Practitioners should advise parents on sun safety alongside promoting uptake of vitamin D.

Conclusion

Vitamin D deficiency is a serious public health problem, with increasing numbers of infants and children experiencing deficiency and related disease, including rickets.

Health professionals have a role in educating families about the need for vitamin D and the risks associated with deficiency, and promoting the uptake of vitamin D supplementation for all mothers and children, particularly those at high-risk. They are also well-placed to educate other members of multi-professional teams and colleagues in children’s centres or nurseries, to ensure that children at risk of vitamin D deficiency do not slip through the net.


