



Jacqui Lowdon
Paediatric
Dietitian - Team
Leader Critical
Care, Therapy &
Dietetics, RMCH

Presently team leader for Critical Care and Burns, Jacqui previously specialised in gastroenterology and cystic fibrosis. Although her career to date has focused on the acute sector, Jacqui has a great interest in paediatric public health.

For full article references please email info@networkhealthgroup.co.uk

FOLLOW-ON FORMULA: WHEN COMPLEMENTARY FEEDING REQUIRES SUPPLEMENTING

The benefits of exclusive breastfeeding are well documented,^{1,2} with the percentage of newborns initially breastfed rising.³ However, few UK mothers still exclusively breastfeed for the first six months of their infants life.³ Here, Jacqui Lowdon updates us on current guidelines and provides us with a case study on infant feeding difficulties.

The last Infant Feeding Survey (IFS), 2010,³ demonstrated that the initial breastfeeding rate in the UK had increased from 69% in 2000 to 76% in 2005 and finally to 81% in 2010, and that mothers are continuing to breastfeed for longer. Nevertheless, the proportion following current guidelines on exclusively breastfeeding for the first six months of a baby's life have remained low since 2005, with only one in a 100 mothers following this guideline. Table 1 overleaf shows a breakdown within the UK of the percentage of newborn babies initially breastfed, between 2005 and 2010.

It is, therefore, essential that continuous improvements are made to infant formulas (IF), ensuring that the high nutrient requirements of infants are to be met, if mothers are unable to or choose not to breastfeed.

GUIDANCE AND REGULATIONS

The most recent definition⁴ of follow-on formula milk (FOFM) states that it is 'food intended for use by infants when appropriate complementary feeding is introduced and which constitutes the principal liquid element in a progressively diversified diet of such infants'.

FOFM contains the same ingredients as standard IF, but with higher levels of protein, iron and micronutrients, such as vitamin D. The levels of nutrients are strictly controlled

under the European Commission Directive on infant formulae and follow-on formulae. The Codex Alimentarius of the United Nations Food and Agriculture Organisation and the WHO also provides guidance on the composition of IF, which is used widely internationally (Codex Alimentarius Committee, 2006). The most recent UK legislation was 2007, with amendments made since. In 2014 the EFSA produced its opinion on the essential composition of infant and follow-on formulae.⁵

In July 2016, Regulation (EU) No 609/2013 (commonly referred to as the Food for Specific Groups Regulation or FSGs) replaced the Directive 2009/39/EC on foodstuffs intended for particular nutritional uses (PARNUTS).

The FSGs Regulation abolishes the concept of dietetic foods and provides a new framework, establishing general provisions for a limited number of well-established and defined categories of food that are considered as being essential for certain vulnerable groups of the population, one of which is the category for IF and FOFM.

Directive 2006/141/EC (infant formulae and follow-on formulae) will be replaced by Regulation (EU) 2016/127 in February 2020, with a longer transitional period for IF and FOFM manufactured from protein hydrolysates, due in 2021.



Table 1: UK percentage of newborn babies initially breastfed, 2005-2010

Between 2005 and 2010, the percentage of newborn babies initially breastfed rose from:
78% to 83% in England
67% to 71% in Wales
70% to 74% in Scotland
63% to 64% in Northern Ireland

CASE STUDY: INFANT FEEDING DIFFICULTIES

1 Assessment

Ellie was born at term, on the C25th-50th for weight and length. Mum tried initially to breastfeed, but developed mastitis and found it difficult to continue. So, at 10 weeks of age, Ellie was placed onto a standard infant formula.

Like most infants, Ellie lost weight after birth initially, whilst full feeding was being gradually established. The majority of infants regain their birth weight by day 10-14th of life. NICE (The National Institute for Health and Care Excellence,⁶ recommends that babies are weighed at birth and in the first week of life, followed up at weeks eight, 12 and 16 and again at one year of age.

However, Ellie did not regain this lost weight which was attributed to the difficulties that mum was experiencing whilst breastfeeding. The stress of Ellie not gaining weight also contributed to mum's poor experience of breastfeeding and one of the reasons why mum decided to place Ellie onto a formula feed.

At eight weeks of age, prior to commencing the formula, Ellie's weight had fallen towards the C2nd. As mum was unsure how much formula to feed, she was advised by the health visitor that bottle fed babies should be fed on demand, as with breastfed babies and that they should not be encouraged to 'finish the bottle'. Breastfed babies can regulate their own intake of milk.

A systematic review⁷ of the volumes taken of breast milk and infant formula in early infancy have shown that formula fed infants have a higher intake than breastfed babies. Not only did bottle fed babies take larger volumes, but they also had more energy dense milk. Based on this evidence, Ellie should have started to thrive. However, initially, Ellie did not take to the formula, but mum persevered and eventually Ellie started to take formula from a bottle. At this stage she was taking around 120-130mls/kg and although this is less than the needs of most babies at this age (150mls-180mls/kg), by week 16, Ellie's weight gain had started to show an improvement, increasing towards C9th.

Whilst Ellie continued to be fed with the standard formula, she remained a small feeder, never taking more than 130mls/kg. Her weight showed an initial improvement, increasing to the C9th but never increasing higher than this.

2 Identification of nutrition and dietetic diagnosis

At around 20 weeks of age (five months) mum introduced Ellie to some solid food, initially fruit and vegetables. However, mum noticed that Ellie's intake of formula milk declined, taking less than 120mls/kg. At this stage, Ellie was approaching six months of age and her weight gain had started to slow down again.

Ellie was slow to take a wide variety of solids and mum found it difficult to progress with different flavours and lumps. Concerned, she took Ellie to the GP who diagnosed iron deficiency anaemia and was referred to a community paediatric dietitian for dietary advice.

The paediatric dietitian suggested to mum that, as Ellie was now six months of age, she change her onto a follow-on formula milk. Mum had always been informed that FOFM were unnecessary by her health professionals.

Presently, there is no evidence to support the use of FOFM in infants receiving complementary foods containing adequate protein, carbohydrate, fat and iron.⁸ The Scientific Advisory Committee on Nutrition⁹ stated that *'there is no published evidence that the use of any follow-on formula offers any nutritional or health advantage over the use of whey-based infant formula among infants artificially fed'*.

In 2013, the WHO reiterated its position¹⁰ that FOFM is not necessary and is unsuitable as a replacement for breast milk after six months. For this reason FOFM is not included in the UK Healthy Start Scheme. However, FOFM does have characteristics that may be of benefit for certain groups of babies and children.

3 Plan and implement nutrition and dietetic intervention

It is suggested that FOFM is given from six months of age, when an infant's iron stores are depleted and cannot be replaced by breast milk (being a poor source of iron). However, randomised controlled trials have not shown any consistent benefit from the additional iron in FOFM compared to IF, after the age of six months.¹¹

A position paper by ESPGHAN¹² has recommend that FOFM should be iron-fortified, but that there is insufficient evidence to determine an optimal iron concentration. Further studies are required of different iron fortification levels of FOFM.

There is some argument that FOFM should be considered for inclusion in anaemia prevention programmes, especially aimed at the lower socio-economic families in the UK,¹³ although meat-rich weaning diets and use of commercially prepared baby foods, which are iron supplemented, are also advantageous.¹⁴

Other minerals

FOFM contains higher amounts of calcium and phosphorous because calcium requirement increases in the second six months of life. Infants should begin to consume solid foods at six months and, therefore, additional calcium and phosphorus requirements should be met without difficulty from first IF and food sources.²³

Protein

When complementary feeding, the most suitable protein-to-energy ratio in a formula depends on the protein-to-energy ratio of the food available. This will obviously vary, on what is available. The protein-to-energy ratio of complementary food in many developed countries is high, up to 2.5 g/100 kcal.¹⁵ A very high protein milk is, therefore, not needed to achieve adequate intakes. However, even modest displacement of breast milk, or standard formula milk, by low-protein complementary foods can result in inadequate total protein intake. An alternative approach to meeting protein needs in situations where complementary foods contain no or low amounts of protein, the possible use of a FOFM, containing more protein,¹⁶ may help.

5 Monitor and review

At two months follow-up, although Ellie was consuming the same volume of formula, her weight gain had improved and was now heading up towards the C25th. This was attributed to the improvement in iron intake and improved protein intake from the FOFM.

The Scientific Advisory Committee on Nutrition¹⁷ states that: *'there is no published evidence that the use of any follow-on formula offers any nutritional or health advantage over the use of whey-based infant formula among infants artificially fed'*. From a nutritional point of view, it maybe that FOFM is best considered in relation to the introduction of complementary food and the toddler diet, rather than breast/bottle feeding.



4 Evaluation

The 2010 IFS¹⁸ investigated the use of FOFM at different stages. At Stage 2 of the survey (four to 10 weeks old), use was low (9%). By Stage 3 (eight to 10 months old), mothers were more likely to be using FOFM (57%) as their baby's main source of milk at 35%. At Stage 3, 69% of all mothers had given their baby FOFM. Most mothers followed the recommendation of not giving their baby FOFM before the age of six months (16% had given FOFM when their baby was four months old, increasing to 50% at six months). Mothers from routine and manual occupations and mothers who had never worked were more likely than average to say that they had given their baby FOFM at an earlier age (18% and 27% respectively at four months).

Protein needs are met by breast or formula milk protein, but at the time of weaning, the most suitable protein-to-energy ratio in a milk or formula will depend on the protein-to-energy ratio of the weaning foods available. This will obviously vary depending on what is offered and what is available. The protein-to-energy ratio of weaning food in many developed countries is high, reaching 2.5g/100kcal after correction for protein quality.¹⁹ Thus, a very-high-protein milk is not needed to achieve satisfactory intakes. However, even modest displacement of breast milk or standard formula milk by low-protein complementary foods can result in inadequate total protein intake. In many developing countries, the only weaning food is maize or rice, which has a low protein-to-energy ratio. When the protein concentration of the weaning food drops below that of milk, i.e. when it is <1g/100kcal (such as for cassava), it is impossible to meet total protein needs.

An alternative approach to meeting protein needs in situations where complementary foods contain no or low amounts of protein, is the possible use of a FOFM containing more protein.²⁰

CONCLUSION

The growth and development of infants fed with FOFM require to be similar to those infants who continue to be breastfed while complementary food is introduced. During the first year of life, Stage 1 infant formulas can be consumed by babies to help meet their nutritional requirements. The recent EFSA Panel has concluded that it is not necessary to propose specific compositional criteria for formula consumed after one year of age.

Presently, there is no evidence to support the use of FOFM in infants receiving complementary foods containing adequate protein, carbohydrate, fat and iron.²¹ The Scientific Advisory Committee on Nutrition²² stated: 'There is no published evidence that the use of any follow-on formula offers any nutritional or health advantage over the use of whey-based infant formula among infants artificially fed.'

There may be nutritional and health advantages to continuing formula milk intake into the second year for those infants considered

at high risk of iron deficiency due to poor diet or other difficulties, such as fussy/faddy eating. It is advised, however, that first formula remains the milk of choice during the first year if babies are not breastfed.²¹

From a nutritional point of view, it maybe that FOFM is best considered in relation to the introduction of complementary food and the toddler diet, rather than breast/bottle feeding. The medical literature now contains mixed findings on the use of FOFM when included in the introduction of solids for prevention of iron deficiency anaemia in babies over six months of age and in toddlers. With the 'growth acceleration hypothesis' suggesting that early and rapid growth during infancy programs the infant metabolic profile to be susceptible to obesity and the other components of metabolic syndrome, a review of the protein content of FOFM is quite timely and will lead manufacturers to review their formulations.