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## SPECIALISED INFANT FORMULA: AN OVERVIEW

**Paediatric dietitians manage infants in a variety of settings, with a diverse range of clinical conditions and nutritional requirements. Although breastfeeding is best, in some cases a mother may be unable to continue feeding and may make the decision to partially or completely discontinue.**

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It is well established that breastfeeding is the best sole source of nutrition from birth to six months of age and should be continued alongside weaning foods for as long as the mother wishes to do so.<sup>1</sup> In very rare cases, breastfeeding may be contraindicated, but in most clinical conditions it can be maintained alongside dietary management.<sup>2</sup>

In infants with no other clinical concerns that are not fully breastfeeding, over-the-counter standard infant formulas are used. Manufacturers attempt to match these products as closely as possible to breast milk, although the many living components and benefits of breast milk are impossible to replicate.<sup>3</sup> The composition of standard infant formulas must comply with the Infant Formula and Follow-on Formula Regulations (2007); there are also strict rules which apply to marketing and advertising.<sup>3</sup>

In cases where a standard infant formula is not appropriate, it is the job of the Paediatric Dietitian or managing healthcare professional to suggest an appropriate, specialised alternative that meets the infant's needs. These products are regulated, but come under different legislation than standard infant formula as they are classified as

'Foods for Special Medical Purposes (FSMP)'.<sup>4</sup> Previously, the FSMP Directive (1999/21/EC) governed specialist infant formulas; however, from this year, a new regulation will come into effect: Regulation on Foods for Specific Groups (FSG) (EU 609/2013).<sup>4</sup> The supplementary regulation specific to specialised infant formulas: (EU) 2016/127; will apply from February 2020 (February 2021 for protein hydrolysate formulas);<sup>5</sup> therefore, manufacturers are likely to make changes to packaging and composition as they prepare for this.

This article will summarise some of the indications for the use for specialised infant formulas, with the relevant products available in the UK listed in Table 1. There are, however, many other specialised products in use for various other clinical conditions that are not covered.

### FOOD HYPERSENSITIVITY

Food hypersensitivity is a broad area incorporating both allergic and non-allergic responses to food and is one of the most common reasons why a specialised infant formula will be prescribed for an infant. Nevertheless, due to the number of products available and varying associated symptoms,



there can be some confusion in identification and management. Training of general practitioners and other health professionals is vital and paediatric dietetic referrals should be made where appropriate. This helps to ensure promotion of breastfeeding where possible and that the correct specialised formula is prescribed and reviewed in a timely manner.

### Cows' milk protein allergy (CMPA)

CMPA is an immune mediated reaction to the protein found in cows' milk. It affects approximately 7% of formula and mixed-fed infants<sup>6</sup> and a much lower proportion of exclusively breastfed infants (0.5%).<sup>7</sup> CMPA can be further categorised into IgE-mediated (rapid onset), non-IgE mediated (delayed onset), or mixed. Infants can display a wide range of symptoms with varying severity.<sup>8</sup>

In a majority of cases, breastfeeding remains

the best way to feed an infant with IgE or non IgE mediated cows' milk protein allergy<sup>4</sup> and can usually be successfully managed with maternal exclusion of cows' milk protein, along with vitamin D and calcium supplementation.<sup>8</sup> In formula, or partially breastfed infants, a hypoallergenic infant formula will need to be prescribed.<sup>8</sup>

**Extensively hydrolysed infant formulas (eHFs):** enzymes, heat, pressure and ultrafiltration<sup>4</sup> are used to break protein molecules into small pieces (<3000Da) which are less likely to mount an immune response.<sup>9</sup> It is estimated that around 90% of infants with CMPA should tolerate an eHF.<sup>8</sup> The protein fraction may be whey or casein based and the formula may contain lactose to improve palatability. One company has added probiotics to their formulation (see Table 1). EHF's are around a third of the price<sup>4</sup> of amino acid formulas (AAFs) (see below). Of note, some eHFs contain medium-chain triglycerides, which are indicated in malabsorptive conditions and not usually used in first line food allergy treatment; however, they have been listed in Table 1.

### Amino acid infant formulas (AAFs)

The protein fraction in this group of formulas is made up of individual amino acids. They are generally used for infants who have not tolerated eHFs or who have severe symptoms.<sup>8</sup>

### Lactose intolerance

Lactose-free infant formula differs from standard infant formula in that the carbohydrate source

### A NOTE ON SOYA FORMULA

In the UK, there is one soy protein-based infant formula (soya formula) available to buy over the counter. Whilst this formula meets compositional regulations, and has been shown to support normal growth and development in healthy term infants<sup>15</sup>, it is not recommended for infants under six months of age.<sup>16</sup> This is due to concerns that high levels of phyto-oestrogens present may pose a potential risk to future reproductive health.<sup>17</sup> Additionally, soya formula is not an appropriate treatment for cows' milk protein allergy (CMPA), as a significant proportion of these infants will also be allergic to soy protein.<sup>16</sup>

Soya formula is routinely used in the management of galactosaemia. Infants with this inherited condition cannot metabolise galactose, a constituent of lactose, and it is one of the few conditions for which breastfeeding is contraindicated.<sup>18</sup>

is glucose rather than lactose. These formulas are aimed at infants with lactose intolerance; however, it is important that the clinical condition is defined and the formula prescribed appropriately. For instance, they should not be recommended to treat colic.<sup>10</sup>

In the rare incidence of congenital lactose intolerance in an infant, a lactose-free formula would need to be prescribed promptly<sup>11</sup> and continued long term. Secondary lactose intolerance resulting from damage to the small bowel and a subsequent reduction in lactase production can occur after gastroenteritis or prolonged diarrhoea.<sup>12</sup> This is likely to be temporary and should resolve two to four weeks after the infection.<sup>11</sup> Using lactose-free infant formula to treat acute diarrhoea or gastroenteritis has been shown to provide little clinical benefit.<sup>13,14</sup> However, it may be used clinically as a temporary measure to manage symptoms.<sup>11</sup>

#### MANAGEMENT OF PRETERM INFANTS

Preterm infants are defined as being born before 37 weeks completed gestation.<sup>19</sup> They are a very vulnerable group of patients and early nutritional management, along with close monitoring, is imperative to promoting positive short- and long-term health outcomes.<sup>4,19</sup> Nutritional needs and the mode of feeding required in this group depends upon many factors including gestation and birth weight; for instance, infants less than 30 weeks gestation will usually require some parenteral nutrition (PN) while enteral feeds are gradually increased.<sup>19</sup> Three international publications are available for preterm nutrition and are used in the UK.<sup>20,21,22</sup> However, there are still many unknowns in this area and practices vary.<sup>4</sup>

What is universally agreed is that breast milk is particularly important for preterm infants, ideally expressed from the infant's mother, or donated breast milk if available. Breast milk provides a raft of benefits, including a reduced risk of necrotising enterocolitis (NEC), among other comorbidities.<sup>19</sup>

#### Breast milk fortifiers

Breast milk in satisfactory amounts is likely to be nutritionally adequate for infants born at >33 weeks gestation.<sup>19</sup> For those born at <33 weeks, breast milk fortifiers are designed to add extra

protein and micronutrients to expressed breast milk (EBM) to aid in meeting their increased nutritional requirements.<sup>19</sup> It is important that fortifiers are added to the minimum amount of EBM possible; prolonged storage is suspected to cause disruption to immunological components.<sup>19</sup> Breast milk fortifiers are only used in a hospital setting, although continued use has been investigated.<sup>19</sup>

#### Preterm formulas

For preterm infants <2,000g birth weight and <35 weeks gestation who cannot be fully fed with expressed breast milk and where donor breast milk is not available, preterm infant formulas are used.<sup>19</sup> The composition of these formulas is based on published recommendations,<sup>21,22</sup> and aim to meet the increased requirements of preterm infants by containing more energy, protein and carbohydrate than breast milk or term infant formula and significantly higher levels of certain micronutrients.<sup>4</sup>

Micronutrient levels vary between the available formulas in the UK. Preterm formulas are designed to be used in a hospital setting and are available on prescription in a sterile ready-to-feed form. Two available formulas have a hydrolysed protein source and, although there is currently no evidence supporting the use of hydrolysed infant formulas in preterm infants,<sup>4</sup> it may be indicated in certain infants who are not tolerating a standard preterm formula and who are not candidates for donor milk.<sup>19</sup> It is important to note that these hydrolysed preterm formulas are not suitable for the management of cows' milk protein allergy.

#### Post-discharge formulas

When a partially or fully formula-fed preterm infant is discharged from hospital, they will usually be transitioned onto a post discharge formula. These were developed following observations that preterm infants often demanded very high volumes of term formula which was difficult for carers to manage.<sup>19</sup> The nutritional composition falls between that of a preterm and term formula.<sup>19</sup> They are prescribable up to six months corrected age,<sup>19</sup> and ESPGHAN recommends their use up to 40 to 52 weeks post-conceptual age.<sup>23</sup> However, regular

<b>SPECIALISED INFANT FORMULAS - REFERENCE TABLE</b>							
Commonly used specialised infant formulas (0-6 months age) NOTE: values correct as of June 2016							
<i>Always refer to manufacturers' product information in case of any changes and for further information</i>							
Product name (manufacturer)	Presentation	Composition notes	Indications for use	Energy/100ml (Kcal)	Protein /100ml (g)	Osmolality (mOsmol/kg H <sub>2</sub> O)	Prescription only?
<b>EXTENSIVELY HYDROLYSED FORMULAS</b>							
Nutrigen 1 with LGG® (Mead Johnson)	400g tin	Extensively hydrolysed casein protein. Added probiotics		68	1.9	290	Yes
SMA Althera (Nestle Health Science)	450g tin	Extensively hydrolysed whey protein. Contains lactose (3.8g/100ml)		67	1.7	252*	Yes
Aptamil Pepti 1 (Aptamil)	400g / 800g tin	Extensively hydrolysed whey protein. Contains lactose (2.9g/100ml)	Management of mild to moderate cows' milk protein allergy	67	1.6	280	Yes
Similac Alimentum (Abbott)	400g tin	Extensively hydrolysed casein protein		68	1.9	274	Yes
Pepti-Junior (Cow & Gate)	450g tin	Extensively hydrolysed, semi elemental whey protein. 50% MCT	Malabsorption, short bowel syndrome, multiple food allergies and intolerances	66	1.8	210	Yes
Infatini Peptisorb (Nutricia)	200ml ready to feed (RTF) bottles	High energy, extensively hydrolysed whey protein. Contains lactose (0.1g/100ml)	Disease-related malnutrition with malabsorption and/or maldigestion	100	2.6	350	Yes
MCT Peptide (Nutricia)	400g tin	Extensively hydrolysed pork and soya protein. 75% MCT	Whole protein intolerance, short bowel syndrome, malabsorption	68	2	290	Yes
Pregestimil LIPIIL (Mead Johnson)	400g tin	Extensively hydrolysed casein protein. 55% MCT	Fat malabsorption, whole protein intolerance	68	1.89	280	Yes
<b>AMINO ACID FORMULAS</b>							
SMA A1f amino (Nestle Health Science)	400g tin	Amino acid formula. 24.4% MCT	Management of moderate to severe & multiple food allergy /	70	1.9	300*	Yes
Neocate LCP (Nutricia)	400g tin	Amino acid formula	Feed intolerance &	67	1.8	340	Yes
Nutrigen PURAMINO (Mead Johnson)	400g tin	Amino acid formula. 33% MCT	malabsorption	68	1.89	350	Yes
<b>LACTOSE-FREE FORMULAS</b>							
SMA LF (SMA Nutrition)	430g tin	<6.7mg lactose per 100ml	Lactose intolerance	67	1.5	204	No
Aptamil Lactose Free (Aptamil)	400g tin	<6mg lactose per 100ml		66	1.3	170	No
Enfamil O-Lac (Mead Johns.)	400g tin	<7mg lactose per 100ml		68	1.42	172	No

BREAST MILK FORTIFIERS & PRETERM FORMULAS						
Nutriprem Breast milk Fortifier (Cow & Gate)	2.2g sachets	Whey and casein protein hydrolysate	81**	2.7**	450**	Hospital only
SMA Breast milk Fortifier (SMA Nutrition)	1g sachets	Whey protein	84.8**	2.8**	Approx. 376**	Hospital only
Nutriprem 1 (Cow & Gate)	70ml RTF bottles	Whey and casein protein. Higher levels of some micronutrients	80	2.6	375	Hospital only
Hydrolysed Nutriprem (Cow & Gate)	90ml RTF bottles	Hydrolysed whey and casein protein. Higher levels of some micronutrients	80	2.6	405	Hospital only
SMA Gold Prem 1 (SMA Nutrition)	100ml RTF bottles	Whey and casein protein	82	2.2	272	Hospital only
SMA Gold Prem Pro (SMA Nutrition)	70ml RTF bottles	Partially hydrolysed whey protein 39.5% MCT	80	2.9	293	Hospital only
Nutriprem 2 (Cow and Gate)	900g tin, 200ml and 90ml <sup>§</sup> RTF bottles	Whey and casein protein	75	2.0	340/310 (powder/liquid)	Yes
SMA Gold Prem 2 (SMA Nutrition)	400g tin, 250ml and 100ml <sup>§</sup> RTF bottles	Whey and casein protein	73	1.9	311/312 (powder / liquid)	Yes
HIGH ENERGY FORMULAS						
Similac High Energy (Abbott)	60ml and 200ml RTF bottles	Primary sweetener maltodextrin Protein:energy 10.4%	100	2.6	333	Yes
Infantini (Nutricia)	125ml and 200ml RTF bottle, 500ml pack	Primary sweetener maltodextrin Protein:energy 10.3%	101	2.6	360	Yes
SMA High Energy (SMA Nutrition)	100ml RTF bottle, 250ml carton	Lactose only CHO source Protein:energy 8.8%	91	2.0	387	Yes
ANTI-REFLUX FORMULAS						
Aptamil Anti-Reflux (Aptamil)	900g tin	Thickened with carob bean gum	66	1.6	290	No
Cow & Gate Anti-Reflux (Cow & Gate)	900g tin		66	1.6	290	No
Enfamil AR (Mead Johnson)	400g tin	Thickened with rice starch	69	1.72	240	Yes
SMA Staydown (SMA Nutrition)	900g tin	Thickened with gelatinised maize starch	67	1.6	230	No

\*osmolality (mOsmol/L) stated when osmolality not available

\*\*when recommended amount added to 100ml preterm breast milk (using manufacturers data for preterm breast milk composition)

<sup>§</sup> hospital only

review is needed to ascertain the appropriate period an individual infant requires.

The evidence for long-term benefits of post discharge formulas is not consistent, a Cochrane review from 2012<sup>24</sup> found no evidence for improved growth outcomes at 12 to 18 months age; however, one of the trials with contrary results may have skewed the overall conclusion.<sup>19</sup>

### FALTERING GROWTH

There are a number of ways that a Paediatric Dietitian can support catch up in an infant whose growth is faltering. If an infant is breastfeeding it is important to optimise this. Expressed breast milk can also be fortified with standard infant formula to increase nutrient density. In formula-fed infants, strategies used to increase nutrient density include concentrating standard infant formula, or prescribing a ready-to-feed high energy formula. High energy infant formulas have a higher energy, protein and micronutrient content than standard infant formula and a higher protein: energy ratio. They only come in ready-to-feed form in the UK and need to be prescribed.

Although they can be a handy tool to improve growth in infants, these formulas should be used with caution and regular monitoring. Evidence for their use is limited,<sup>4</sup> and there is widespread discussion about the potential impact of early rapid catch-up growth and future long-term health risks, particularly obesity.<sup>25</sup> Gradual introduction of high energy formulas should be considered to ensure tolerance.

High energy infant formulas are also used in children with increased energy requirements, infants unable to take large volumes of feed and those who require fluid restrictions.

### GASTRO-OESOPHAGEAL REFLUX DISEASE (GORD)

Regurgitation of feeds, otherwise known as gastro-oesophageal reflux (GOR), is a common occurrence in infants and usually begins before eight weeks of age, becoming less frequent with time.<sup>26</sup>

Further investigation or treatment is not needed unless it is associated with distress, projectile vomiting, feeding difficulties and/or faltering growth. It is then known as gastro-oesophageal reflux disease (GORD).<sup>26</sup>

In formula-fed infants with GORD, a trial of a thickened infant formula is recommended, but only after full assessment and other advice has been given such as smaller, more frequent feeds.<sup>26</sup> Anti-reflux infant formulas with added thickeners, such as rice starch, corn starch or carob bean gum, have been developed for use in these circumstances. The fact that these formulas are widely available over the counter in the UK means that there is the potential for them to be used in simple GOR which is not recommended.<sup>26</sup>

Manufacturers also often recommend that anti-reflux formula is made up with cold or hand hot water to prevent lumps from forming. Care should be taken as using water less than the recommended 70°C could compromise food safety.<sup>4</sup>

### IN CONCLUSION

Specialised infant formulas can be used successfully in a variety of clinical conditions, and in some they are a mainstay of treatment. However, it is important that their use is appropriate, reviewed regularly, breastfeeding is promoted where possible and that parents have the correct equipment and are taught safe preparation techniques.

#### References

- 1 World Health Organisation (2003). Global Strategy for Infant and Child Feeding. Geneva: WHO. Available at: <http://apps.who.int/tris/bitstream/10665/42590/1/9241562218.pdf?ua=1&ua=1> (accessed May 2016)
- 2 World Health Organisation (2009). Acceptable medical reasons for use of breast-milk substitutes. Geneva: WHO
- 3 First Steps Nutrition Trust (2016). Infant Milks in the UK: A Practical Guide for Health Professionals. Available at: [www.firststepsnutrition.org/pdfs/Infant\\_Milks\\_February2016.pdf](http://www.firststepsnutrition.org/pdfs/Infant_Milks_February2016.pdf) (accessed May 2016)
- 4 First Steps Nutrition Trust (2015). Specialised Infant Milks in the UK: Infants 0-6 months. Information for Health Professionals. Available at: [www.firststepsnutrition.org/pdfs/Specialised\\_infant\\_milks\\_Infants\\_0-6\\_months\\_final.pdf](http://www.firststepsnutrition.org/pdfs/Specialised_infant_milks_Infants_0-6_months_final.pdf) (accessed May 2016)
- 5 British Specialist Nutrition Association Ltd. Legislation. Available at: [www.bsna.co.uk/legislation/](http://www.bsna.co.uk/legislation/) (accessed June 2016)
- 6 Caffarelli C, Baldi F, Bendandi B et al (2010). Cows' milk protein allergy in children: a practical guide. *Italian Journal of Pediatrics*; 36(5)
- 7 Vandeplass Y, Brueton M, Dupont C et al (2007). Guidelines for the diagnosis and management of cows' milk protein allergy in infants. *Archives of Disease in Childhood*; 92(10): 902-908
- 8 National Institute for Health and Clinical Excellence (2015). Cows' milk protein allergy in children. Available at: <http://cks.nice.org.uk/cows-milk-protein-allergy-in-children> (accessed May 2016)
- 9 Ludman S, Shah N and Fox A (2013). Managing cows' milk allergy in children (clinical review). *British Medical Journal*; 347: f5424
- 10 Lucassen PL, Assendelft WJ, Gubbels JW, et al (1998). Effectiveness of treatments for infantile colic: systematic review. *British Medical Journal*; 316: 1563-1569
- 11 MacDonald S (2015). *Gastroenterology*. In: Shaw V (Ed). *Clinical Paediatric Dietetics* (4th edition). Wiley Blackwell Publishing
- 12 Committee on Nutrition of the American Academy of Pediatrics (2006). Lactose intolerance in infants, children and adolescents. *Pediatrics*; 118: 1279-1286

- 13 Kukuruzovic R, Brewster D (2002). Milk formulas in acute gastroenteritis and malnutrition: a randomised trial. *Journal of Paediatrics and Child Health*; 38(6): 571-577
- 14 Lee KS, Lee JH (2012). Clinical applications and limitations of a special formula for diarrhea in children. *Journal of the Korean Medical Association*; 55: 551-561
- 15 Mendez M, Anthony M, Arab L (2002). Soy-based infant milks and infant growth and development: a review. *The Journal of Nutrition*; 132: 2127-2130
- 16 Agostoni C, Axelsson I, Goulet O et al (2006). Soy protein infant milk and follow-on infant milk: A commentary by the ESPGHAN Committee on Nutrition. *Journal of Pediatric Gastroenterology and Nutrition*; 42: 352-361
- 17 Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (2003). Phytoestrogens and Health. Available at: <http://cot.food.gov.uk/pdfs/phytoareport0503> (accessed May 2016)
- 18 MacDonald A, Portnoi P (2015). Disorders of Carbohydrate Metabolism: Galactosaemia. In: Shaw V (Ed). *Clinical Paediatric Dietetics* (4th edition). Wiley Blackwell Publishing
- 19 King C, Tavener K (2015). Preterm Infants. In: Shaw V (Ed). *Clinical Paediatric Dietetics* (4th edition). Wiley Blackwell Publishing
- 20 Koletzko B, Poindexter B, Uauy R (Eds) (2014). *Nutritional Care of Preterm Infants: Scientific Basis and Practical Guidelines*. World Rev Nutr Diet. Basel, Karger; vol 110: 4-10
- 21 Agostoni C, Buonocore G, Carnielli VP, et al (2010). Enteral Nutrition Supply for Preterm Infants: Commentary from the European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee (ESPGHAN). *Journal of Paediatric Gastroenterology and Nutrition*; 50, 1-9
- 22 Tsang RC, Lucas A, Uauy R, Zlotkin S (2005). Nutritional needs of the preterm infant: scientific basis and practical guidelines. Baltimore: Williams & Wilkins
- 23 Aggett P, Agostoni C, Axelsson I et al (2006). Feeding preterm infants after hospital discharge. A commentary by the ESPGHAN Committee on Nutrition. *Journal of Pediatric Gastroenterology and Nutrition*; 42: 596-603
- 24 Young L, Morgan J, McCormick FM, McGuire W (2012). Nutrient-enriched infant milk versus standard term infant milk for preterm infants following hospital discharge. *Cochrane Database of Systematic Reviews* 2012, Issue 3.
- 25 Pearce J, Langley-Evans S (2013). The types of food introduced during complementary feeding and risk of childhood obesity: a systematic review. *International Journal of Obesity*; 37: 477-485
- 26 National Institute for Health and Care Excellence (2015). *Gastro-oesophageal Reflux Disease: Recognition, Diagnosis and Management in Children and Young People*. NICE Guideline. Available at: [www.nice.org.uk/guidance/ng1/resources/gastrooesophageal-reflux-disease-recognition-diagnosis-and-management-in-children-and-young-people-51035086789](http://www.nice.org.uk/guidance/ng1/resources/gastrooesophageal-reflux-disease-recognition-diagnosis-and-management-in-children-and-young-people-51035086789) (accessed May 2016)



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Type your answers below, download and save or print for your records, or print and complete by hand.

<b>Q.1</b>	<b>Describe the nutritional management of CMPA in infants.</b>
A	
<b>Q.2</b>	<b>What are extensively hydrolysed infant formulas (eHFs)?</b>
A	
<b>Q.3</b>	<b>How do lactose-free formulas differ from standard infant formulas?</b>
A	
<b>Q.4</b>	<b>Why is soya formula not recommended for infants under six months of age?</b>
A	
<b>Q.5</b>	<b>Explain the challenges faced in the nutritional management of preterm infants.</b>
A	
<b>Q.6</b>	<b>When would preterm formulas need to be used and why?</b>
A	
<b>Q.7</b>	<b>What dietetic strategies can be put in place to manage growth faltering?</b>
A	
<b>Q.8</b>	<b>Explain why infants with GORD may require specialised formulas.</b>
A	

Please type additional notes here . . .