

BACK TO BASICS: AN OVERVIEW OF PRETERM FEEDING



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Feeding the preterm infant comes with several challenges, such as coping with an immature GI tract, an absent or inefficient suckle and swallow, along with a higher risk of necrotising enterocolitis (NEC), a condition where the intestinal tissue becomes inflamed and starts to die. This can lead to gut perforation where intestinal contents leak into the abdomen, which can cause severe infection.

Often, chronic lung disease is also an added complication. Premature birth interrupts the development of the infant in utero, and consequently leads to the arrival of a baby who has limited nutritional stores and limited capacity to improve them. Specialist nutritional support at this delicate stage in life is vital for neuro development, bone mineralisation, catch-up growth and the development of the immune and organ systems. Without adequate nutrition from the start, premature infants are at significant risk of short- and long-term complications.

DEFINING 'PRETERM'

Infants born before 37 weeks of complete gestation are considered premature (1). Very premature infants are those born before 28 weeks (2). Premature infants are often categorised based upon their birth weight. For example, infants weighing less than 2,500g, whether they are premature or not, are termed low birth weight (LBW). Very low birth weight (VLBW) infants will weigh less than 1,500g, with a further category of extremely low birth weight (ELBW) for infants weighing less than 1,000g (3). Subcategories of infants who are delivered at weights that are smaller than expected, may be divided into one of the following categories: Either small for

Table 1: Selected preterm nutritional requirements

Nutrient	Preterm infant			Term infant
	ESPGHAN (5) (1000g-800g)	Tsang (4)		
		ELBW	VLBW	
Energy (kcal/kg)	110-135	130-150	110-130	95-115
Protein (g/kg)	<1.0kg = 4.0-4.5 1.0-1.8kg = 3.5-4.0	3.8-4.4	3.4-4.2	2
Calcium (mmol/kg)	3.0-3.5	2.5-5.5	2.5-5.5	3.8
Phosphate (mmol/kg)	1.9-2.9	2.0-4.5	2.0-4.5	2.1
Sodium (mmol/kg)	3.0-5.0	3.0-5.0	3.0-5.0	1.5
Potassium (mmol/kg)	2.0-3.5	2.0-3.0	2.0-3.0	3.4

gestational age (SGA), where the infant is uniformly small with possible genetic explanations for the infant's growth pattern, or intrauterine growth restricted (IUGR), where the infant will be small but disproportionately so; length or head growth being limited. Both infant types have higher risks of short- and long-term developmental complications (3).

TINY TOTS WITH BIG REQUIREMENTS

Preterm infants have increased requirements for not only energy but for several macro and micro nutrients. Tsang, 2005 and ESPGHAN, 2010 (4, 5) provide the most up-to-date guidance on preterm nutritional requirements. There are variations and consistencies between the two (see Table 1). All round adequate nutrition is key to the growth and development of the

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Table 2: Preterm infant formulas

Product name (manufacturer)	Usage
Preterm formulas	
Aptamil Preterm (Milupa)	Hospital only
Nutriprem 1 (Cow & Gate)	
SMA Gold Prem 1 (SMA Nutrition)	
Nutriprem 2 (Cow & Gate)	Post discharge
SMA Gold Prem 2 (SMA Nutrition)	

preterm infant, as they have missed the opportunity to build stores of many nutrients during the third trimester of pregnancy. The most commonly supplemented nutrients in preterm infants include calcium, phosphorus, iron, folate and the fat soluble vitamins A, D and E. Meeting fluid requirements in the preterm infant requires careful consideration, as fluid overload may be a problem. This is due to the infant's immature renal function, but transcutaneous fluid losses are often high. Feed volumes may be restricted to ensure fluid overload is avoided. This, however, can often lead to inadequate nutritional intake. As such, where possible, the nutritional content of the permitted feed volume should be maximised.

'BREAST IS BEST'

Human breast milk is considered the preferred feed for preterm infants, due to its protective properties against infection, and the possibility of reducing the risk of NEC, which evidence has shown may be dose dependent (6). Improved neurocognitive development is one of the longer term benefits of human breast milk. Maternal expressed breast milk (MEBM) is encouraged as first line nutrition. Donor breast milk, however, is sometimes used in Special Care Baby Units (SCBU). The quality and availability of donor breast milk (DBM) can vary and may not always be an option and, as DBM is usually expressed by mothers of more mature infants, its nutritional profile may not be adequate for the needs of the preterm infant. Maternal and donor breast milk, however, does improve feed tolerance (7). The calorie content of DBM can be significantly lower than MEBM and may be used when establishing enteral feeds before larger volumes of alternative feeds are introduced. Use of DBM can offer the preterm infant some immunological benefits when MEBM is not available. Whilst on the SCBU, mothers are encouraged to breastfeed once the infant is capable. Once discharged, continued breastfeeding with iron and multivitamin supplementation is considered the ideal.

BUMPING UP THE NUTRIENTS

As previously mentioned, expressed breast milk (EBM) is the preferred feed for preterm infants, but due to the increased nutritional requirements for energy, protein and micronutrients, particu-

larly in very premature infants, EBM isn't always able to meet these needs. Prolonged protein deficits in the preterm infant have been shown to be detrimental to postnatal growth (8). In many SCBUs breast milk fortifier (BMF) is added to EBM to help meet nutritional requirements and promote adequate weight gain. Nutriprem BMF (Cow & Gate) and SMA BMF (Wyeth) are the two BMFs available for use in UK hospitals. Use of BMF benefits the preterm infant in the short term by improving growth, as the energy and protein content of the EBM are increased. On the other hand, few studies have found long-term benefits linked with uses of BMF. BMFs also increase the vitamin and mineral content of the EBM. If the infant is tolerating adequate amounts of fortified EBM and meets preterm nutritional guidelines, additional supplementation is not required. BMF does not contain iron, therefore additional iron supplementation is still needed.

ALTERNATIVE FEEDS

When MEBM or DBM are not available, or supply is inadequate, preterm formula is used. When developing their products, manufacturers of preterm formulas follow the published nutritional guidelines of Tsang (4) and ESPGHAN (5), in order to meet the increased nutritional demands of the preterm infant (see Table 2 for product examples). Despite the guidelines available, preterm formulas do have some variations in their vitamin and mineral content. This should be taken into consideration, as supplementation may still be required when using them. High calorie formulas such as Similac High Energy (Abbott Nutrition) and Infatrini (Nutricia SHS), are not considered first line formulas in preterm infant feeding. Although they contain adequate energy, they do not meet preterm nutritional guidelines for many vital nutrients. If a preterm infant is not showing satisfactory weight gain, it is best practice to consider increasing the volume of fortified EBM or preterm formula, if tolerated, rather than swapping to a high calorie formula. In older, heavier and stable preterm infants, high calorie formulas can be used as an alternative feed. The infant, however, would need to be tolerating 150ml/kg/day or more to ensure nutritional requirements are met and additional supplementation can be discontinued. Hydrolysate formulas have been proposed as a possible alternative feed for preterm infants, as they may improve feed tolerance and gut motility in the absence of EBM. However, there is conflicting and limited evidence (9, 10) for their use. As such, they are not commonly used in preterm infants.

FEEDING METHODS

Many ELBW and VLBW infants will require parenteral nutrition support from birth, in light of their very immature 'suck, swallow, breathe' reflexes, which may not fully develop until

the infant is 35 to 37 weeks (11). Early gradual introduction of enteral feeds may be beneficial in these high risk preterm infants (12). However, in heavier and more stable preterm infants, enteral feeding is encouraged as close to birth as possible (13). Trophic or small volumes of feed are given as a gut stimulus. Trophic feeding is also known as minimal enteral feeding, where < 20ml/kg/d of feed is given via NG tube whilst the infant receives the majority of their nutrition via the parenteral route. This has been shown to help in the prevention of NEC (14). Once tolerated, the feeds can be gradually increased along with regular clinical assessment to ensure feeds are not restricted and progression to full feeds is not delayed. Often enteral nutritional support will be required at least until the infant is 35 to 37 weeks. Some infants may require ongoing enteral nutritional support beyond this age.

GOING HOME

Post discharge, formulas are also available for continued specialist nutritional support, once the infant is well enough to go home. They provide appropriate nutrition, in a smaller volume, for preterm infants, and there is some evidence to support their usage for improved growth and bone mineralisation (15). They are available for use from 35 weeks and can be given up until the infant is six months of corrected age. Standard

term formulas can be introduced at this stage, if the infant is thriving. High calorie formulas are useful when intakes are limited and/or there is evidence of faltering growth.

From this brief overview of preterm infant feeding, it is clear that the dietitian plays a vital role in the management of this patient group. Unfortunately, due to limited funding for specialist neonatal posts, we are not always able to provide the service for this complex patient group. With growing evidence, however, that links improved growth and development with the idea of giving preterm infants the best possible nutrition from the start, there is always hope that this situation can improve.

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Questions relating to: *Back to basics: an overview of preterm feeding.*

Type your answers below and then **print for your records**. Alternatively print and complete answers by hand.

Q.1	Briefly define 'preterm'.
A	
Q.2	Why is specialist nutritional support essential for preterm infants?
A	
Q.3	What complications make feeding a preterm infant challenging?
A	
Q.4	Why do fluid requirements need careful consideration in preterm infants?
A	
Q.5	What are the benefits of maternal and donor breast milk for the preterm infant?
A	
Q.6	When and why would preterm formula be used in preterm infant feeding?
A	
Q.7	What is trophic feeding and what is its main benefit?
A	
Q.8	What are the benefits of post discharge formulas?
A	

Please type extra notes here . . .