Infant nutrition in the first year of life

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In the first of a two-part series looking at infant nutrition in the first year of life, Dearbhla Hunt discusses feeding in the first six months and explains the various formulae available to patients with specific health needs.

Introduction
The first year of life is a time of rapid growth and development. The infants weight doubles in the first six months of life and triples in the first year whilst length doubles within the first year of life. During infancy, nutrient requirements per kg of body weight are higher than at any other time of life. Appropriate nutrition is essential to support the infant’s growth during this critical time in order to prevent stunting and wasting. Furthermore research has shown that poor nutrition in the early months of life has long term implications. Neurological development, immune function, bone health, metabolism and cardiovascular health are all linked to early development and optimal nutrition in the early months of life. Whilst infants are born with stores as a result of pregnancy, these stores can be quickly depleted unless an adequate supply of nutrients is provided. Recommendations for nutrient requirements are set out by the Food Safety Authority of Ireland (FSAI).

How to support optimal nutrition and growth in the first year
Breast milk
Breast milk best meets the nutritional needs of the infant and it contributes immunological properties that provide the infant with a defence against infection. Studies have shown that breast fed infants are less likely to suffer from allergic disorders e.g. asthma, eczema, have fewer episodes of diarrhoea and ear infections and less severe chest infections. There is new evidence emerging that breast feeding may protect against obesity and type 1 diabetes and leukaemia in later life. The psychological benefits of breast feeding are equally important as the benefits to health – breastfeeding is a very close emotional and rewarding experience for both mother and infant.

Breast milk varies during the individual feeds and during the course of lactation, reflecting the nutritional needs of the growing infant.

The Department of Health and the World Health Organisation (WHO) recommend exclusive breastfeeding for the first six months of life. Breastfeeding is encouraged thereafter in combination with appropriate spoon feeds until aged two years or for as long as possible to maximise the advantages that breastfeeding provides.

Vitamin D, is present in low amounts in breast milk as vitamin D production is primarily dependent on sunlight. Furthermore, studies have shown that a high percentage of pregnant women living in Ireland have poor vitamin D stores. It is important for a mother to have good vitamin D stores during pregnancy as infants obtain 50-60% of their mother’s vitamin D at birth. Department of Health national policy recommend that all infants born and or living in Ireland, whether breast fed or formula fed, are given 5ug or 200 international units (iu) of vitamin D3 daily for the first year of life. Sunshine is the natural source of this key nutrient and given Ireland’s northerly latitude, very little UVB light reaches the earth’s surface resulting in a reduced production of vitamin D, especially in the months of October to
March. The FSAI (2011) report on ‘Scientific Recommendations for Healthy Eating Guidelines in Ireland’ suggest that a working group should be convened to examine the issue of vitamin D supplementation among all population groups in Ireland but in the interim, it states that all pregnant women should eat foods rich in vitamin D including well cooked eggs and oily fish, but as it is difficult to achieve adequate vitamin D through dietary intake they should take a 5ug (200iu) vitamin D daily and similarly that women who are breastfeeding should take 5ug of vitamin D3 daily in addition to infant supplementation.

**Infant formula milk**

If breast milk is not available or if the mother discontinues breastfeeding before the infant is one year old, the safe alternative is a modified cow’s milk based infant formula milk unless clinically contraindicated due to specific disease related conditions. All infant formula milks must be made to European Union Legislation Directives. There are a number of categories of infant formula milks available as follows:

- Standard formulae
- 1st infant formula
- ‘hungrier baby’ formula
- Follow on formula
- Soya based formulae
- Lactose free formulae
- Anti-reflux/regurgitation formulae
- Partially hydrolysed formulae
- Extensively hydrolysed formula
- High Energy formulae
- Specialised Infant Formulae: not based on cows milk: Amino Acid formulae

**Standard Infant formulae**:
- **Whey dominant** – Cow & Gate First Infant milk, Aptamil First, SMA First Infant milk, Hipp Organic Combiotic First Infant Milk
- **Casein dominant** – Cow & Gate Infant Milk for Hungrier Babies, Aptamil Hungry, SMA Extra Hungry infant milk, Hipp Organic Combiotic Hungry infant milk
- **Follow on milks** – Aptamil Follow-on, Cow & Gate Follow-on, SMA Follow-on Milk, Hipp Organic Combiotic Follow-on milk

Whey based standard infant formula milks are the first choice for non-breast fed babies. The ratio of whey to casein is 60 : 40 which mimics the amount of whey found in breast milk. It is recommended that infants remain on a whey based formula milk from birth to twelve months unless a health care professional recommends an alternative due to clinical needs of the infant.

Casein based infant formula milks (i.e. casein: whey ratio 80:20) have a slower rate of gastric emptying. They are marketed for the ‘hungrier baby’ but there is no definite scientific proof to support this claim. Casein based infant formula milks are suitable from birth but should not be used before the infant is 6 weeks old or older.

Follow on infant formulas are marketed to infants from 6 months onwards and are not suitable for infants under 6 months. The majority of these milks have similar calories to infant formula but their protein (except in the case of SMA Follow On milk), iron, calcium and phosphate content is higher. They may be useful if the infant is taking less than 400mls formula per day or if the weaning diet is poor and contains limited dietary sources of iron although studies have failed to show an advantage for follow on formulas in terms of anaemia prevention.

**Soya based infant formulae: Wysoy, Infasoy**

This formulae milk is not recommended for infants less than 6 months due the potential oestrogenic effect in the developing infant. The only exceptions to this recommendation are if the newborn infant is diagnosed with the inborn error of metabolism, Galactosaemia. The prevalence of Galactosaemia in the indigenous traveller community in Ireland is higher than in the settled community. In high risk infants in this patient group if breast milk is not available or if the mother discontinues breastfeeding before the infant is one year old, the safe alternative is a modified cow’s milk based infant formula milk, a soya based infant formula milk may be commenced from birth until the results of the neonatal screen i.e. ‘heel prick test’ results are known. If the infant’s screen is negative, the soya formula milk should be discontinued and the infant commenced on a whey based standard infant formula milk.

Caution should be applied if soya infant formula milk is used in the treatment of cows milk protein allergy (CMPA) due to the increased risk of concurrent soya allergy in this patient group but in cases where soya allergy is not a risk and the infant refuses to take either an extensively hydrolysed or amino acid based
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IMPORTANT NOTICE: Breast milk is the best nutrition for babies. The decision to discontinue breastfeeding may be difficult to reverse and the introduction of partial bottle-feeding may reduce breast milk supply. Failure to follow preparation instructions carefully may be harmful to your baby’s health. Parents should always be advised by an independent healthcare professional regarding infant feeding. Products of Mead Johnson must be used under medical supervision. EU 11.564. Trademark of Mead Johnson & Company. LLC. © 2015 Mead Johnson and Company, LLC. All rights reserved.
formula milk, then a soya based infant formula milk may be used in infants less than 6 months old. These formula milks should be offered to infants of vegan mothers who are unable to breastfeed or choose not to breastfeed.

**Lactose free formulae: SMA LF Lactose Free, Enfamil O-Lac**

This formulae is similar to standard infant formula but without the lactose and is only recommended for the management of Lactose Intolerance (Li) where a standard cows milk based lactose containing formula worsens the symptoms of diarrhoea and abdominal discomfort.

This formulae contains cows milk protein and must not be used in the management of CMPA.

**Anti reflux/regurgitation formulae: SMA Staydown, Enfamil AR, Cow & Gate anti reflux**

This formulae is indicated in the management of gastrointestinal reflux (GOR) that is particularly bothersome and is not relieved by conventional methods e.g. winding, sitting the infant up straight during feeds, not letting the infant lie flat for at least 20 minutes after each feed. The use of medications such as infant gaviscon to treat reflux is contraindicated if the infant is on any one of the above formulas or on a thickened standard formula milk.

**Partially hydrolysed formulae: Comfort First, Aptamil Comfort , SMA Comfort**

This formulae is marketed for infants with minor feeding difficulties such as constipation, colic or digestive discomfort. It is suitable from birth. It has a lower content of lactose than standard infant formula. Some of the branded formulas are thicker in consistency and will require a change of teat. The protein is partially hydrolysed and the fat blend is altered which is thought to lead to a softer stool. The colour and consistency of stools may change with these feeds, resulting in a softer, greener stool.

**Extensively hydrolysed formulae: Nutramigen Lipil 1 & 2, Aptamil pepti 1 & 2, Pregestimil and Pepti Junior**

This formulae is indicated for the treatment of cows milk protein allergy, but it should be noted that Pregestimil and Pepti Junior both contain at least 50% medium chain triglycerides (MCT) and hence should only be used in CMPA with malabsorption and not as first line treatment for CMPA. Pregestimil and Pepti Junior are used in the treatment of cystic fibrosis due to their MCT profile. These formulas are more expensive than the standard infant formula milks and depending on the age of the infant, tolerance may be an issue.

**High Energy Formulae: SMA High Energy, Infatrini, Similac High Energy**

This formulae is indicated for infants with insufficient weight gain due to reduced volumes of feed taken or where higher nutritional requirements exist. It contains additional calories, protein and key nutrients to promote catch up growth in term infants presenting with faltering growth. It is only available on prescription.

**Specialised Formulae: Amino acid formula: Neocate, Puramino**

It is not based on cows milk. It should be the first choice formula in a breast fed infant who reacts to the trace amounts of milk protein in the breast milk and is suitable for infants with cows milk protein allergy that do not improve on extensively hydrolysed formulas, multiple allergies and those infants post surgery or presenting with other gastrointestinal issues.

**Other drinks**

Infants should be given breast milk or formula milk only as their main drink until at least one year old. If an infant is thirsty (rather than hungry) or constipated, cooled boiled water can be given between formula feeds.

Unsuitable drinks include:
- Unmodified cows milk until at least one year old
- Unmodified Soya milk and or soya based infant formula, unless clinically indicated
- Unmodified Goats milk
- Tea or coffee
- Fizzy drinks or cordials
- Mineral or sparkling waters
- Fruit juices – should not be offered until at least 6 months and when introduced it should be unsweetened, well diluted (1 part juice to 6 parts water), given only at meal times and limited to no more than one cup per day
- A cup should be introduced for drinks other than breast feeds from 6 months.

**Monitoring and growth**

Infants should be monitored frequently to ensure that they are feeding well and thriving. A growth assessment should include an accurate measurement of naked weight, length and head circumference, details of feed type, feed preparation and frequency, number of wet and dirty nappies etc.

Serial measurements should be plotted onto an appropriate growth chart. If growth falls below the expected centile curve, or if growth crosses downward through the centile curves or if there are two or more centile bands between weight and length curves, intervention may be warranted.

**Growth charts include:**
- UK – WHO (0 – 4 years)
- UK – WHO Neonatal and Infant Close Monitoring Charts
- UK Growth charts (2-18 years) replacing UK90 Growth charts
- UK90 BMI
- Irish Clinical Growth Standards, Hoey, Tanner and Cox (1986)

Specific centile charts are also available for Downs Syndrome, Cerebral Palsy, Turner Syndrome, Sickle Cell Disease, Williams Syndrome, Marfan Syndrome, Noonan Syndrome, Praeder – Willi – Syndrome and Achondroplasia.

**References available on request**

In the second part of our series looking at infant nutrition in the first year of life. Dearbhla Hunt will discuss common feeding issues in the first year of life and weaning. This will appear in the July/August issue of NIGP.