

# UPDATE ON INFANT FEEDING

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## On infant feeding

*"A pair of substantial mammary glands have the advantage over the two hemispheres of the most learned professor's brain in the art of compounding a nutritive formula for infants."*

Oliver Wendell Holmes 1809-1894

## Breast milk – designer milk

*Kangaroos usually have one young each year. The joey remains in the pouch for nine months and continues to suckle until 12 to 17 months of age. Kangaroos can have three babies at the same time – one maturing and just out of the pouch, one developing in the pouch and one embryo in pause mode. There are four teats in the pouch, each one producing milk of different composition, ideally suited to meet the nutritional demands for each stage of maturity and development.*

The majority of non-breast-fed infants receive a cow's milk-based formula. The various brands have minor differences and choice can be left to parents.

## WHICH MILK?

It is widely accepted that nature knows best, and therefore breast milk is the ideal nutritional formula for infants. However as fewer than 30% of babies are breast-fed for longer than four weeks it is essential that infant formulae should be designed with the required nutrients for optimal growth and development, while at the same time ensuring absolute safety.

## SOYA FORMULA AS SOLE NUTRITION

Over recent years increasing numbers of infants have received a soya-based formula as sole nutrition, the reason being either that the infant or sibling has suspected lactose intolerance or cow's milk protein intolerance (CMPI), or as a vegan option. The choice of soya has been discouraged for several years in allergy and CMPI, as up to 40% of these infants will also develop an intolerance to soya. Recent discussions have raised more serious concerns because of the isoflavones in soya formulae and their potential impact on the longterm reproductive health of infants. Isoflavones are oestrogen-like products, or phytoestrogens which bond to oestrogen receptors in animal models. On a weight for weight basis, an infant receiving a soya formula as sole nutrition would consume three to five times the amount of isoflavones which has been shown to affect the levels of luteinising and follicle stimulating hormones and the menstrual cycle in adult women. Other studies suggest a possible effect on thyroid function and the immune system. Little is known about any effect it may have on infants and there have been no reports of adverse endocrine events in adolescents who were fed on soya. However these concerns led the CMO to state in January 2004 that soya-based infant formulae should not be used as the first choice for sole nutrition in infants with

CMPI, lactose intolerance or one of the rarer enzyme deficiencies necessitating a lactose-free formula (see attached statement).

## WHAT ALTERNATIVES ARE THERE TO BREAST MILK AND COW'S MILK-BASED FORMULAE?

In an infant with symptoms of lactose intolerance on breast milk or cow's milk-based formula then a lactose-free cow's milk-based formula such as SMA LF or Enfamil Lactofree should be offered. Lactose intolerance not uncommonly develops as a temporary phenomenon after a bout of gastroenteritis, but resolves within a couple of weeks when the infant can go back onto a standard cow's milk-based formula.

When an infant has suspected CMPI, usually manifest as vomiting, abdominal pain, variable or abnormal bowel habit and failure to thrive, then a cow's milk hydrolysate feed should be offered. During the first six months of life a casein-based one such as Nutramigen or Pregestimil is recommended. The protein in these is highly hydrolysed with 95% being less than 1,000 daltons. These products are not very palatable but fortunately young infants don't seem to mind. However, an older infant will often refuse to take them in which case Peptijunior or Alfare should be used as an alternative. These are whey-based formulae which are less hydrolysed (63% of protein is less than 1,000 daltons) and are much more palatable. These infants generally need to continue on the hydrolysed formula into the second year of life by which time milk constitutes only a small proportion of calorie intake, and standard cow's milk can often be tolerated. Occasionally children remain intolerant longterm.

A very small proportion of children with CMPI cannot even tolerate the hydrolysed formula and an amino acid-based substitute is used, usually Neocate. These children will generally have been referred to hospital.

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|------------------|--------|
| Standard formula | £3.00  |
| Enfamil LF       | £3.22  |
| SMA LF           | £3.99  |
| Nutramigen       | £7.80  |
| Peptijunior      | £8.22  |
| Neocate          | £19.50 |

Table 1 Cost of infant formulae 400 gm.

## Formula requirements

Fluid requirements are:

0 – 3 months 150 ml/kg/24 hours

4 – 6 months 130 ml/kg/24 hours

This is usually given over six feeds per day, 3-4 hourly during the day time and 4-6 hourly overnight. Breast-fed

infants during the early weeks of life will often demand more frequent feeds until good milk production is established.

### **Weight gain**

A newborn term infant will lose some weight initially and up to 10% is acceptable. Return to birthweight is expected by about 10 days of age. Thereafter growth is at the rate of 200 grams per week (or for those opposed to metric measurements an ounce a day except for Sundays). This holds until about four months of age.

### **Probiotics and prebiotics**

Breast milk contains protective and immunoregulatory components that have a beneficial effect on the infant's immune system, affording protection from some infections and atopic disease. Research is now focusing on the bioactive components in human milk, aiming to achieve these same beneficial and functional effects in formula feeds.

It is probable that many of these properties are related to the microflora of the intestine. The gut is sterile at birth, but becomes rapidly colonized within days, depending on the type of feed and environmental factors. The predominant micro-organisms in a breast-fed infant are the bifidobacterium and lactobacillus, whereas the formula-fed infant will have equal numbers of bifido and bacteroides species.

**Probiotics** These are live microbial food components which beneficially affect the host by improving its intestinal microflora. Important ones include bifidobacterium bifidum, lactobacillus acidophilus and lactobacillus casei.

Studies have demonstrated that supplements can reduce the duration of symptoms in both diarrhoeal illness and antibiotic-associated diarrhoea. There is also growing evidence for beneficial effects in modifying allergic inflammation, eg atopic eczema.

Many 'over the counter' products are now available. It is important to ensure that the contents are live and not past their sell-by date, and that the product delivers at least two billion viable micro-organisms per dose.

**Prebiotics** These stimulate the growth of bifidobacteria. Important ones present in human milk are the oligosaccharides, which occur either free with sugars or bound to glycolipids or glycoproteins. They resist digestion in the small intestine and reach the large intestine where they have two important functions.

Firstly, they are prebiotics, ie they support the growth of healthy colonies of commensal bacteria. Secondly, they act as soluble receptor analogues for pathogens, thus having a direct inhibitory effect on certain pathogenic micro-organisms.

Studies to date have demonstrated that supplementation of standard infant formula with specific oligosaccharides (transgalacto and fructo oligosaccharides) results in an increased number of bifidobacteria in the stools, and the stool appearance is more similar to that of a breast-fed infant. Future research will study the longterm effect of prebiotics on the prevention of infectious disease, allergies and the modulation of the immune system.

## **RECOMMENDATIONS ON INFANT FEEDS FROM DIETETIC AND PAEDIATRIC DEPARTMENTS**

- 1 Breast milk is best.
- 2 Children who are not breast-fed should be given cow's milk-based 'first' infant formula of the parents' choice. There is no reason to avoid cow's milk-based formula on the basis of a sibling or close relative having had suspected or proven cow's milk allergy/intolerance.
- 3 Children who develop symptoms of lactose intolerance on breast milk or cow's milk-based formula should be offered a lactose-free cow's milk-based formula such as SMA LF or Enfamil Lactofree.
- 4 Children with suspected cow's milk protein intolerance should be offered a cow's milk protein hydrolysate such as Nutramigen, Pregestimil (casein-based, first choice below six months of age), Pepti Junior or Alfare (whey-based, less hydrolysed but more palatable – useful for older infants).
- 5 There will be a small proportion of children with cow's milk protein intolerance who require an amino acid-based substitute, such as neocate.
- 6 Soya-based formulae should only be used in exceptional circumstances to ensure adequate nutrition – for example they may be given to infants with galactosaemia (tertiary specialist recommendation), infants of vegan parents who are not breast-feeding or to infants who find alternatives unpalatable.
- 7 Children who are already using a soya formula under the direction of a doctor or health professional do **not** need to change.
- 8 A doctor, dietitian or other health professional should review parents of children being given soya milk without medical supervision.