7.6.2 Arguments for and against exclusive breastfeeding for six months

In May 2003, Hazel Blears, who was the UK health minister at the time, announced that the UK College of Midwives, the UK Health Visitors' Association and several other key bodies backed the new government guidelines for exclusive breastfeeding up to six months[1]. In 2001, the World health Organisation had published a systematic review of the benefits of this policy[2] and a study of 42 developing countries that demonstrated that exclusive breastfeeding to 6 months and partial breastfeeding continued up to 12 months could save the lives of 1.3 million children/year[3]. The dangers of bottle feeding in the developing world using unsafe contaminated water have already been discussed (see 7.3) but does this really translate to Europe and North America? The advantages and disadvantages are summarised in the table below:

	Advantages	Disadvantages
Normal growth or obesity?	Less likely to be a tubby toddler and an obese child[4]	Risk of growth faltering (< 2nd centile at 4 months) is at least 2%[5]
Diabetes risk	Significantly reduced risk of type1 diabetes and obese children are at risk of becoming obese type2 diabetic adults. [6]	None
Risk of adult cardiovascular disease	Exclusive breastfeeding associated with lower BP and cholesterol levels in early childhood.[6]	There is no proven direct link with reduced cardiovascular risk in adulthood.[6]
Infection risk	Lower risk of gastrointestinal infection, lower respiratory tract infection and otitis media.[6]	Benefits to infants in developed countries may be overestimated due to poor control for potential confounders.
Anaemia risk	Although there is <1mg/L of iron in human milk it is absorbed relatively well (@50%)	By age 4 months some infants will have low iron reserves. Anaemia in infancy in breast-fed mothers varies in different populations between 6-50%. [7], [8]
Micronutrient deficiency	Micronutrient deficiencies are rare in well-nourished mothers.	Not All mothers are well nourished, either in the developing world or in the affluent Western world. Zinc deficiency may be present in up to 25% of exclusively breast fed infants[9] and vitamin A and D

		deficiency are common.[9, 10, 11]
Health in infancy	**Infants that are breast fed up to and beyond 6 months are generally healthier with lower relative risk of sudden infant death syndrome compared with formula fed infants of 0.81.**[6]	**Most studies relate to "any breast feeding" and cannot be related to the exclusive breastfeeding policy.**
Allergies	**Delaying baby solids to 6 months may reduce the incidence of asthma, eczema and allergies[12] and coeliac disease.[13]**	**At least one RCT failed to find any link between early introduction of solids and these allergic conditions[14].**

The WHO guidelines on exclusive breastfeeding do point out the dangers of growth faltering and iron and micronutrient deficiencies in a minority of cases but the authors do not cover this adequately. Researchers have pointed out that breast milk may not be sufficiently energy dense to sustain normal growth. This would become critical at 58 kcal/100 ml, which is a commonly reported value for human breast milk[15]. In the 2008 review of breast feeding by Hoddinott et al[6], the authors endorse the WHO recommendations for exclusive breast feeding to 6 months and the new WHO growth charts that reflect the slower rate of growth seen in healthy breast-fed infants (n=8500) compared with previous growth charts that were based on mixed feeding patterns[16]. Hoddinott et al state that with previous growth charts there were "....concerns that misinterpretation of growth charts could lead to breast fed babies being given unnecessary supplements or formula". There is certainly some evidence that cow milk proteins, still present in formula milk, is different in quantity (50% more than in human milk) and quality (different balance of amino acids)[17], and that this explains excessive weight gain.

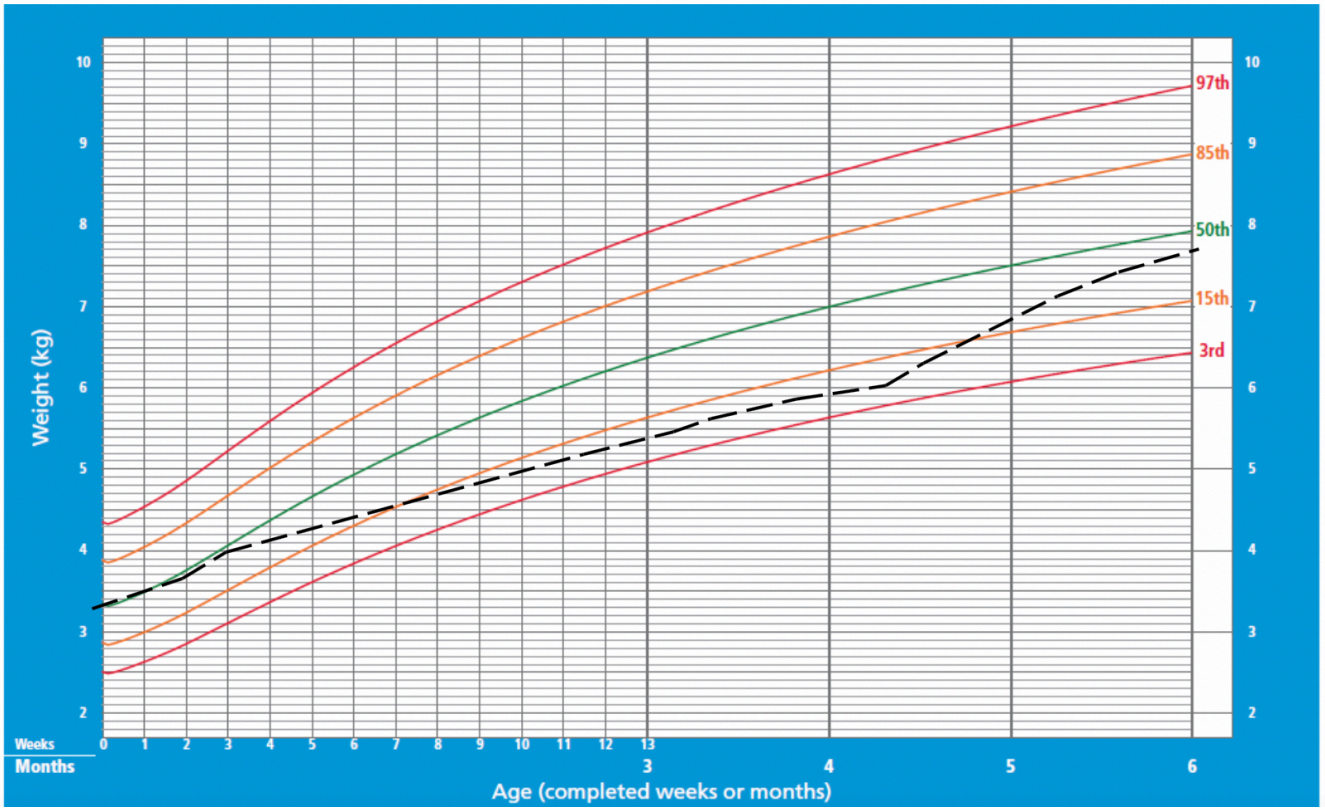
> **Infants on formula milk have been found to have high blood levels of amino acids that stimulate release of insulin which may play a role in excessive weight gain and risk of developing diabetes. Modification of these proteins would be expensive and requires further research. The alternative of genetically engineered constituents from plants or genetically engineered cows producing human-like milk are being explored but GM research is opposed by many scientists, commercial interests and politicians.**

Our older charts are misleading because they are based on mixed feeding infants whose "unhealthy" weight gain was partly due to this cow milk protein effect. The UK adoption of the WHO charts will lead to more infants being classified as overweight and fewer being diagnosed as 'growth faltering'. Hodinott et al cite a recent paper based on two UK prospective birth cohort studies (n = 923 and 1029)[80] as evidence the WHO charts should be implemented in the UK. This paper shows a 2% incidence of growth faltering (< 2nd centile at 4 months). However, the authors concede that infants in their sample include a significant proportion (no figure given) who had supplemental feeds or solids both before and after 4 months. The authors are unable to quote data on the incidence of growth faltering with exclusive breast feeding.

The WHO systematic review[18] is a very impressive document which represents a gargantuan effort in data collection and statistical analysis, but I wonder if some of the trials included have the same problem of unrecorded supplementary foods being given at about 4 months. The chart of a baby boy (Figure 27) illustrates a not uncommon sequence of events when the infants weight gain starts to veer away from the 50th centile. This baby boy's length remained close to the 50th centile whilst his weight gain dropped below

the 10th centile at 4 months. The mother wanted to maintain exclusive breast feeding and a relative commented that this was a "banana baby" – i.e. a slim-shaped but healthy infant. However, the baby, who had been sleeping through, started to wake in the night more often.

Figure 27. Baby boy (see text) exhibiting mild growth faltering (dotted black line) on WHO growth chart.



At this point, the baby was given some complementary foods: baby rice, baby banana porridge (baby rice with banana flavour), sweet potato. He was much happier and his growth curve came back into the normal range. Similar and rather more dramatic examples of growth faltering with appropriate treatments are described in a recent paper by Kristin and Bauchner.[19] Neither the WHO nor the UK Department of Health ignore the problem of growth faltering and the UK guidelines issued in 2003 stated: "All infants should be managed individually so that insufficient growth or other adverse outcomes are not ignored and appropriate interventions are provided." However, there seems to be rather more concern to spot infant obesity early and to get to grips with the epidemic of childhood obesity that is perceived as a serious threat to the health and wealth of the nation.

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7.6.3 Four-month complementary feeding – an evolutionary hypothesis

Adding in jars of baby food, home puréed food and/or supplementary formula feeds at about 4 months is such common practice that there must be good reasons for it. We know that infant iron reserves start to run out at about this time [1],[2] and mothers were, for many years, told to start with a smooth beef broth at about this age as a source of haem iron. We also know that complementary feeding often helps a hungry baby to sleep through and this must be very important to parents who are often exhausted by night feeds by this stage. However, it is all rather unnatural - isn't it? Our Palaeolithic ancestors had no access to animal milk at that stage (domesticating and milking animals came much later) and the Palaeolithic kitchen did not have an effective food blender did it? There is one theory that takes us back to nature for an equivalent to the kitchen blender. Many animals and birds feed their young partially digested food and nature films like to show sea birds regurgitating

fish into the mouths of their young. Research in anthropology and child health has shown that the practice of pre-mastcating food is so widespread in rural non-Western cultures (including Thailand[3]) that we can presume that this was standard practice for our Palaeolithic ancestors. The German zoologist Wolfgang Wickler suggested that kissing did not evolve, originally, as a courting ritual but was the method by which a mother transferred premasticated food from her mouth to her infant's mouth[4]. Like so many components of sexual attraction and courting display, a habit associated with successful child rearing was subsequently incorporated into a courting ritual that served the biological function of assessing the suitability of a potential mate[5]. In an excellent PhD thesis by a Chinese researcher at Cornell University, USA, the researcher suggests that premastication behaviour had a significant evolutionary advantage as the haem iron component (i.e. meat) of the premasticated food corrected the trend to faltering iron status, anaemia and risk of infant mortality[6]: "The results of the various lines of investigation suggest that premastication has been a common practice in human societies, but has been significantly under-reported. The potential dangers of increased infection that premastication poses for infant health have probably been less serious than the disadvantages of not engaging in premastication, which is a means of giving infants iron to prevent deficiency as stores begin to drop during the first semester of life. Therefore I conclude it is probable that premastication was the behaviour/cultural solution to the complementary feeding challenge in human societies, that it probably prevented the level of iron deficiency, which is common today in poor societies." This researcher found that 39 out of 119 cultures (33%) are known to practice premastication as an infant feeding strategy and in her survey of mothers and their infants in rural China, 63% of infants (65 of 104) were fed premasticated food.[93].

Human babies are born relatively premature because the human infant brain is relatively large. If the human infant grew to a stage of maturity similar to the maturity at birth of other large mammal, its head would be too large to pass through the female pelvis (which is also compromised by the upright human posture). Therefore the human infant is both physiologically and metabolically vulnerable and remains so for longer than other mammals. At a stage when other mammals may be more independent, the human infant is still very dependant, still breast fed and running low on iron. No wonder, then, that during this extended infancy there is a need for something more than just mother's milk at about 4 months and premasticated food fits the bill perfectly.

7.6.4 Arguments for and against complementary feeding before age 6 months

The benefits of breastfeeding up to and beyond six months are undeniable. These include better brain development, an immune system that deals with infection more effectively and a lower risk of sudden infant death syndrome. The residual cow milk proteins in formula milk trigger higher levels of insulin and this, together with overfeeding, may help to explain the rising tide of childhood obesity and subsequent diabetes. However, the WHO gold standard of exclusive breastfeeding up to six months may be misleading if our human and pre-human ancestors added in premasticated food at about 4 months, as still happens in many non-Western rural cultures. The UK policy of recommending exclusive breast feeding and adopting the WHO infant growth charts is intended to help improve the very poor 22% rate of breastfeeding at age 6 month. However, the extent of the risk that this may increase iron deficiency and growth faltering at about 4-6 months is unknown and requires professional vigilance. Whilst I would not advocate a return to premastication as a solution, there are modern equivalents.

7.7 Weaning in more detail

7.7.1 Introduction of complementary foods

Section 7.2 deals with the ways in which infant's nutritional needs differ from those of adults and older children. Deciding when to introduce weaning (complementary) foods alongside breast or formula milk has become a controversial issue. The timing of introduction alongside breastfeeding raises the following issues:

- When is the infant gut sufficiently mature to cope with complementary(puréed) solids and liquids?
- When will breast milk no longer be an adequate source of certain nutrients (i.e. iron, zinc, calcium and vitamins D and A)?
- Is there a danger that early introduction of complementary foods will lead to premature cessation of breastfeeding?
- What are the most suitable foods to introduce first?
- How can the risk of food allergy be minimised?
- Do premature infants differ in their nutritional needs at this stage?
- How do infants on formula milk differ with respect to all these issues?

We have already established that the infant gut can cope with premasticated or puréed foods from about age 3-4 months and that this can help to prevent iron deficiency. There is a substantial body of evidence to show that before age 3 months complementary solids can be harmful and increases the incidence of respiratory illness and eczema throughout childhood[7],[8]. In developing countries, there is a balance of risk from adding in complementary solids after age 4 months to infants between:

Risk A. Microbial contamination- the risk of bacterial and viral contamination of complementary foods which is mainly related to the use of unsafe contaminated water for making up bottle feeds. There is also concern about premastication as a source of pathogenic bacteria although premasticated foods contain maternal IgA antibodies and digestive enzymes that are beneficial.[90] However, poor water quality, poor hygiene and storage of food (during which bacteria multiply) are more serious issues that account for gastroenteritis and infant mortality.[90]

Risk B. Inadequate nutrition – malnutrition is a major factor in infant mortality and if the risk of anaemia associated with exclusive breastfeeding could be safely reduced with appropriate complementary foods that alone would be beneficial to the infant. Improvement of zinc and vitamin A deficiency could also be a survival advantage. Vitamin D content of breast milk will only be adequate if maternal vitamin D status is good and this depends on sunlight exposure (Chapter 6: 6.7.2).

Even in the developed countries where severe infant malnutrition is rare, lesser degrees of malnutrition may be an issue. Zinc deficiency can be severe in the totally breastfed premature infant [9] and 50% of infants may have sub-optimal zinc status that could cause undetected mild developmental delay and even later behaviour problems [10]. Iron and zinc status can be improved in exclusively breast-fed infants by adding in puréed meat or baby food jars containing puréed meat (usually a beef broth initially) [11] at any time from age 4-6 months. Iron fortified baby rice is a popular first food for age 4-6 months but the zinc content is minimal.

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