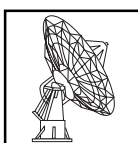


The Hebrew word translated 'river' in all these cases is *nachal*, as used in Ezekiel 47:19 to refer to the borders of the land in the Kingdom. The first two passages above refer to the borders of the land to be inherited under Joshua; this did not extend to the Nile. The third is referring to the northern and southern boundaries of Solomon's dominion, which again did not extend to the River Nile; and the final passage is referring to the same territory.

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*Brother Barbaresi quotes Exodus 23:31 as evidence that the boundaries of the land are defined by God as extending to the Red Sea. The verse reads: "I will set thy bounds from the Red sea even unto the sea of the Philistines, and from the desert unto the river". It seems from reading the full description that the first part is defining the eastern and western limits of the land and the second part the northern and southern limits, with the Red Sea being the Gulf of Eilat, and the sea of the Philistines the Mediterranean. We know from 1 Kings 9:26 that the Gulf of Eilat was part of the Red Sea.—T.B.*



## Science

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# "As newborn babes . . ."

Valerie Pinfield

**A** NEWBORN baby is completely dependent on its mother for the nourishment it needs to grow and develop. In the natural order, our heavenly Father has provided for the needs of such infants in the form of milk produced by the mother and delivered by breastfeeding. As well as supplying all the nutritional requirements, human milk includes vitamins and minerals essential for proper development, and protects the baby against infection, a vital role in the earliest and most vulnerable stage of life.

This article aims to show how the production and composition of human breast milk are finely tuned to the baby's needs, and therefore show the hand of a Designer in creation. As we go along we will draw out spiritual lessons, such as the relationship between mother and baby being a figure for our position before our Creator. The final section illustrates the benefits of breast-feeding in preference to bottle-feeding, demonstrating human limitations in trying to improve on God's creation.

### The composition of human milk

In the earliest months of life, a mother's breast milk provides entirely for her baby's nutritional and developmental needs. During this stage not only does the baby's weight and size increase

rapidly (typically its weight doubles in four to five months), but its eyes, nervous system and other parts develop dramatically too. To achieve this, milk is a complex concoction of substances taken from the mother's diet or stores of fat (via the blood stream), or manufactured in the milk-producing cells.

Breast milk includes the well-known nutritional components water, proteins, fats and sugars, as well as vitamins and minerals, enzymes and hormones (see [Table 1](#) overleaf). Water is, of course, essential for all cells, whilst fats and sugars (carbohydrates) are needed for energy and growth. The proteins (including the 'curds and whey' proteins) have a range of roles, from nourishment to binding surplus iron, or preventing infection (antibodies). Similarly, the category known as 'fats' includes many different substances, such as triglycerides, phospholipids, cholesterol and free fatty acids.

There has been much public information (and confusion) in recent times in Western societies as to which sorts of fats are best in the diet of a fully-grown adult. A baby has somewhat different needs, requiring a range of fats, not all of whose importance is yet understood. A particularly important group are the polyunsaturated fatty acids (PUFAs), which cannot be produced

<b>Table 1</b>		
<b>Contents of typical breast milk (percentages are the proportion of milk)</b>		
<b>Component</b>	<b>Types</b>	<b>Uses</b>
Water		needed by all cells
Fat (3-4%)	triglycerides, phospholipids, cholesterol, free fatty acids	energy and growth, development of eye, nerves, etc.
Protein (1.2%)	proteins, amino acids, nucleotides, antibodies	growth, preventing infection, binding surplus iron, etc.
Carbohydrate (7.5%)	lactose, oligosaccharides	energy and growth, promotes healthy gut
Minerals	sodium, iron, magnesium, calcium, etc.	many uses, for example, for strong bones, oxygen intake
Vitamins	A, C, D, E, etc.	many uses, including iron absorption, calcium absorption

in the body and so are only obtained by the baby through the diet of the mother. These are vital for the formation of nerve coverings in the brain and spinal nerves, and also in the development of the eye. Lactose (milk sugar) accounts for most of the carbohydrate content of breast milk, making the milk taste sweet and also contributing to calcium absorption and the correct balance of microorganisms in the gut. Other sugars help protect the baby against infection of the respiratory system, gut and urinary system.

In terms of the quantities of minerals in the milk, more is not necessarily better, since an excess can harm the kidneys. Hence the amounts of minerals such as sodium, calcium, magnesium and iron are finely tuned to the baby's needs. Iron, for example, as an essential constituent of haemoglobin, is used to aid oxygen transfer around the body, and a baby already has a store of it at birth. Its absorption from milk is assisted by vitamins C and E, one example of the many interactions between components of the milk which indicates the importance of the proportions of the various substances. Vitamins have varied uses in a baby, as they do in adults, and breast milk includes them, as long as the mother consumes them as part of her own diet.

Having looked at the content of breast milk, it is interesting to consider that the milk actually has a different composition at different times of the baby's life and during each feed. 'Colostrum' is the first milk produced for the newborn baby, and is made in only small amounts. It has a very

high content of anti-infective agents that protect the baby against infection, a lower level of sugar and fat (for the immature digestive system), and it encourages the first bowel movement to expel waste accumulated while in the womb. It also has a much higher protein content than later breast milk, which perhaps allows the baby to sleep longer between feeds in the first few days, benefiting the mother too! After two to three days the normal milk supply becomes established. At each feed, the first milk received by the baby is watery and low in fat, acting as a drink. Even in hot weather, a baby receives sufficient fluid through breast-feeding alone, providing the mother is not herself dehydrated. Part way through the feed the milk turns creamy and is higher in fat, supplying the 'food' of the meal.

These few simple facts show that breast milk is not as simple as might be imagined. It is in fact finely tuned to the needs of an infant, as intended by a loving Creator and Designer. Just as a baby is entirely dependent on its mother, so do we rely absolutely on our heavenly Father. But if we recognise this, He will provide all we need for our spiritual growth and development. Peter exhorts us: "as newborn babes, desire the pure milk of the word, that you may grow thereby" (1 Pet. 2:2, NKJV). We need no other source of nourishment for our spiritual welfare. Elsewhere Paul refers to "milk" (in contrast to "meat") as a figure for the spiritual food needed by those of undeveloped understanding, just like the immature digestive system of a baby (1 Cor. 3:2; Heb.

5:12,13). The milk is, however, designed for our growth and development.

### Production

Having shown how breast milk is suited to a baby's needs, we shall now look at the *supply* of milk, which is similarly designed. The production of milk is controlled by the hormone prolactin, which is released into the mother's bloodstream from the pituitary gland. Although prolactin is produced during pregnancy, its milk-producing role only properly comes into effect after the birth, when the other pregnancy hormones, such as oestrogen and progesterone, are no longer present. Thus the initial milk supply is formed in response to the body's expectation of a hungry baby. Once the baby feeds at the breast, however, the release of the hormone is controlled by the very feeding process itself. The physical process of breast-feeding causes more prolactin to be released, signalling that more milk should be produced. Breast-feeding is, then, a natural example of a 'demand and supply' process; the baby demands by feeding, the mother supplies by producing more milk. By this mechanism it is rare for a mother to produce insufficient milk.

A further interesting element of the process is the 'let-down reflex'. Only about one third of a feed is readily available to the baby in reservoirs in the breast. The rest of the milk stays in the milk-producing cells and ducts until the baby requests it by commencing feeding. The milking action of the baby causes another hormone, oxytocin, to be released into the blood, which causes the milk to be pressed out of the cells and forward through the ducts so the baby can receive it. This reflex process provides the baby with the more nutritious milk after its first drink.

The mechanism of milk production is surely an illustration of Divine design, relying as it does on many interacting elements for its success. But also, such provision of milk is a lovely picture of God's provision for us. Just as the baby requests milk from its mother and she supplies its needs, so our Father, though knowing our needs, receives our requests and provides for us. The words of the Lord Jesus are perhaps relevant here: "Ask, and it shall be given you" (Mt. 7:7).

### Can we do better?

Over the last century there has been a huge rise in developed countries of bottle-feeding in preference to breast-feeding. There are probably

many and complex reasons for this change, but there is a widespread belief that bottle-feeding is as good as, if not better than, breast-feeding. More and more research is, however, showing that breast feeding is indeed the best, as our Creator intended.

The early 'formula milk' (as bottle-feeding milk is known) was simply produced by diluting cows' milk and adding sugar. These modifications simply brought the protein and carbohydrate content in line with breast milk. Over the years scientists have discovered many more differences between cows' milk and breast milk and their impact on a baby's development. Formula milk manufacturers have modified or added substances to their milk to try to make it closer to breast milk, but studies continue to show that breast milk is the best for a baby.

Cows' milk is still, however, the basis for formula milk. Cows' milk protein is more difficult to digest, and it spends longer in the stomach, so bottle-fed babies need feeding less often than breast-fed babies. However, a baby uses only half the nutritional protein in formula milk (compared with ninety-five per cent of that in breast milk), and a baby is therefore likely to require larger amounts of formula milk. A further disadvantage of cows' milk protein is that it can be absorbed into the blood, and this early exposure to 'foreign' protein can lead to allergy later in life. The types of fats in cows' milk are also different from breast milk. Currently there is some dispute as to their exact roles, but they are known to be used for nerve, eye and brain development, and may influence later heart disease.

Cows' milk is certainly lacking in the PUFAs mentioned in the first section, which are essential for nerve development. Some formula milk manufacturers now add these to their milk because of their importance. Cows' milk also has different proportions of minerals and vitamins compared with breast milk. Not only is there a higher mineral content in formula milk, but the various elements influence the baby's use of other elements. For example, calcium absorption is affected by lactose content (which is lower in formula milk). Formula milk also contains lower amounts of some carbohydrates which contribute to a healthy bacterial balance in the gut. [Table 2](#) overleaf lists some of the differences between breast milk and formula milk, and their effects on the baby.

Given the differences between breast milk and formula milk, it might be expected that some

## Table 2

*Breast milk has the following features compared with formula milk:*

- protein includes less casein (forms curds)
- protein is more easily digested
- protein is more efficiently used (95% of the nutritional protein is used)
- more cholesterol
- more polyunsaturated fatty acids
- lower mineral content
- less iron and calcium (but it is absorbed better)
- more lactose
- more antibodies

*Breast feeding reduces the risk of:*

- illness in the baby's first year, possibly including diarrhoea, respiratory infections, middle ear infections, urine infections
- allergic diseases, for example, eczema, asthma
- digestive diseases, for example, coeliac disease (requiring removal of gluten from the diet), Crohn's disease
- dental decay
- \*diabetes, heart disease, cot death
- breast cancer (for the mother)

\* These findings may not be conclusive and await further study.

differences will result in the baby's health and development. Much research has shown the benefits of breast-feeding, and some examples are also listed in Table 2. They include fewer infections (such as those causing diarrhoea or respiratory problems), less likelihood of allergy-related disease (such as eczema and asthma), and a lower incidence of cot death. Studies have also indicated that breast-feeding lowers the mother's chance of contracting breast cancer. Some of these effects are relatively short term, affecting the baby's health in its first few months, but others will affect the child for the rest of its life.

Although the view that the baby 'won't come to any harm' is prevalent, it is not supported by the evidence. God has provided a means of feeding our infants which is best suited to their needs, and cannot simply be replaced at our convenience by the product of another animal. Some women do have insurmountable difficulties with breast-feeding, but largely the use of formula milk is a social trend that we would do well to resist. As the Lord reminded Job: "Where wast

thou when I laid the foundations of the earth? declare, if thou hast understanding" (Job 38:4).

### Conclusion

Breast-feeding has been provided by the Creator as the means by which human mothers provide for their young. The nature of the milk produced and the means of production both show the hand of a Designer. We should also remember our entire dependence on our heavenly Father for the supply of all our needs, just as a baby depends on its mother. We are able to grow and develop spiritually through the milk of God's Word.

### References

- Sheila Kitzinger, *Breastfeeding your baby*. Dorling Kindersley, London, 1989.  
 Maire Messenger Davies, *The Breastfeeding Book*. Frances Lincoln, London 1991.  
 Drs Penny and Andrew Stanway, *Breast is Best*, Pan Books, London, 1996.