ABC of Nutrition

A STEWART TRUSWELL

INFANT FEEDING

Breast or bottle?

Advantages of breast feeding

- Breast milk is microbiologically clean
- Breast feeding is natural and may confer benefits that science doesn't yet know about
- It provides anti-infective components: lymphocytes, macrophages, immunoglobulins (especially IgA), lactoferrin, lysozyme, complement, and bifidus factor
- The major differences in composition between cows' and human milk have been minimised in modern infant formulas but not all, and some nutrients are known to be better absorbed by babies from human milk, such as iron and zinc.
- For most women breast feeding is a satisfying and enjoyable experience
- Allergic reactions are less likely
- A mother can always change from breast to bottle feeding but not the other way

Infant feeding is the dominant nutritional interest in Third World countries and it gets much attention in Western countries because infants depend on others to feed them. Babies cannot eat ordinary adult food or say how they feel after the feed. Though there are still many questions, scientific knowledge is probably fuller about this age of man than any other.

For the first 4 to 6 months of life the infant should be fed either by breast feeding or on a milk based formula modified to make its composition suitable for infants—that is, more like breast milk. The decision which method to start with should be made well before delivery, and it should be made by the mother. The doctor's role is to give advice to help her make up her mind and then, whichever method she wants to use, to provide support and arrange instruction.

In Britain the choice is more even than ever before. Breast feeding is recommended by the DHSS and all authorities; the organisation of maternity wards, control of advertising, and change of social attitudes all make it easier than it used to be. On the other hand, modern technology makes bottle feeding easy and safe; the newer infant formulas are closer to breast milk in composition and may in some ways have small advantages—for example, they can be a more reliable source of vitamin K and fluoride.

How to manage breast feeding

In Third World countries breast feeding unquestionably reduces infant mortality but in affluent countries it is very difficult for epidemiologists to show a significant improvement of morbidity when other factors are taken into account. Mothers who breast feed tend to have a higher educational level and income.

"How is it that poor men's wives, who have no cold fowl or port wine on which to be coshered up, nurse their children without difficulty, whereas the wives of rich men, who eat and drink everything that is good, cannot do so?"

ANTHONY TROLLOPE 1847

Knowing how to establish breast feeding is no longer instinctive in the women of our complex industrial societies. Some take to it naturally but others will not do well without guidance and a sympathetic environment.

- The mother should be adequately nourished during pregnancy.
- She should have watched others breast feeding and talked about it.
- She needs to involve and consider her husband. There can be sexual implications in breast feeding. His support (or opposition) will be important.
- The National Childbirth Trust or La Leche League can help to provide instruction and information.
- The baby should be put to the breast as soon as possible after delivery.
- Frequent suckling stimulates prolactin secretion. Suckling more than six times a day maintains high basal prolactin as well as initiating prolactin surges with feeding.

Composition of cows' milk compared with human milk and a modified infant formula (breast milk substitute). (All per 100 ml)

	Human* (mature)	Cows' (full cream)	A modified milk formula† (powder diluted as directed)
Energy (kcal)	70	67	69
Protein (total) (g)	1.1	3.5	1.5
Casein (% protein)	40%	80%	40%
Carbohydrate (g)	7.3	5.0	7.2
Fat (total) (g)	4.0	3.7	3.6
Saturated fat (% fat)	46%	66%	44%
Linoleic (% fat)	7-11%	3%	17%
Sodium (mmol)	0.7	2.2	0.71
Calcium (mg)	35	120	49
Phosphorus (mg)	15	95	30
Iron (mg)	0.075	0.050	0.9
Vitamin C (mg)	3.8	1.5	6.9
Vitamin D (µg)	0.8	0.15	1.1

* The composition of breast milk varies considerably with stage of lactation, between individuals, and with maternal nutrition.

† Mean of Cow and Gate Premium and SMA-S26.

- After delivery the baby should be in a crib next to its mother all or most of the time and suckled every few hours even if little is produced. Colostrum is a valuable anti-infective fluid.
- Relaxation and privacy are needed.
- The baby should not be given other complementary milk—only water if necessary.
- The baby should feed from both breasts each time and start the next feed with the breast used last.

Advice may be needed for sore nipples or breasts, for oversupply or undersupply.

Nutrition for the lactating mother

Drugs and lactation

For most drugs the concentration in human milk is of the same order of magnitude as the plasma concentration or in some cases less. The infant would receive 1% or less of the daily maternal dose. But the milk/plasma ratio is 12 for propylthiouracil and 25 for iodine-131.

Other drugs are contraindicated if they are radioactive, can cause allergy, agranulocytosis or bleeding disorders or are poorly metabolised in the newborn. These include chloramphenicol, indomethacin, diazepam, reserpine, anti-cancer drugs, lithium, and some others.

Tetrahydrocannabinol is concentrated in the milk of cannabis smokers, as are opiate narcotics in the milk of those taking them.

Extra nutrients needed*

About 850 ml water
600 kcal of energy
15 g of protein
700 mg of calcium
30 mg of vitamin C
100 µg of folate
500 µg of vitamin A
10 µg of vitamin D

* Mostly from DHSS recommended daily amounts of food energy and some nutrients for groups of people in the UK (1981)

Except in malnourished communities, there is little evidence that calories, protein, fat, water, or anything else have a consistent effect on milk volume. Regular and fairly frequent suckling is the well established stimulus. Human lactation works more by pull than by push.

Some constituents in the milk are affected by the mother's intake.

(1) Fatty acid pattern, vitamin A, riboflavin, biotin, folate, vitamin B12, and vitamin C are affected, especially downwards if the mother's diet is deficient. (2) Zinc, iron, fluoride, and vitamin D may be responsive in some circumstances, but more research is needed. (3) Protein, lactose, fat content, calcium—that is, the major proximate constituents—do not appear to be affected. (4) Proteins in the mother's diet might be excreted in small amounts and an allergic reaction occasionally occurs in the baby. (5) The amount of caffeine in the milk after a cup of coffee is only about 1% of the maternal dose. Likewise, the alcohol concentration of breast milk is about the same as that of plasma. Single drinks of coffee or alcohol, well spaced out, are harmless, but the babies of alcoholics can be affected. Beer stimulates prolactin secretion (at least in non-lactating women) and so might increase lactation. Milk production is reduced in heavy smokers. (6) The fat soluble environmental contaminants, polychlorinated biphenyls, dry cleaning solvents, and organochlorine insecticides (DDT, etc), are stored in adipose tissue and excreted in the cream of breast milk (though the DDT group is fairly innocuous in man). Lactating women should not go on to weight reducing diets, which might mobilise lipid contaminants from body fat so that they appear in the milk.

The mother's need for extra nutrients

A good average production of breast milk is 850 ml/day, and the mother's extra nutritional requirements are calculated from this and the average composition of milk (see table), taking into account the efficiency of absorption.

Most of the nutrients come along with the extra calories; lactating women usually have a good appetite and if this is satisfied by a mixed diet the only nutrients that need watching are calcium, iron, folate, and vitamin D. The extra calcium can come from a pint of milk or two cartons of yoghurt. Iron supplements and a simple vitamin D preparation may be advisable. Folate

deficiency incurred during pregnancy may first show as anaemia in the puerperium.

Ending lactation

In an industrial population the incidence of breast feeding goes down with infant's age in a curve reminiscent of first order elimination kinetics. In a British national sample the major reasons for stopping in the first 6 weeks were insufficient milk (54%) and painful breasts or painful or inverted nipples (18%); the commonest reason for stopping between 6 and 16 weeks was also insufficient milk (66%). Those with insufficient milk early never got lactation well established. Those with insufficient milk later may have had normal volume production but the baby started to outgrow this.

Complementary and supplementary bottles of milk

Measured breast milk intakes of Cambridge infants. Mean and ranges against estimated requirements

Complementary bottle feeds are used to finish off a breast feed and supplementary bottle feeds to replace a breast feed. The occasional bottle feed once a day or less is convenient if the mother has to leave the baby with a friend, but regular topping up of the baby's intake with bottle milk is likely to reduce sucking and breast milk production. Some mothers produce less milk than others, however, and if the baby is not gaining and hungry on pure breast feeding with good technique extra bottle feeding may be necessary.

Bottle feeding

Some mothers choose to bottle feed from the start and others will change over from breast to bottle feeding after weeks or months, so they need practical advice.

- A cows' milk formula specially modified for infants should be used in which the protein has been reduced, the casein partly replaced by whey, the fat made more unsaturated, the lactose increased, sodium and calcium reduced, and enough of all the essential micronutrients added.
- Bottles and teats should be washed in water and detergent (the bottle brush used only for this) rinsed and sterilised by boiling in water or by standing covered in sterilising solution (usually hypochloride) in a plastic container. It saves time to prepare several bottles at once. Empty the water out of each bottle, without touching the inside, then fill to the mark with recently boiled water that has cooled some minutes, not too hot or it will destroy some vitamins and may produce clumping.
- Exactly the amount of powder in the manufacturer's instructions should be put into the (wide mouthed) bottle, using the scoop provided (levelled with a clean knife, not pressed down). "One for the pot" can lead to obesity. Mothers and even nurses are often found to prepare feeds inaccurately. Screw on the cap and shake the bottle well. Bottles may be kept in the refrigerator for up to 24 hours.
- If the hole in the teat is too small it can lead to aerophagia or underfeeding. Milk should drip from the inverted teat at about 1 drop per second. Teats need replacing every few weeks.
- Babies do not mind cold milk but usually prefer it warm. The bottle should not be warmed for too long and the milk's temperature should be checked by dropping some on the mother's skin. For about the first 8 weeks of life babies need to be fed every three to four hours, including the small hours of the morning. By the end of the first week most babies are taking 120-200 ml/kg per day (160 ml/kg corresponds to the old 2½ fluid ounces per lb bodyweight).

Weaning

Babies cannot cope with solid food in the first few months because:

- The extrusion reflex prevents spoon feeding
- They cannot swallow solids
- Pancreatic amylase is not adequately produced
- There is an increased likelihood of absorption of intact foreign (food) proteins
- Supplements may decrease iron absorption from breast milk and its anti-infection properties.

- Cereals or rusks should not be added to milk in the bottle and babies should not be left to sleep with a bottle in their mouth.
- Vitamin drops, fruit juices, are not required as supplements to modern infant formulas.
- Uncles, grannies, and baby sitters can give a bottle feed but parents should feed their infant themselves as much as possible with the same sort of closeness, cuddling, and communication as in breast feeding.

Young infants cannot deal properly with solid foods for the first 3 or 4 months. The natural time for starting solids (beikost) is when the energy provided by well established breast feeding starts to become insufficient. The DHSS and other authorities advise that the introduction of any food to the baby, other than milk, should be unnecessary before the age of 4-6 months, but mothers may be tempted to jump the gun. There is a considerable individual range in the time when a baby is ready to and needs to start solids, from about 3 months to 8.

Weight in the lower half of the standard percentiles without other symptoms is not an indication to augment breast feeding. Breast fed babies tend to put on weight (and length) a little more slowly than bottle fed babies, may not be ideal. The time to start thinking about adding solids is when the infant still seems hungry after a good milk feed. But by 6 months stores of several nutrients, such as iron, zinc, and vitamin C, are often falling in exclusively milk fed infants, whether from breast or bottle.

When solids are introduced single ingredient foods should be used and started one at a time at weekly intervals so that there is time to recognise allergy or other intolerance to each food. A little of the food on the tip of a teaspoon is enough at first, given after a milk feed when the baby is wide awake.

Infant cereals (usually enriched with iron) are traditional foods to start with; rice is better before wheat. They can be thinned with baby's milk (mother's or formula) or water. Thereafter different soft foods can be added: mashed potato; soft porridges; pureed fruit and vegetables, meat, or chicken. Foods should be semisolid—sieved or blended or commercial baby food. It is nutritionally sensible to give a balance of foods from the four major food groups: cereals, vegetables/fruit, dairy products, and meats/fish. Combination foods should not be given until tolerance for their individual components is established. Egg should not be started before 6 months because of the chance of allergic reactions and then it is best to begin with a small amount of cooked yolk. Spinach, turnip, and beets can contain enough nitrate to cause methaemoglobinaemia in young infants. Coffee and tea should not be given. Babies should not be left alone while they are eating.

In the second six months other liquids can be given from a cup, especially citrus fruit juices. Untreated cows' milk can sometimes cause gastrointestinal bleeding from irritation by the bovine serum albumin. This does not happen with boiled milk or infant formulas (which have been heat treated). It is wrong to add any salt or more than a little sugar to the foods given to infants. There has been a quiet revolution in commercial baby foods; most contain no added salt or colours and only up to 4% sugar (with sour fruits). Infants' sodium intakes have been found to shoot up after 6 months but from home prepared not commercial baby foods.

In the second 6 months

An increasing range of foods are given in the second 6 months. Variety is likely to cover the needs for most nutrients and provide a basis for

A suggested time table for introduction of solid foods:-

1- 4 months	Breast milk only
4- 6 months	Cereal (s)
6- 7 months	Vegetables (pureed)
8-9 months	Start finger foods (rusk, banana) and chopped (junior) foods
9 months	Meats, citrus juice (from a cup)
10 months	Egg yolk (cooked); bite-sized cooked foods
12 months	Whole egg; most table foods

healthy food habits. Some fruits or vegetables should be given each day, but the most critical nutrients at this stage are protein and iron: finely minced beef and legumes should be given regularly and the protein in cereal foods should not usually be diluted by refining or by added fat or sugar. Foods should become progressively more chewy and fibrous and include rusks and other finger foods like bread or cheese. Babies do not usually like strongly flavoured foods like pickled onions. Nuts, pop-corn, raw peas, and similar small hard foods should be avoided; they can be breathed in accidentally. Commercial baby food manufacturers offer a succession of "strained," "junior," and "toddler" foods for maturing babies, and similar meals are usually made at home. Some cookbooks for babies are more sensible than others.

Milk continues to be the main source of calories but a diminishing one. Sweetened fruit juices should be given by cup not bottle because the latter can promote dental caries. Infantile obesity is probably becoming less common in the UK now people are aware of it. It is not usually caused by bottle feeding or early introduction of solids per se but by more concentrated feeds, by pushing food at mealtimes, or by snacks in between. Between feeds, water for thirst and a minimum of snacks or sweets are good general rules.

Two other nutrients are not adequately supplied in all mixed diets. In communities where rickets occurs—for example, among Asian babies in northern cities—a supplement of vitamin D 10 µg (400 IU) daily is good insurance. In areas where the drinking water is not fluoridated, sodium fluoride prophylactic tablets or drops (1 mg/day) should be considered.

In the 2nd or 3rd year of life the "toddler won't eat" syndrome is common and needs firm but low tension management. Appetite often falls off somewhere between 10 and 36 months. The child should not sit at the table endlessly facing his plate or chewing if he does not want to eat. If he will not eat meals there should be no snacks. He does not have to eat all possible vegetables or meat every day. The doctor can help anxious mothers at this stage by reassurance and by advising how to cover nutritional needs.

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WORDS TROCAR and CANNULA are a closely associated pair. "Trocar and cannula" are uttered almost as one word. A trocar is a perforator whose function is to facilitate the insertion of a cannula. It lies snugly in the cannula's lumen, the sharp end projecting beyond the cannula's rim. In transverse section the sharp end is an equilateral triangle whose angles form the cutting edges and whose sides form the flats. "Trocar" derives from the French *trois carres*, meaning three sides, and by implication, three edges. *Carre* is the breadth of a square, but may be extended to the sides of other polygons and the angles between them, for example, *lame à trois carres*, three edged sword. The English adjective "square" and the French "carré" have a common origin in the Latin "ex quadra."

A cannula is a rigid tube for insertion into a body cavity or vessel. The word is derived from *L. canna*, reed. The reeds are members of the grass family (*Gramineae*), and as such have stems which are hollow between the nodes. This was common knowledge even to botanical ignoramuses in the days when drinking straws were made of straw. Just as "cannon" (the sort that fires projectiles) is etymologically the augmentative of *canna*, so "cannula" is its diminutive. It is the rigidity and hollowness of the reed that justifies the term cannula as a little reed. Somewhere between the grasses in size and the bamboos (all *Gramineae* they) lie the canes, the nearest word we have in the vernacular to *canna*, whence we have (a) cane sugar (sucrose), which is bad for the teeth and also, we are assured, the coronary arteries; and (b) the cane, used as a light stick, and carried as a social gesture or wielded punitively on schoolboy rumps.—B J FREEDMAN.

Two men, one aged 63 and the other 47, complained of erectile impotency. The older one's serum testosterone concentration was 20 with a serum prolactin concentration of 216. The younger one's was 17 and 129, respectively. Neither man is hypertensive or diabetic (nor were they taking any medication). Counselling was unsuccessful but both regained their normal sexual function with injections of testosterone propionate (Sustanon 250) 1 ml every four weeks. When the testosterone was stopped they relapsed. Should the testosterone treatment be continued indefinitely? Neither of them has any symptoms or signs of carcinoma of the prostate.

In both patients the plasma testosterone concentration is well within the normal range and there is therefore no demonstrable androgen deficiency or hypogonadism. The prolactin concentrations are also normal, thereby excluding impotence due to hyperprolactinaemia related to a pituitary tumour. There is no reason other than a placebo effect why the administration of testosterone should favourably influence lack of potency in either patient in question. Psychosexual counselling is unlikely to succeed unless both marital partners are actively and willingly involved. Having started treatment with monthly injections of Sustanon 250 and shown that the treatment is effective, the doctor is naturally under some pressure to continue with treatment. If treatment is prolonged production of endogenous testosterone by the testicular Leydig cells will fall due to lack of stimulation by pituitary luteinising hormone, and this may not be readily recovered.—J C GINGELL, consultant urologist and lecturer in urology, Bristol.