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FACT SHEET

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Feeding the Infant

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The health of a baby at birth is directly related to the nutritional well-being of the mother. She has nourished the fetus through the blood stream for 9 months. If the mother's diet is inadequate for her and the growing fetus, her tissues may be robbed of their nutritive elements. This may be dangerous for the mother and baby. For this reason, the pregnant woman must be sure her diet is adequate for herself and the growing fetus.

An infant grows and develops more rapidly during the first year than any other year of his life. He more than triples his birth weight and adds 9 to 10 inches to his birth length.

Food is important in the infant's development. Newborn, full-term infants are able to digest protein, emulsified fats (dissolved fats as in milk), and simple carbohydrates (sugars). However, the digestive system of a young infant is unable to digest starches and solid fats because enzyme production systems in the digestive tract have not been developed fully.

The infant's body contains a high proportion of water. The bones are not ossified (hardened); the skeleton contains mostly cartilage and is very soft. Subcutaneous fat is limited; muscles are poorly developed. However, all necessary feeding reflexes are present, though not in a well-developed form. Hunger is exhibited by crying. The baby's sucking and swallowing reflexes are present. A rooting or food searching movement is expressed when an infant turns his head toward the side when stroked on the cheek. Finally, infants display the satiety reflex, a mechanism by which the baby knows he has had enough to eat. This reflex varies widely in babies. Some simply resist further feeding, others will vomit what they cannot handle.

THE QUESTION—WHICH MILK?

The problem of feeding newborn infants is not what, but which type of milk to feed. Milk, especially human milk, is the most suitable food for infants. Cereals, strained fruits and vegetables, and meats are added to the diet within a few months after birth.

Many parents express concern over whether to feed cow's milk or human milk. Table 1 compares the nutritive value of these milks. It shows that cow and human milk are similar in fat content. Fat is essential in the infant's diet as a source of energy, for maintaining healthy skin and as a carrier of two important vitamins, A and D.

The protein content of these two types of milk is considerably different. Cow's milk contains more protein than human milk. At first glance this might imply that cow's milk is better for infants than human milk. However, this may not be the case. Protein in cow's milk is difficult for the infant to digest. When milk protein is digested, it is changed into a curd in the stomach. Enzymes act upon the curd so it can be absorbed in the body. Curd formed from cow's milk is harder than that formed from human milk. It appears, too, that the infant's enzyme system is not as effective as a young calf's in digesting the cow's milk curd. Thus, cow's milk used in a formula is diluted with water to make the protein more digestible.

Protein is important in the infant's diet. The proper growth and development of the child depends upon a generous supply of protein foods.

Unlike protein and fat, the function of carbohydrates is primarily as a source of energy for the infant's activities. Table 1 shows that cow's milk contains approximately half the carbohydrates found in human milk. The carbohydrate in both milks is a simple sugar-lactose. Sugar generally is added to an infant's formula made with cow's milk to make the carbohydrate content comparable to human milk.

The mineral content of cow's milk is slightly higher than that of human milk. However, there is no significant difference in the growth of children fed cow's or human milk during the first year.

Calcium and phosphorus are the most important minerals for development of the infant, particularly for the growth of strong bones and teeth.

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Iron is the mineral lacking in milk of any kind. Iron stores are found in infants born from well-nourished mothers. This supply is adequate to last approximately 3 months. At this time iron-rich foods such as egg yolk and meat are added to the diet.

Both human and cow's milk contain moderate amounts of vitamin A and the three B-vitamins. Vitamin A helps maintain healthy skin and develop good eyesight. The B-vitamins maintain a good digestive system and help the body use energy from food.

The ascorbic acid (vitamin C) content of cow's milk is inadequate for the infant. The vitamin C content of human milk depends upon the mother's diet during lactation. The infant requires adequate supplies of vitamin C for the formation of various tissues. For this reason, orange juice is added to the infant's diet after about 2 weeks.

Human milk does not contain vitamin D. Cow's milk may or may not have vitamin D added. Vitamin D helps the body absorb and use calcium and phosphorus in building bones and teeth. Vitamin D supplements are given to some infants.

In summary, milk is the most suitable food for a newborn infant. However, all the nutrients required for proper development are not present in milk. After adjustments are made in the formula, cow's milk is nutritionally comparable to human milk.

BREAST OR BOTTLE FEEDING—A DECISION

One decision a mother must make is whether to breast or bottle feed a baby. The nutritional value being comparable, she must base her decision on other considerations.

Many physicians consider breast feeding to be the safest and most desirable method of nourishing the baby. Since milk of each species is adapted for its young, it follows that human milk is best adapted for a baby. When a baby is breast fed, the nutritional value of his diet is directly related to that of his mother during pregnancy and lactation. Even though the mother's diet is adequate, human milk does not supply adequate

amounts of iron, vitamin D and, occasionally, vitamin C. They physician may recommend supplementing the diet with these.

Breast feeding is relatively simple. In comparison to bottle feeding, breast feeding does not require washing or sterilizing bottles, or routine preparation of formulas. Also, there is no problem of refrigerating the formula or warming the formula before feeding.

Another consideration is safety. Human milk is as fresh as possible when fed from the breast. There is no danger of spoilage or contamination in human milk. If refrigeration facilities are limited, there may be an advantage of breast feeding. When traveling, canned formulas may be prepared safely without refrigeration. However, these may have practical economic limitations because of higher cost.

Probably the greatest factor in choosing breast or bottle feeding is an emotional one. There is a feeling of intimacy when the mother nurses her baby. This makes the baby feel secure and loved. The infant responds to this warm relationship which extends to all aspects of his physical, mental and social growth, bringing psychological advantages to the mother and child.

This same feeling of intimacy can exist when a mother holds the baby and bottle feeds. This is an opportunity for the mother to relax and be with her baby during the day. Other family members can share in this experience, too.

Breast or bottle feeding, however, does not insure that this closeness will exist between mother and child. In either instance, the mother must be adjusted emotionally and psychologically to the method she chooses.

Breast feeding is more economical, as far as equipment and formula ingredients are concerned. However, the nutritional needs of the mother during lactation are significantly greater than normal. Consequently, more money must be spent for her food.

There are several situations in which bottle feeding has a distinct advantage over breast feeding. The mother should not breast feed if she is not in good health.

If the baby is premature and requires special nutritional supplements, bottle feeding may be preferred. Through bottle feeding the baby may receive an adequate diet if he happens to be allergic to human or cow's milk.

Bottle feeding may be more desirable if the mother must return to work shortly after the baby is born.

One major reason for bottle feeding is related to social taboos against breast feeding. Many mothers feel that though breast feeding may be the best method, it is not the socially accepted method for feeding their babies. Breast feeding and social acceptance appear to be related to social class. Among the lower income classes, there is a trend away from breast feeding. Bottle feeding is a sign of prestige. On the contrary, the trend in upper income classes appears to be toward breast feeding.

Table 1. The Nutritive Value of Cow and Human Milk*

	Cow's Milk (whole, 3.7% fat)	Human Milk
Water	87.4 %	85.2 %
Calories	65 cal.	77 cal.
Protein	3.5 g.	1.1 g.
Fat	3.5 g.	4.0 g.
Carbohydrates	4.9 g.	9.5 g.
Calcium	118 mg.	33 mg.
Phosphorus	93 mg.	14 mg.
Iron	Trace	.1 mg.
Sodium	50 mg.	16 mg.
Potassium	144 mg.	51 mg.
Vitamin A value	140 I.U.	240 I.U.
Thiamine (vitamin B ₁)	.03 mg.	.01 mg.
Riboflavin (vitamin B ₂)	.17 mg.	.04 mg.
Niacin	.1 mg.	.2 mg.
Ascorbic Acid	1 mg.	5 mg.

*Composition of Foods, Agricultural Handbook No. 8, United States Department of Agriculture.

The mother and other persons who will care for the child should make the final choice. Eventually, all infants during the first year will be bottle fed, because most mothers do not breast feed beyond 3 months.

BOTTLE FEEDING

Various formulas are available for bottle feeding. There are commercially prepared formulas (dried, concentrated fluid or ready-to-feed) and the home-prepared formula. Make this choice under the guidance of a pediatrician.

All formulas consist of three ingredients—milk, sugar and water. Several types of milk are used in formulas. The most common ones include:

Evaporated Milk contains approximately half the water content of whole milk and is canned. Generally, evaporated milk is more economical than whole fluid milk; unopened, it can be stored indefinitely without refrigeration. The milk has been sterilized during canning. However, this does not eliminate sterilization procedures in preparing formulas. Fat in this milk has been broken up into small particles, and protein has been modified during evaporation. This results in an easily digestible milk.

Dried Milk is available in two forms—whole or skim. Dried whole milk is canned, and must be refrigerated after opening and after reconstitution. Dried skim milk has had all of the fat removed and does not require refrigeration until after reconstitution. Dried skim milk generally is not used in formulas.

Dried milks are reconstituted with water to make fluid milk, making them less expensive than other types of milk.

Whole Fluid Milk—Whole fluid milk may be pasteurized or pasteurized-homogenized. Pasteurization is accomplished by heating milk to a high temperature to kill harmful bacteria. Homogenization occurs when pasteurized milk is further treated to break up fat into smaller particles, making it easier to digest. Whole fluid milk is more expensive than dried or evaporated milk.

There are other types of milk available for babies on special diets or with certain physical conditions such as diarrhea. These include 2 percent milk, lactic-acid milk and skimmed milk. Use these only under the direction of a pediatrician.

Whether you choose evaporated, dried or whole fluid milk, it must be modified further to make it more digestible and more like human milk. Water is added to dilute milk and make the protein more digestible. Sugar is added for energy and to make it more nearly like human milk.

Types of sugar commonly used in formulas include:

Granulated Sugar—This is common table sugar—cane sugar. It is inexpensive and easy to use

Corn Syrup—Corn syrup is a mixture of sugar and dextrans. Dextrans are a combination of several simple sugars. Corn syrup is inexpensive, easy to use and interchangeable with granulated sugar.

Dextrimaltose—Dextrimaltose is much like corn syrup, except that it is powdered. Dextrimaltose has half the energy value of granulated sugar; therefore, larger amounts are used in preparing the formula. Dextrimaltose is a less sweet substitute than other sugars. This sugar is more expensive.

Lactose—This sugar is identical to that found in human and cow's milk. It is the most expensive sugar, with no nutritional advantage. However, lactose is satisfactory to use in formulas.

There are two recommended methods of preparing a formula. The one you choose depends upon the equipment you have, the recommendations of your doctor, and the method you find most convenient. *Terminal sterilization* is a method in which the formula is put into bottles and sterilized at the end of preparation. This is considered to be the simplest and safest method. The *aseptic method* is one in which the formula and bottles are sterilized separately and then carefully combined.

Whichever method you choose, sterilization is important to kill bacteria that may be present in milk. After cooling, refrigerate the formula until use.

WHEN TO FEED

Modern feeding schedules are not as rigid as they were in previous years. Today, most doctors suggest self-demand feedings. A self-demand feeding means that the schedule is flexible, but with some regularity. Generally, on the self-demand schedule the baby is fed every 3 or 4 hours. However, at first the baby may require smaller, more frequent feedings. This permits the child to form his individual feeding pattern.

When handled properly, the self-demand schedule makes for a happy and well-nourished baby. A pleasant association between hunger, food and people will be formed. Hunger is a basic need for all persons. If the signs of hunger are ignored and the baby is required to wait until a scheduled hour, he may feel his parents fail him because they do not satisfy a basic need. Thus a barrier between the child and parent is formed. Studies show that early experiences with feeding have psychological influences on children in later life.

WHAT ELSE BESIDES MILK?

Milk remains one of the major foods in the baby's diet during the first year. However, milk lacks several important vitamins and minerals; therefore, the baby may require a vitamin supplement. This supplement may be particularly important when the infant is not consuming a quart of milk a day. Vitamins A and D, the B-vitamins and ascorbic acid should be included in the supplement. As the baby begins drinking a quart of milk a day and as solid foods are added to the diet, this vitamin supplement becomes less necessary.

Regardless of the amount of milk consumed by the baby, ascorbic acid must be supplemented. For this reason, orange juice is added to the baby's diet after about 2 weeks. The ascorbic acid in 4 ounces of orange juice is sufficient to meet the growing needs of infants.

Breast-fed babies will always require vitamin D supplement. Cow's milk is usually fortified with vitamin D. A vitamin D supplement is not necessary for babies consuming a quart of fortified cow's milk. Since vitamin D is a fat-soluble vitamin, excess amounts are stored in the body. Very large amounts of vitamin D may be harmful to the child.

When solid foods should be added to a baby's diet differs among pediatricians. This varies from a few days after birth to 4 months. The child is able to digest and utilize solid foods even during the first few days. The current trend, however, is to introduce solid infant foods between the first 6 to 8 weeks.

Generally, solid foods are given first at the night feeding. Solid foods are more filling, and they enable the baby to sleep through the night without a feeding. Add solid foods gradually. This applies to adding new foods to a child's diet at any time.

Precooked cereal is the first solid food added to infant's diets. Cereals are enriched with B-vitamins and iron—essential nutrients that are low or lacking in milk.

When solid foods are introduced to a baby for the first time, he may have some difficulty in moving food to the back of his mouth and swallowing it. For this reason the cereal should be fairly fluid, diluted with milk or water. Soon the baby will learn how to manipulate and swallow solid food. The addition of cereals should be gradual and in small amounts. For example, the mother may begin by feeding only one-fourth to one-half teaspoon of cereal.

Pureed fruits and vegetables are added to the diet next, generally between the ages of 1 and 4 months. It is important to feed only a small amount of fruit or vegetable and to add them to the diet gradually. Serve a variety of fruits and vegetables to introduce the baby to new flavors and textures. If he refuses to eat some fruit or vegetable, then substitute. Mothers sometimes taste the foods they are feeding the baby. Baby foods do not contain as much seasoning as many adults prefer. The mother should not refuse to feed a food because she does not like the bland taste. Since foods habits are formed early in life, the mother must convey pleasant and happy experiences with food.

Meats and egg yolks are added to the diet after fruits and vegetables have been well-established. Meats and egg yolks are a good source of iron, a mineral that becomes increasingly necessary in the diet after 3 months. Meats are usually strained or pureed. Egg whites are withheld from the diet for the first year because infants are often allergic to them.

Crackers and toast are given to babies to train them to chew their food. These are finger foods and are easy for the baby to manage when he begins to want to feed

himself. Many times the mother uses toast and crackers as pacifiers between meals. Too many snacks may dull the baby's appetite. Other starchy foods such as potatoes and macaroni are filling foods and may be fed in small amounts.

By the time a baby is 3 months, he should be eating a wide variety of foods—foods from each of the four food groups. They are milk, meat, bread and cereal, and fruit and vegetable. A baby needs the same foods as adults, but in smaller quantities. The amount and variety of foods will increase throughout the year. Foods usually found in a good daily diet for a 1-year old include:

Milk	3 to 4 cups
Egg	1 whole
Meat, poultry, fish	2 tablespoons
Potatoes	2 tablespoons
Vegetable (green leafy or deep yellow)	2 tablespoons
Fruit for vitamin C	1 medium orange or 1/2 to 3/4 cup tomato juice
Other fruit	1/4 cup
Cereal	1/4 cup
Bread	1/2 to 1 slice
Butter/Margarine	1 teaspoon
Vitamin D supplements	

These foods may be grouped into a daily meal plan such as:

Breakfast	cereal egg toast milk
Lunch	potato meat fruit milk
Dinner	cereal fruit milk
Snacks	orange juice crackers or toast

PROBLEMS ANYONE?

Food habits are learned early in life and are difficult to break whether good or bad.

Feeding problems may arise early in life and may be because of a lack of parental understanding. For example, a parent may not realize how quickly a baby can sense his parents' attitudes toward a particular food. A child does not have preconceived ideas about food; therefore, all foods may be introduced in a positive and pleasant manner.

A baby's appetite may vary from meal to meal, or from day to day. This is a natural pattern for all children and should not cause parental concern. The baby is a good judge of the amount of food he needs. As long as he gains weight gradually and appears healthy, parents can be assured their baby is eating enough.