



## Summary

Milk is the liquid food secreted by the mammary gland for the nourishment of newly born, containing water, fat, protein, lactose and minerals. Milk contains on average of 87 percent water, 3.9 percent fat, 4.9 percent lactose, 3.5 percent protein and 0.7 percent minerals, vitamins, and other minor constituents. Milk may be defined as the lacteal secretion practically free from colostrum obtained by the complete milking of one or more healthy milch animals. The quantities of the various main constituents of milk can vary considerably between cows of different breeds and between individual cows of the same breed. Besides total solids, the term solids-non-fat (SNF) is used in discussing the composition of milk. SNF is the total solids content less the fat content. The mean SNF content of milk is  $13.0 - 3.9 = 9.1\%$ . The pH of normal milk generally lies between 6.5 and 6.7, with 6.6 as the most common value. This value applies at temperature of measurement near 25°C. Milk and cream are examples of *fat-in-water* (or oil-in-water) emulsions. The milk fat exists as small globules or droplets dispersed in the milk serum. Their diameters range from 0.1 to 20  $\mu\text{m}$  ( $1 \text{ mm} = 0.001 \text{ m}$ ). The average size is 3 – 4  $\mu\text{m}$  and there are some 15 billion globules per ml. The emulsion is stabilised by a very thin membrane only 5 – 10 nm thick ( $1 \text{ nm} = 10^{-9} \text{ m}$ ) which surrounds the globules and has a complicated composition. Milk fat consists of triglycerides (the dominating components), di- and



monoglycerides, fatty acids, sterols, carotenoids (the yellow colour of the fat), vitamins (A, D, E, and K), and all the others, trace elements, are minor components. The membrane consists of phospholipids, lipoproteins, cerebrosides, proteins, nucleic acids, enzymes, trace elements (metals) and bound water. Milk contains hundreds of types of protein, most of them in very small amounts. The proteins can be classified in two groups i.e., caseins (80%) and whey proteins (20%). The three subgroups of caseins are  $\alpha$ -casein,  $\kappa$ -casein and  $\beta$ -casein, are all heterogeneous and consist of 2 – 8 genetic variants. Whey protein is a term often used as a synonym for milk-serum proteins, but it should be reserved for the proteins in whey from the cheese making process. In addition to milk-serum proteins, whey protein also contains fragments of casein molecules. Some of the milk-serum proteins are also present in lower concentrations than in the original milk. Lactose is a sugar found only in milk; it belongs to the group of organic chemical compounds called carbohydrates. Vitamins are organic substances which occur in very small concentrations in both plants and animals. They are essential to normal life processes. Milk contains many vitamins. Among the best known are A, B<sub>1</sub>, B<sub>2</sub>, C and D. Vitamins A and D are soluble in fat, or fat solvents, while the others are soluble in water. Milk contains a number of minerals. The total concentration is less than 1%. Mineral salts occur in solution in milk serum or in casein compounds. The most important salts are those of calcium, sodium, potassium and magnesium. They occur as phosphates, chlorides, citrates and caseinates. Potassium and calcium salts are the most abundant in normal milk. The amounts of salts present are not constant. Towards the end of lactation,



and even more so in the case of udder disease, the sodium chloride content increases and gives the milk a salty taste, while the amounts of other salts are correspondingly reduced.

Milk is one of the most nutritionally complete foods. It is naturally a good provider of a whole range of nutrients essential to growth, development and maintenance of the human body and contains no artificial preservatives or colourings. Relatively small quantities of milk can provide a significant proportion of daily nutrient requirements for all age groups making it nutrient rich relative to its energy content. In addition to its contribution to nutrient intake, increased milk consumption has also been linked to reducing the risk of numerous health problems such as osteoporosis, cancer, cardiovascular disease, type 2 diabetes and obesity to name but a few. Milk therefore makes a significant contribution to the human diet through provision of the macro-nutrients, vitamins and minerals.