



Milk hygiene	Part 1	5 th stage	2024
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Lecture 1 :: Milk and Chemical composition of raw Milk

Introduction

Milk is the first natural food of all young mammals during the period immediately after birth. The public health experts have defined milk as to be “the lacteal secretion of the mammary glands of a mammal, practically free from cholesterol, obtained by the complete milking of one or more healthy cows which contains not less than 8.25% milk solids-not-fat, and less than 3.25% milk fat”.

The public health reasons for the terms included in this definition are as follows: The food value of milk depends upon its milk fat and milk solids-not-fat content. If either of these contents is reduced to below the range for normal market milk, the proteins, carbohydrates, minerals and certain vitamins are also reduced. Practical experience shows that 3.25% of milk fat and 8.25% of solids-not-fat are a reasonable minimum for mixed herd milk. Cholesterol tends to produce intestinal disturbances in children. For this reason, milk obtained within 15 days before and 5 days after calving, the period during which cholesterol is produced, should be excluded.

Chemical composition of Milk

Milk is a complete food. It is the most nearly perfect food. It is not ‘the’ perfect food because it is not an entirely dependable source of all vitamins (vitamins C and D) nor does it contain sufficient iron. Why milk deserves this reputation is that it is the one food specifically prepared by nature for the young of mammals. The composition of milk is extremely complex, consisting chiefly of water, protein in colloidal suspension, lactose and fats in emulsion, inorganic salts in solution, vitamins, enzymes, gases and other substances.



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Percentage composition of milk of different food animals.

Source of Milk Species	Water	Fat	Lactose	protein	Minerals
Human	87.58	3.74	6.37	2.1	0.30
Cow	87.35	3.75	4.75	3.40	0.75
Sheep	80.35	6.97	4.96	6.72	0.90
Goat	81.04	4.63	4.22	4.35	0.76
Camel	87.10	2.91	5.39	3.90	0.70
Donkey	90.12	1.37	6.25	1.78	0.48

Water

This is the principal constituent of milk and is the medium in which all constituents are in solution or in suspension. In some countries, such

as Ethiopia, where the production and distribution of milk is not properly controlled, the adulteration of milk by the addition of water is commonly practiced.

Protein

Proteins are built up of amino acids in various combinations. The three principal proteins found in milk in colloidal suspension are casein, lacto albumin and lacto globulin. A complete protein contains all the essential amino acids and, therefore, has a high nutritive value especially suited to the growth requirements of children.

Casein is a complete protein, insoluble in water and is found only in milk. It exists in milk in combination with calcium phosphate and this combination causes precipitation. The acids in milk take the calcium from calcium phosphate and thus throw the insoluble casein out of the solution as curd. In the normal curdling or souring of milk the casein is precipitated by lactic acid produced through the action of bacteria upon lactose.

Lactose (Milk Sugar)



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Lactose is composed of the simple sugar glucose and galactose. Lactose, like glucose, is a reducing sugar. Lactic acid bacteria present in milk readily germinates it. These bacteria produce an enzyme known as lactase which splits the lactose and ferments it into lactic acid and other products. This causes the milk to sour. Lactose by nature gives milk a sweet flavor and furnishes the body with heat and energy

Fats (Lipids)

The milk fat is suspended in the milk in the form of an oil-in-water emulsion. Fats are a dispersion of fine particles or globules of milk in water. The milk fat, known as cream, occurs in the form of globules or droplets and is lighter than water and tends to rise to the surface of the milk if not homogenized. Since the fat globules are lighter than the milk whey, they tend to rise up to the top part of the milk and can be dispersed by the help of the homogenization process. The agitation of milk under certain conditions, such as churning, causes the fat

globules to gradually coagulate into larger drops and lumps to form butter . Chemically milk fat is composed of about 25 different fatty acids combined with glycerol forming a mixture of different neutral fats, such as olein, palanitin and stearin. When the fat is hydrolyzed the free fatty acids are liberated and as a result the fat becomes rancid. Milk fat furnishes the body with heat and energy. It is rich in vitamin A and D. It also contains carotene (pro vitamin A) which gives a golden (reddish yellow) color to the milk.

The percentage of fat in milk has long been one of the standards by which milk is tested. Fat is the most variable in the constituents of milk. The amount varies with different animals and even in the same animal from time to time. A high fat standard encourages the breeding of better cows. The richness of fat in milk is more of an economic than a sanitary question.

Good Luck