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Lecture No.: 4
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Date: 2025
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Lecture title: Milk sugar, lactose
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Summary:

3. Milk sugar, lactose

The two components of lactose – glucose and galactose – play an important biological role in the body as the major source of energy supply and for brain development. Bovine milk contains about 4.6–4.8% lactose, which is lower than that found in human milk of about 7%. Lactose and its derivatives provide about 50% of the energy requirements of the infant. It is of great interest to discover that human milk contains higher amounts of lactose and its derivatives compared to other mammals such as cows and goat.

The important of the lactose derivatives are:

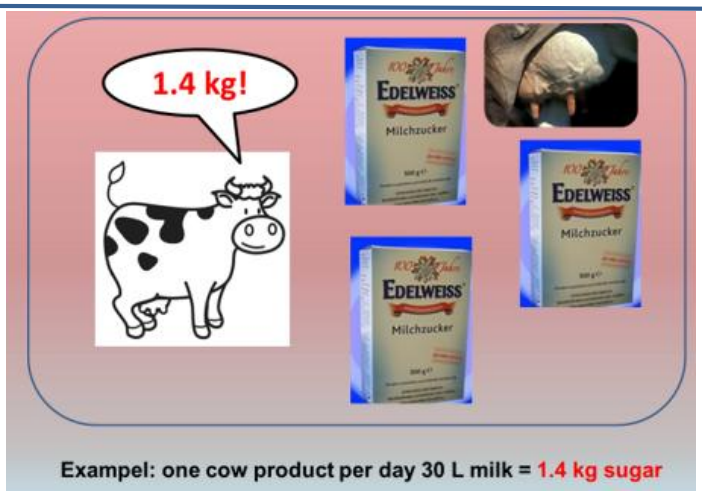
1. The lactose is less sweet than sucrose so allow the baby to take large amount of milk without causing nausea.

2. The lactose is non fermentable carbohydrate so it doesn't produce CO2 in GIT and the baby doesn't suffer from abdominal colic or distention.

3. The lactose help growth of lactic acid producing bacteria so help in absorption of Ca, P, Fe, and Cu which prefer acidic medium for their absorption.

4. The lactose derivative have physiological functions expressed mainly in the intestinal tract; they could act as prebiotics for the growth of the beneficial microflora in the gut such as Bifidobacterium bifidum which are naturally present in the gut of breast-fed babies, hence improving their general health.

5. The Lactose derivatives have also been considered to improve health through the modulation of the defence system against pathogens, and could act as receptor analogues and prevent pathogenic micro-organism attachment to the epithelial membrane of the colon.



Lactose as milk components

Lactose is the major carbohydrate of milk, found in the milk of most all mammals separated from milk in industrial practice, from whey, by letting it crystallize. Crystalline lactose is produced in large amounts, and it is mainly used in foods and in pharmaceuticals.

Lactose is hydrolyzed by the enzyme lactase. Naturally, the suckling young needs this enzyme, but after weaning, the amount of enzyme produced decreases to an insignificant level. This is not so for all humans. The estimates vary, but in at least 60% of people over 4 years old the enzyme activity is greatly reduced to 5-10%, and they thus poorly metabolize lactose; these people are called lactose mal-absorbers.

One of the problems associated with milk consumption, experienced by small sector of the population, is **lactose intolerance**. One of the problems associated with milk consumption, experienced by small sector of the population, is lactose intolerance.

4. MILK ENZYMES

Milk is a store of many of enzymes. Over 60 indigenous enzymes have been reported in cow's milk. Milk enzymes associated with milk Fat globule membrane (FGM), (xanthine oxidase, sulfhydryl oxidase, and glutamyltransferase), or with skim milk fraction (catalase, superoxide dismutase), or with micelles of casein (plasmin and lipoprotein lipase).

Other enzymes present are lactate dehydrogenase, malate dehydrogenase, lactoperoxidase, galactosyl transferase, alkaline phosphatase, phosphoprotein

phosphatase, ribonuclease, lysozyme, fructose biphosphate aldolase, and glucose phosphate isomerase. Many enzymes in milk are original enzymes coming from the cow's udder.

Nutritional Aspects of Milk

1. Milk fat is well digestible, primarily provides energy, about 37 Kj/g, proteins providing about 17 Kj/g and sugars (16 kJ/g).

2. The milk fat solvent for some vitamins (A, D, and E).

3. The milk fat providing the nutrients linoleic and linolenic acid, called essential fatty acids (EFA). These are needed as precursors for some hormones and other essential metabolites.

4. Milk fat is considered to be hypercholesterolemic, i.e., causing an increased blood cholesterol level, due to its high content of saturated and low content of polyunsaturated fatty acids.

5. Milk fat intake has been incriminated as increasing the incidence of (fatal) coronary heart disease (CHD). Milk fat is indeed slightly hypercholesterolemic, at least in some individuals, but whole milk is not.

6. On one hand, a high fat intake has been incriminated as enhancing the occurrence of certain types of **cancer.** The effect is very slight, however.

7. On the other hand, some scientists suppose that the presence of certain **conjugated linoleic acids (CLAs)** in milk fat may protect against cancer; however, the significance of this effect has not been established. CLAs originate from the rumen fermentation, but the concentration of the precursors in the feed is highly variable.