

FST-307 Milk Handling and Processing 3(2-1)

Milk:

Milk is defined as “Fresh, clean, lacteal secretion of one or more healthy milch (milking animals) animals excluding that obtain 15 days before & 5 days after calving (giving birth to new generation) & that milk should contain the prescribed standards of Fat & SNF (solid not fat)”.

Milk is a complete diet except iron & vitamin C. Vitamin C is present at the time of milking but it is lost due to minor heating.

In milk protein normally casein protein is about 80% while whey protein is about 20%. But in human milk whey is more than casein, & generally protein is less than other species.

Composition of Milk:

Species	Fat %	Lactose %	Protein %	Casein %	Whey %	Minerals %
Cow	3-4.5	4.8-5.0	3.3-3.7	2.7-2.8	0.8-1.0	0.7
Buffalo	3.5-7.0	5.0	3.5-4.0	2.8-3.2	0.9-1.2	0.8
Human	4.0-5.0	7.0	1.0	0.5	0.5	0.2

Milk Production:

- ✦ Pakistan produces 56 million tons milk per year,
- ✦ Pakistan ranks 4 in the milk production,
- ✦ Main source of milk is cow, while buffalo ranks second,
- ✦ In Pakistan & India 80% of total milk is obtained from buffalos,
- ✦ In Pakistan buffalo shares 60-70% in the total milk,
- ✦ Gestation period for cow is about 270-300 days,
- ✦ 15-18 years old cow is sexually mature,
- ✦ Lactation Period is that period during which animal produce milk,
- ✦ Lactation period varies, but average lactation period is about 7-8 months,
- ✦ Dry Period is the period during which cow does not produce milk. It is 2-3 months in case of continuous production of next generation,
- ✦ pH of fresh milk is 6.8, it varies between 6.7-6.9.

Milk Biosynthesis:

It is synthesis of milk within the body of animal. Milk is synthesized in blood & mammary gland.

➔ Synthesis of lactose & protein is done in mammary gland,

Proteins: Some amino acids come from food while some are formed from carbohydrates. These amino acids from blood move in mammary gland. In mammary gland they combine through peptide linkage & form protein.

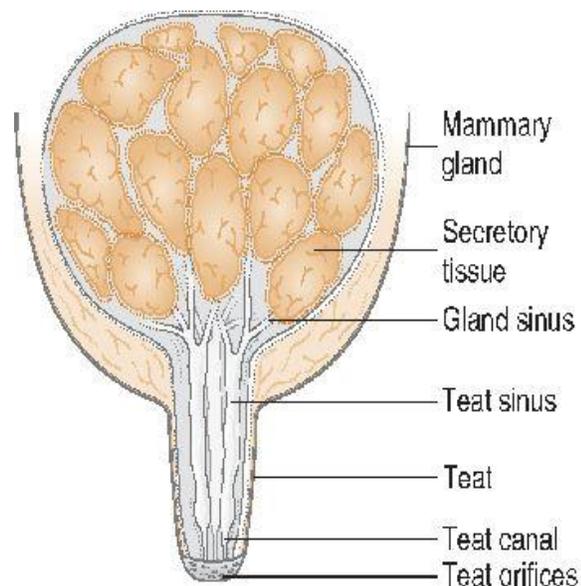
Lactose: In blood all carbohydrates are changed into glucose, when this glucose reaches in mammary gland then 50% of this glucose remains as such while remaining 50% is isomerized & is converted into Galactose. When this Galactose combines with Glucose then resultant product is Lactose.

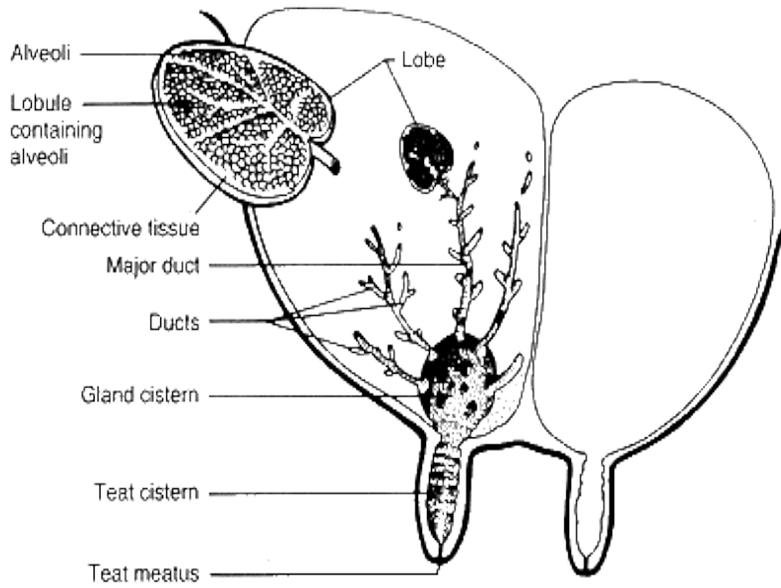
➔ **Vitamins & Minerals** directly come from blood,

➔ **Fat:** 50% fat is synthesized in blood while 50% fat is synthesized in mammary gland,

- From C₄ – C₁₄ are synthesized in mammary gland,
- C_{18:1}, C_{18:2} & C_{18:3} are synthesized in blood, these preformed as a result of rumen hydrogenation and are transported directly in the blood,
- 50% C₁₆ is synthesized in mammary gland while 50% is synthesized in blood.
- The precursors of those fatty acids which are required in milk are Acetaldehyde & β -Hydroxy-butyrate.

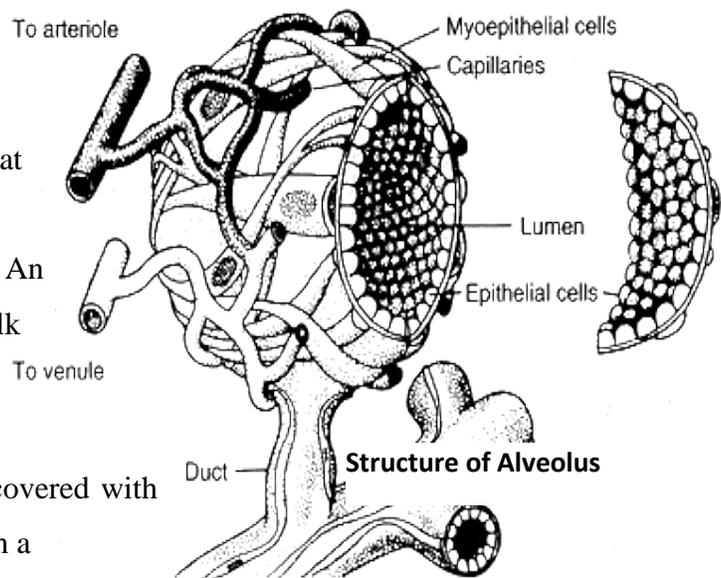
Biosynthesis in Mammary Gland:





Mammary Glands:

- There are a lot of alveoli present in a teat or mammary gland.
- Milk is produced within alveoli. An alveolus is the complete milk production unit. Millions of alveoli are present in a mammary gland.
- Alveolus is a semi round cell. It is covered with capillaries & nerves. In central portion a sack is present which is called as *Lumen*.



- Lumen is covered by secretory or epithelial cells. Synthesis of milk is done in secretory cells & then this milk diffuses in lumen through the epical end.
- Outer side of the secretory cells is called the *Basal End* while inner side is called the *Epical End*.
- Lumen is basically the storage house of milk.