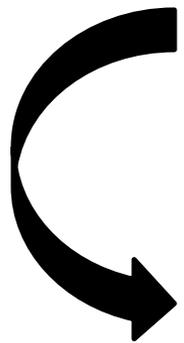


# **Selection and composition of milk**





**Not possess any objectionable odour**  
**Free from extraneous matter**



# Quantitative Factors

**Composition of milk:** Composition affects coagulum properties thereby influencing yield and texture. The milk constituents of prime importance in cheese making are milk proteins (particularly casein), milk fat and mineral salts (particularly calcium).

# Milk Proteins...

Casein (constitutes about 70-80% of total milk protein) exists largely in micellar form in milk

The casein micelles are composed of  $\alpha$ -casein,  $\beta$ -casein,  $\kappa$ -casein and some minor components

Composition and concentration are subjected to variations due to species, breed, animal health, stage of lactation, climate, time of year and environmental factors.

**Alterations in total casein, relative proportion of its constituents and genetic variants, size of casein micelle affect cheese making properties of milk (clotting time, curd strength, syneresis, cheese yield, proteolysis of cheese and composition of cheese**

- 1. During cheese making, serum proteins and lactose are lost in whey. So, milk high in casein is desirable.**
- 2. Milk high in whey protein content may delay clotting time as  $\beta$ -lactoglobulin undergoes aggregation when subjected to heat and may react with  $\kappa$ -casein. Apart from longer clotting time, interaction between  $\beta$ -lactoglobulin and casein tends to cause softer curds which lose moisture more slowly.**
- 3. Cheese milk containing B variant of  $\beta$ -and  $\kappa$ -casein give shorter clotting time, higher curd strength as compared to milk devoid of this variant.**
- 4. Size of casein micelle also affects clotting time. Smaller micelles having more  $\kappa$ -casein give shorter clotting time than larger ones.**

# **Milk Fat.....**

- 1. Increase in fat content of milk gives reduced syneresis and longer time are required to achieve desired moisture content in cheese.**
- 2. Too low fat in milk is also not desirable as it poses problem of moisture retention and results in hard and dry body cheese.**
- 3. Low fat milk gives cheese with leathery texture and lacks mellow, velvetiness and high fat milk produces too soft, buttery and greasy texture.**
- 4. During ripening, lipolysis of fat results in formation of fatty acids, which impart flavor.**

**Fat is incorporated in the casein matrix. Incorporation of fat is dependent on size of fat globule and its composition. Smaller sized globules are easy to incorporate in curd than larger ones. Milk fat with higher melting point is better incorporated in the curd.**

**Milk must be of uniform quality in terms of fat and casein. In Cheddar cheese, milk is standardized to casein/fat ratio between 0.67 and 0.72.**

**Desired: Milk standardization  
to a definite casein/fat ratio**

# Milk Salts.....

1. Ash contains large proportion of metallic components, potassium, sodium, calcium, zinc, chromium, and nickel as well as non-metallic elements (sulphur, chlorine, phosphorous, iodine, etc).
2. Salts of primary importance: Calcium and magnesium salts of phosphoric and citric acid.
3. Calcium makes casein complex with phosphates. Calcium greatly influences rennet coagulation time, strength of clot and body and texture of cheese. Quantity of calcium affects size of casein aggregates. More calcium content in milk leads to increased micelle size of casein.
4. High soluble phosphates, citrates and sodium and low soluble calcium and magnesium and also low proportion of casein bound calcium give slow coagulation of milk by rennet.

# Qualitative Factors

**Chemical qualities of milk which affect the cheese quality:**

**Quality that inhibits starter growth**

**Quality that affects coagulation**

**Quality that produces taints, gas-holes in cheese**

# Qualitative Factors

## Starter bacteria

- Milk used for cheese must be free from inhibitory substances of physiological origin, preservatives and antibiotics.

## Coagulation

- Mixing of mastitis milk, colostrum or late lactation milk adversely affects the coagulation.

## **Mastitis milk:**

- 1. High in serum albumin, sodium and chloride content.**
- 2. Low in fat, casein, lactose, phosphate, potassium and calcium content.**
- 3. Since low in casein, it produces low yield and moist cheese.**
- 4. High concentration of immunoglobulins, proteinase, protease-peptone and catalase and leucocyte count.**
- 5. Mastitis milk has changed casein composition (less  $\beta$ -casein, more  $\gamma$  and  $\kappa$ -casein, presence of para- $\kappa$ - casein in comparison to good quality milk).**

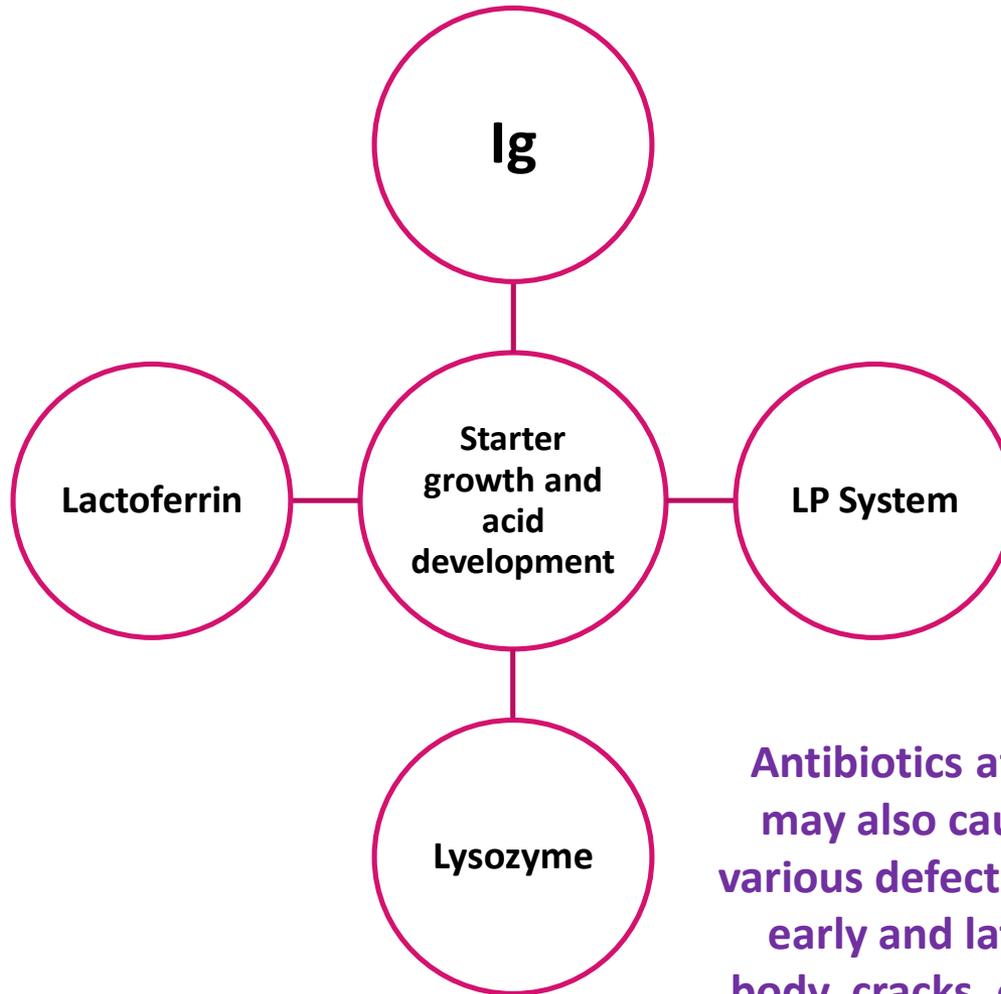
## **Late lactation milk:**

- 1. Slightly alkaline, high in albumin and chloride and low in casein, lactose and calcium and its effect on coagulation of milk with rennet is similar to mastitis milk.**

## **Colostrum:**

- 1. Rich in proteins, vitamin A, and sodium chloride, but contains lower amounts of carbohydrates, lipids and potassium than normal milk.**
- 2. Antimicrobial substances like lactoferrin and lactoperoxidase inhibit starter cultures. So, colostrum must not be mixed with the milk at least for three days but preferably up to 15 days to avoid coagulation delays.**

# Natural Inhibitory Substances and Antibiotic Residues in Milk



Antibiotics affects acid development and may also cause starter failure leading to various defects like high moisture in cheese, early and late blowing, weak and pasty body, cracks, open texture and sponginess.