## Theory - Effect On Milk Properties

Homogenization implies mechanical treatment to break fat globules into smaller size of 2µm or less and uniformly disperse them in milk. Homogenization in the dairy industry is used principally to prevent or delay the formation of a cream layer in full cream milk by reducing the diameter of the fat globules. After homogenization, size of fat globules becomes less than 2µm. The average size of milk fat globule in milk is 2-12µm. The number of fat globules is 3-4 billion in a milliliter of milk.

In the past, pasteurized milk usually was not homogenized, although the flavor of the milk becomes fuller by homogenization. A certain amount of cream was permitted to form to show the consumer clearly the full cream character of milk. Sterilized milk, evaporated or condensed milk and cream are generally homogenized.

Homogenization can be defined as the process in which fat globules in milk are broken down to a size small enough to prevent the formation of a cream layer. Homogenizer is a machine, which disintegrates the fat globules of milk.

According to the United States Public Health Services (USPHS), 'homogenized milk is one that has been treated in such a manner as to ensure the break-up of the globules to such an extent that after 48 hours of quiescent storage, no visible cream separation occurs in milk and the fat percentage of the milk in the upper 10% portion, i.e., in the top 100 ml of milk in a quart bottle or of proportionate volumes in containers of other sizes, does not differ by > 10% of itself from the fat percentage of the remaining milk, as determined after thorough mixing'.

The number of fat globules in homogenized milk is about 10,000 times greater than those in unhomogenized milk. The size of fat globule is reduced to < 1 micron, while normal fat globule size averages 2 – 12µm in milk. The number of fat globules will be increased, but total volume of fat globules will remain almost same. The surface area of newly formed smaller fast globules is increased by 4-6 folds.

Homogenization prevents phase separation of fat into cream layer during storage and enhances the richness of mouth feel as well as due to an increased surface area. It involves physical changes in milk protein, resulting in lower curd tension and possibly increased digestibility due to faster coagulation in the stomach.

**Effect of Homogenization on Physico-Chemical Properties of Milk**

**Reduction of fat globules size**

Reduction of fat globule size to < 2 µ prevents formation of cream layer and increases the surface area of the fat above 6 times.

**Whiter milk**

Homogenization of milk increases its whitening power due to an increase in the number and surface area of the fat globules. Adsorption of casein miscelles and serum proteins on newly created fat globules surface increases scattering of light thereby causing whiter appearance.

**Physiology of nutrition**

Homogenization has been reported to improve the digestibility of milk due to increase in the number and surface area of the fat globules.

**Flavour of milk**

Homogenized milk has a uniform flavour throughout. It tastes richer, smoother and creamier than unhomogenized milk due to an increase in the surface area of the fat globules which are uniformly distributed in milk.

**Sensitivity to lipase**

Homogenized milk is more susceptible to enzymic activities, especially lipase action, than unhomogenized milk. Lipase can cause rancidity rapidly in homogenized raw milk.

**Susceptibility to oxidation**

Homogenized milk is more susceptible to oxidized flavours caused by natural or artificial light than un¬homogenized milk. To prevent development of off-flavours, homogenized milk must be packaged in opaque containers, such as cartons, plastic containers or coloured bottles.

### 25.2.7 Sediment on storage

Homogenized milk may develop dark sediment at the bottom of the container after standing for 24 h. This is due to settling of cells, foreign matter and casein particles. In unhomogenized milk, these particles are usually held by the fat globules. To prevent the sediment formation, homogenized milk must be filtered or clarified, preferably before homogenization.

### 25.2.8 Bacterial count

There will be an apparent increase in bacterial count after homogenization due to the break-up of clumps and colonies of organisms.