

# DAIRY MICROBIOLOGY



## Study of Milk and Microorganisms

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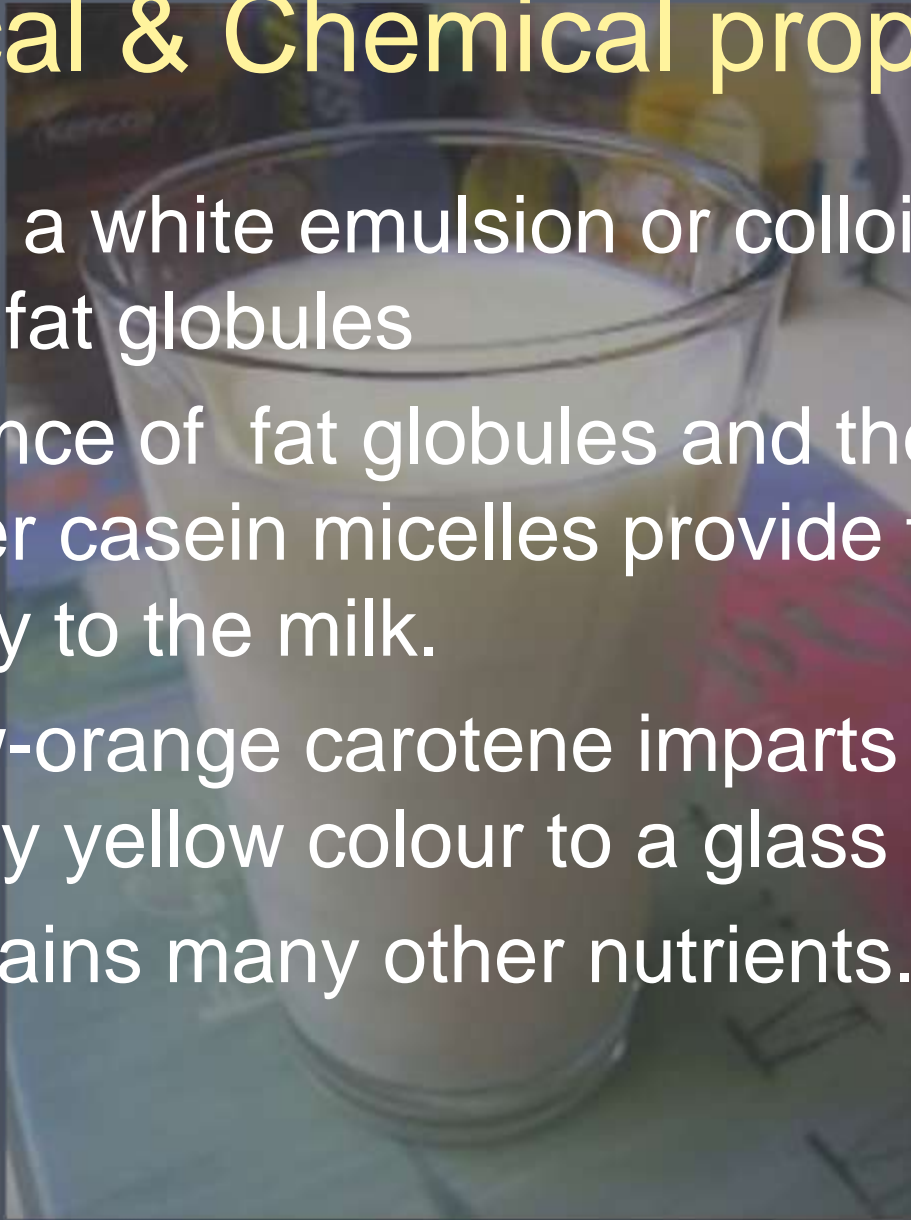
# Introduction

- Milk is a white liquid produced by the mammary glands of mammals.
- Primary source of nutrition for young mammals before they are able to digest other types of food.
- Throughout the world, there are more than 6 billion consumers of milk and milk products.



# Physical & Chemical properties

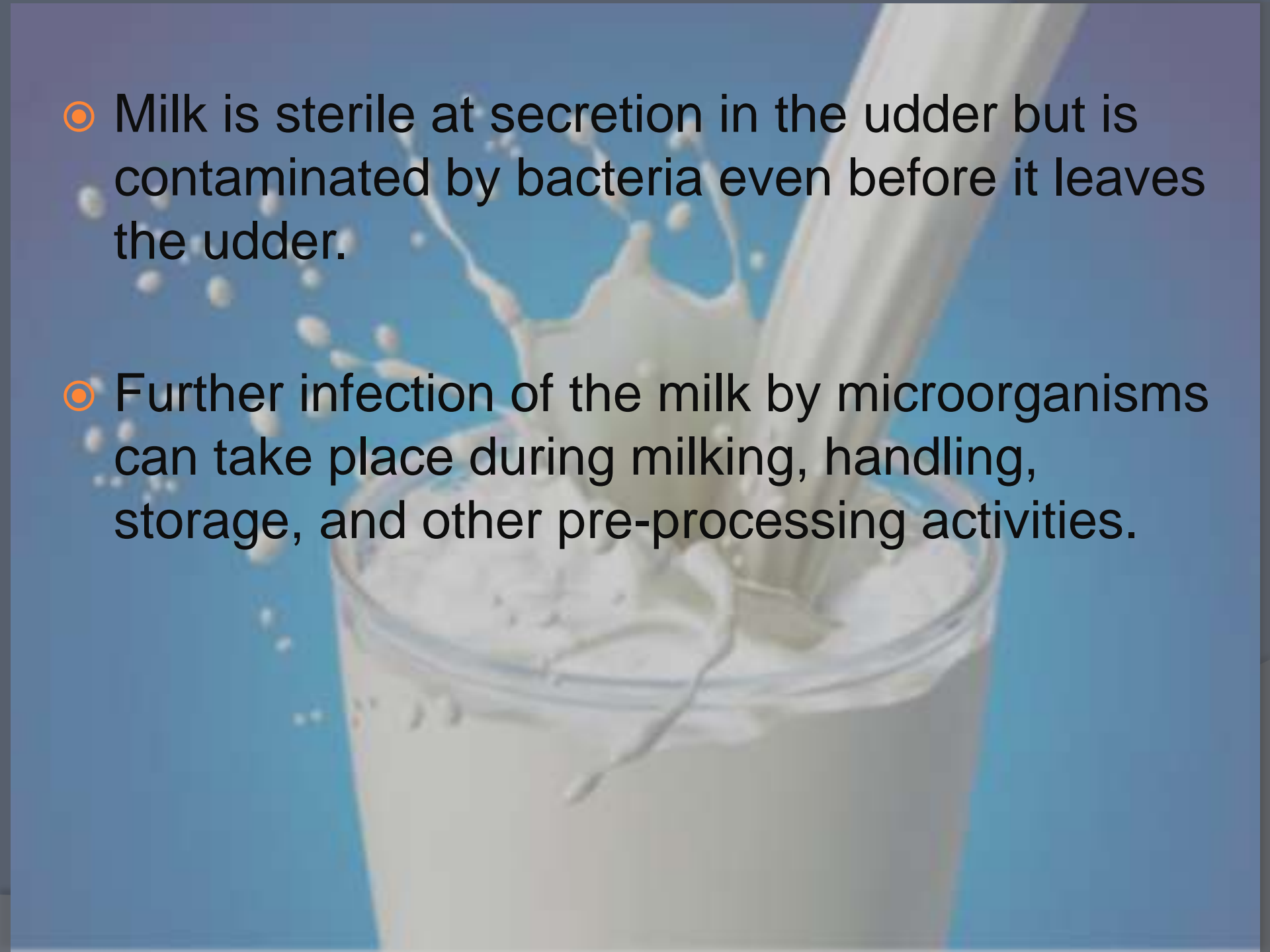
- Milk is a white emulsion or colloid of butter fat globules
- Presence of fat globules and the smaller casein micelles provide the opacity to the milk.
- Yellow-orange carotene imparts the creamy yellow colour to a glass of milk.
- It contains many other nutrients.





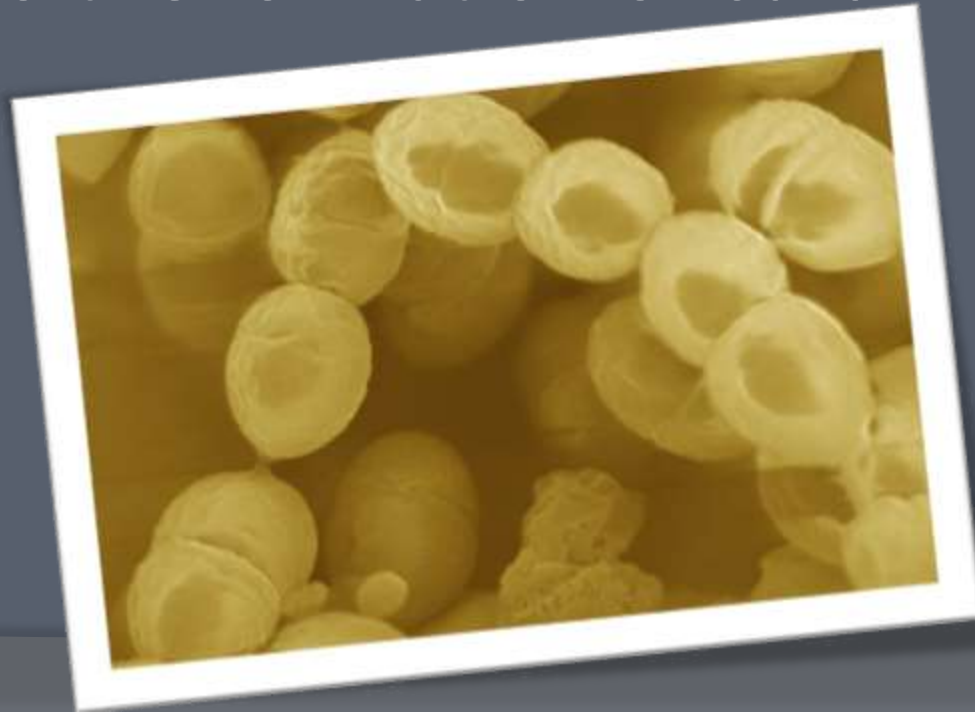
- ❑ Milk contains 30–35 grams of protein per liter of which about 80% is arranged in casein micelles.
- ❑ Different carbohydrate including lactose, glucose, galactose, and other oligosaccharides.
- ❑ Calcium, phosphate, magnesium, sodium, potassium, citrate, and chlorine are all included.
- ❑ Vitamins A, B6, B12, C, D, K, E, thiamine, niacin, biotin, riboflavin, folates, and pantothenic acid are all present in milk.

# Microorganisms in milk

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- A close-up photograph of a glass filled with milk. A stream of milk is being poured from above into the glass, creating a dynamic splash of white liquid against a light blue background. The glass is partially filled, and the milk surface is turbulent with the incoming stream.
- Milk is sterile at secretion in the udder but is contaminated by bacteria even before it leaves the udder.
  - Further infection of the milk by microorganisms can take place during milking, handling, storage, and other pre-processing activities.

Milk supports the growth of a variety of bacteria including pathogenic one.

- Acid-forming bacteria, such as *Streptococcus lactis*, *Str. faecalis* *Lactobacilli*. These ferment lactose, forming lactic acid, and lead to the formation of curd.

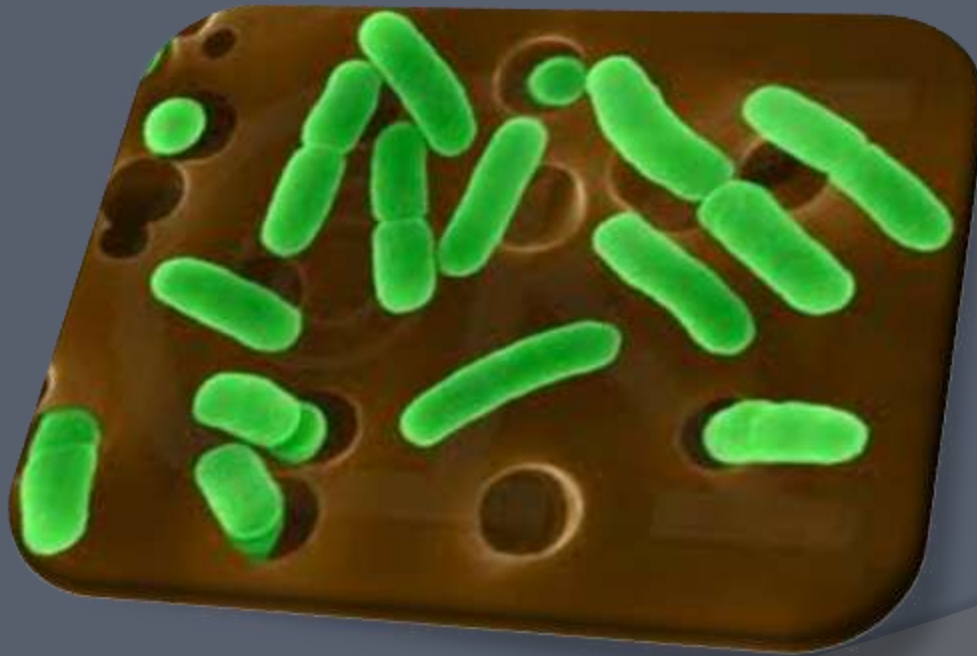




- Alkali-forming bacteria, such as *Alkaligenes sp.* *Achromobacter*. Aerobic spore-forming bacilli These render the milk alkaline.



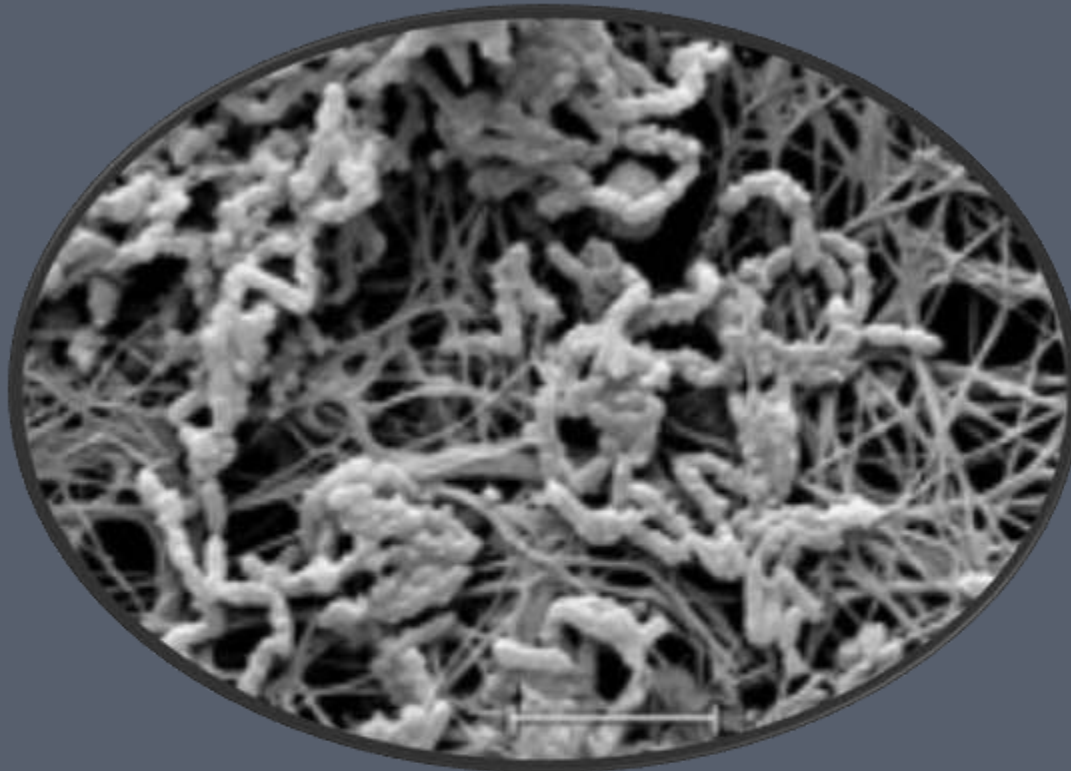
- Gas-forming bacteria, such as Coliform bacteria *Cl. peifringens* *Cl. Butyricum*. These produce acid and gas.



- Proteolytic bacteria, such as *Bacillus subtilis*, *B. cereus*, *Proteus vulgaris*, *Staphylococci* *Micrococci*. These bacteria are responsible for proteolytic activity.



- Inert bacteria, such as *Achromobacter* do not produce any visible change.



# Lactic Acid Bacteria

- lactococci
- *L. delbrueckii* subsp. *lactis* (*Streptococcus lactis* )
- *Lactococcus lactis* subsp. *cremoris* (*Streptococcus cremoris* )
- lactobacilli
- *Lactobacillus casei*
- *L. delbrueckii* subsp. *lactis* (*L. lactis* )
- *L. delbrueckii* subsp. *bulgaricus*
- (*Lactobacillus bulgaricus* )

# Leuconostoc

- Coliforms: coliforms are facultative anaerobes with an optimum growth at 37° C.
- Coliforms are indicator organisms; they are closely associated with the presence of pathogens but not necessarily pathogenic themselves.
- They also can cause rapid spoilage of milk because they are able to ferment lactose with the production of acid and gas, and are able to degrade milk proteins.
- They are killed by HTST treatment, therefore, their presence after treatment is indicative of contamination.
- *Escherichia coli* is an example belonging to this group.

# Pathogenic Microorganisms in Milk

- The following bacterial pathogens are still of concern today in raw milk and other dairy products:
- *Bacillus cereus*
- *Listeria monocytogenes*
- *Yersinia enterocolitica*
- *Salmonella spp.*
- *Escherichia coli* O157:H7
- *Campylobacter jejuni*

# Moulds

- It should also be noted that moulds, mainly of species of *Aspergillus* , *Fusarium* , and *Penicillium* can grow in milk and dairy products.
- If the conditions permit, these moulds may produce mycotoxins which can be a health hazard.



# Spoilage microorganisms in milk:

- The microbial quality of raw milk is crucial for the production of quality dairy foods.
- Spoilage is a term used to describe the deterioration of a foods' texture, colour, odour or flavour to the point where it is unappetizing or unsuitable for human consumption.
- Microbial spoilage of food often involves the degradation of protein, carbohydrates, and fats by the microorganisms or their enzymes.

# Conclusion

- Some species and strains of Bacillus, Clostridium, Cornebacterium, Arthrobacter, Lactobacillus, Microbacterium, Micrococcus and Streptococcus can survive pasteurization and grow at refrigeration temperatures which can cause spoilage problems.

Thank you

