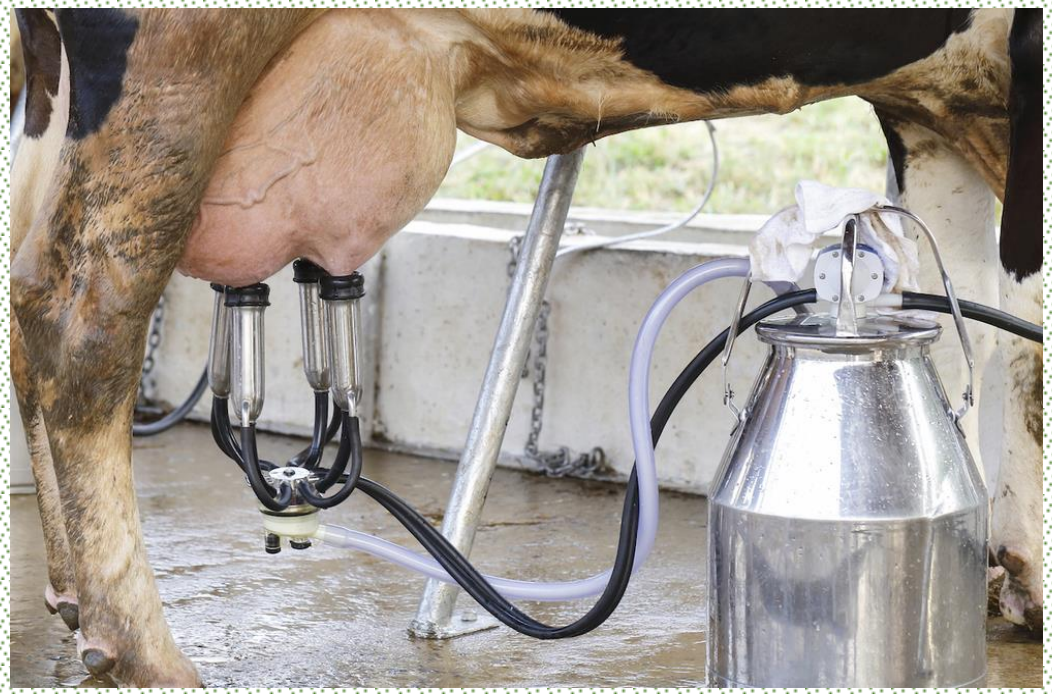
Department of Veterinary
Public Health & Epidemiology

Milk and their sources of contamination

Milk

Milk: The wholesome, fresh, clear lacteal secretion obtained by the complete milking of one or more apparently healthy udders, excluding that obtained within 15 days before or 5 days after calving or such periods as may be necessary to render the milk colostrum free, and containing the minimum prescribed percentage of milk fat and milk solids-not-fat."



FOOD SAFETY STANDARDS OF MILK 2006			
CLASS OF MILK	DESIGNATION	MILK FAT %	MILK SOLID NOT FAT %
COW MILK	RAW BOILED PASTEURIZED FLAVOURED AND STERILIZED	3.5	8.5
BUFFALO MILK	RAW,PASTEURIZED, BOILED, FLAVOURED, STERILIZED	5	9
GOAT MILK	RAW,BOILED, PASTEURIZED, FLAVOURED AND STERILIZED	3.5	9
MIXED MILK	RAW,BOILED, PASTEURIZED, FLAVOURED AND STERILIZED	4.5	8.5
STANDARDIZED MILK	PASTEURIZED, FLAVOURED AND STERILIZED	4.5	8.5
TONED MILK	PASTEURIZED, FLAVOURED AND STERILIZED	3	8.5
DOUBLE TONED MILK	PASTEURIZED, FLAVOURED AND STERILIZED	1.5	9
SKIMMED MILK	RAW,BOILED, PASTEURIZED, FLAVOURED AND STERILIZED	NOT MORE THAN 0.5	8.7

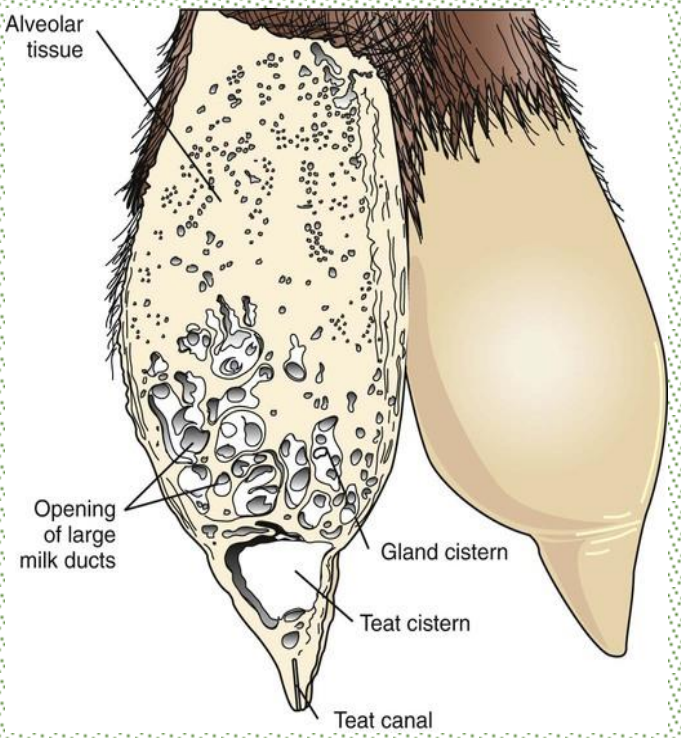
- **Apparently healthy animal: Milk is relatively free of pathogenic bacteria.**
- **Gets contaminated when comes in contact with external environment.**
- **Serious deterioration in the microbiological quality due to**
  - ✓ **Lack of hygiene**
  - ✓ **Unsatisfactory chilling facilities**
  - ✓ **Improper post production storage**
  - ✓ **Improper handling of milk and milk products.**

Sources of Contamination of raw milk

Practice at organized and unorganized dairies

Interior of the udder:

- Generally acquired from the walls of the ducts along the teat canal.
- Introduced in the milk through the teat:
  - during treatment with contaminated intra-mammary preparations or
  - from the environment of the animal.
- Subsequently washed out in the first few streams of milk.
- The microbial load in freshly drawn milk varies with individual animals.
- The cleanliness of quarters and the health of dairy animals contribute significantly.
- Usually the bacterial count of milk varies between **500 and 1000/ml.**



❖**The elimination of disease producing bacteria in milk pose a major public health hazard.**

***Mycobacterium tuberculosis*, *Brucella* sp. and *Streptococcus pyogenes*, *Coxiella burnetti*.**

Control measures:

❖**Animals should be tested regularly for tuberculosis and brucellosis.**

❖**Cows should be stabled in clean stalls and pastured in drier areas, free of swamps and stagnant water / wash water that contaminate the teat canals mainly with coliforms.**

❖ **A few streams of milk should therefore, always discarded before collection of milk.**

- ✓ Tests and control for tuberculosis (SID/DID)
- ✓ Tests and control for Brucellosis
- ✓ Coliforms

Environmental:

- **Condition of the cow-shed**: contamination of flanks, tail and udder
- The microorganisms in soil, discharges, straw, dust etc. accumulated on the surface of body----dislodged during the milking -----contribute a load of 10,000 bacteria or more per ml of milk.
- The presence of pathogens such as coliforms (**fecal coliforms**) may cause summer complaint or infantile diarrhoea.

Control:

- Hygienic methods in cow-sheds helps in maintaining clean stalls.
- Wipening of flanks and udder with a clean damp cloth soaked in 1% $KMnO_4$ just before milking
- Use of small mouthed container for collection of milk
- Properly sterilized milking machine

✓ Faecal coliforms

Milker or Handler:

- Suffering from disease such as typhoid fever, diphtheria, scarlet fever, septic sore throat and tuberculosis, coughs and colds may contaminate milk or milk products.

Control:

- Regular Health checkup

- Diseased individual or carrier should not allowed to handle milk or milk products.

Utensils:

- ❖ The most prolific source of microorganisms.
- ❖ A milk can or bucket improperly washed, inadequately sanitised or dried or a dirty milking machine are a fertile source of milk contamination.
- ❖ Utensils washed with contaminated water: water borne diseases.

Control:

- ✓ Thorough cleansing, followed by sterilisation of utensils.
- ✓ After washing, buckets and milk cans should be rapidly dried and kept in a dry place.
- ✓ At the farm level, there is an utmost need of constant attention to details of hygiene and sanitation.
- ✓ Since man is a direct / indirect source of contamination, he should exercise every hygienic precaution to ensure safety of milk and milk products.

Wholesaler, retailer and the vendor:

- The main sources of contamination of milk are milk cans and buckets used for transport of milk as well as the dippers used to draw milk from the cans.
- The containers if not cleaned well, are potential sources of pathogens
- The pathogens gain entry through contaminated water supplies, carrier individuals handling and fecal contamination.
- Improper washing and cleansing of the cans / containers can cause a build up of milk residues that facilitate the growth of micro-organisms like *Staphylococcus aureus, Bacillus cereus* and fungi.

❖These organisms may get released into milk during refilling of the can.

❖Spoilage organisms such as *Bacillus* sp. as well as yeast and molds, thrive in milk adulterated with contaminated water.

Control:

- Improve the standard of personal hygiene of the staff.
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- Cleaning of containers with hot water and caustic soda / bleaching powder (2%) immediately after emptying their contents and allowing them to dry before refilling.

- The dipper should also be washed and sterilized in a similar manner.

Storage of raw milk in chilling tanks at milk processing units and bulk containers:

- **Milk brought to the cities by tankers is first emptied into chilling plants (bulk containers) at the milk processing units (0° - 4°C).**
- **Contamination with *S. aureus,* yeasts and coliforms at this point occurs through improperly cleaned or sanitized milking equipment and non potable water used for washing.**
- **Mastitic streptococci are derived only from mastitis milk mixed with other milk at the farm level and primary milk collection centers.**

- Mold contamination occurs mainly through aerosols under humid conditions within improperly cleaned and disinfected plants.
- Both yeasts and molds reduce the keeping quality by increasing the acidity in milk and developing off flavours.
- Organisms causing enteric fever and dysentry like *Shigella* sp. are also contracted through bad hygiene.

Control measures:

- Immediate washing of bulk containers / tanks with hot water, caustic soda / bleaching powder after emptying milk
- Sterilized with the help of hot steam jets.
- Proper cleaning of plant premises with hypochlorite also reduces the load of bacteria and molds in the atmosphere of the processing plant.

Transport of raw milk by rail / road tankers:

- Improper maintenance of milk tankers adds to the microbiological contamination in milk.
- The longer time leads to higher load of bacterial and fungal agents.
- The ecological and the local climatic conditions tend to vary from region to region.
- The bacterial counts and species differ with seasons.
- Pathogenic bacteria, yeasts and mold multiply rapidly in summer as compared to winter or monsoon seasons.
- One of the sources of contamination in tankers is accumulation of milk solid residues inside the gauges, taps, pipes etc. which act as a foci for microbial growth.

- Some of the psychrotrophs such as *Pseudomonas* sp. produce extracellular enzymes leads to off flavours.
- Heat resistant organisms may survive even after pasteurization resulting in loss of flavour, texture and stability of milk.
- Spore formers are found to be least in number during the monsoon season due to availability of fresh green fodder, ample water and a relatively dust free environment.
- Presence of pathogens, eg., *S. aureus*, enterotoxigenic *E.coli*, *B. cereus* etc. that originate mainly from the handlers at the source of milking, remain in milk, producing heat stable toxins.
- An overall absence or very low level of pathogens is requires to be ensured especially in tanker milk to be pasteurized.
- The load of organisms can be lowered by taking adequate hygienic precautions at the farm as well as by regular cleansing and proper maintenance of tankers.

THANKS