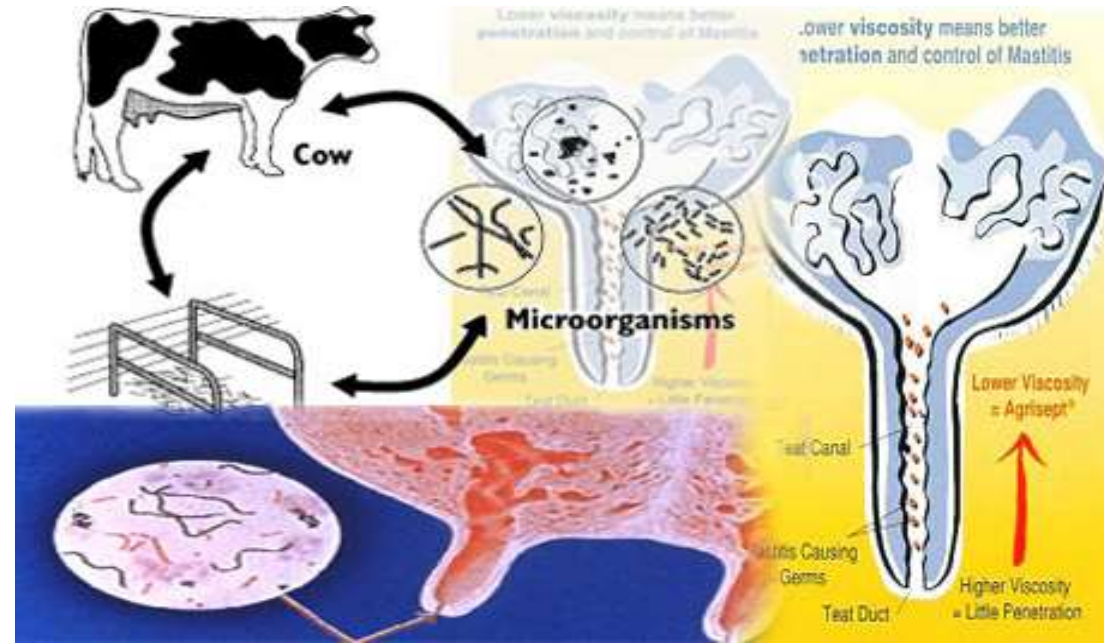


# Sources of contamination in milk

# 1. Interior of udder:

- Varying numbers of bacteria are found in aseptically drawn milk with counts  $<100-10,000$  cfu/ml from normal udder.
- Microorganisms enter udder through the duct at teat tip whose surface is heavily keratinized (exhibit antimicrobial activity).
- Discarding first few streams of milk helps in lowering the counts of microbes in milk.





### Presence of different microbial groups in raw milk

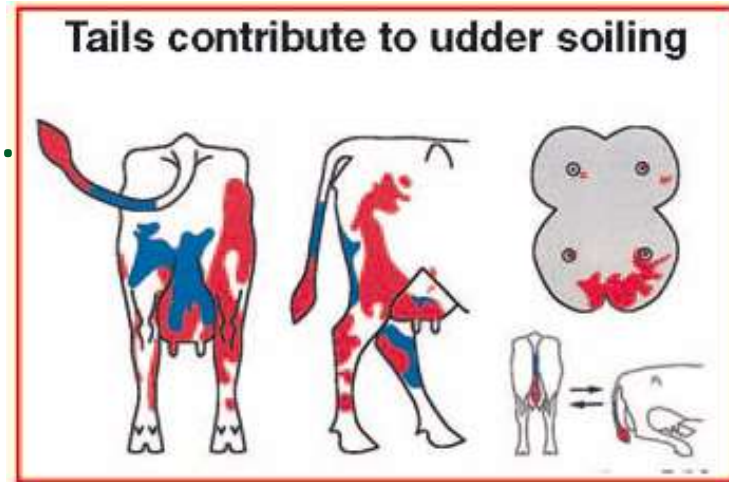
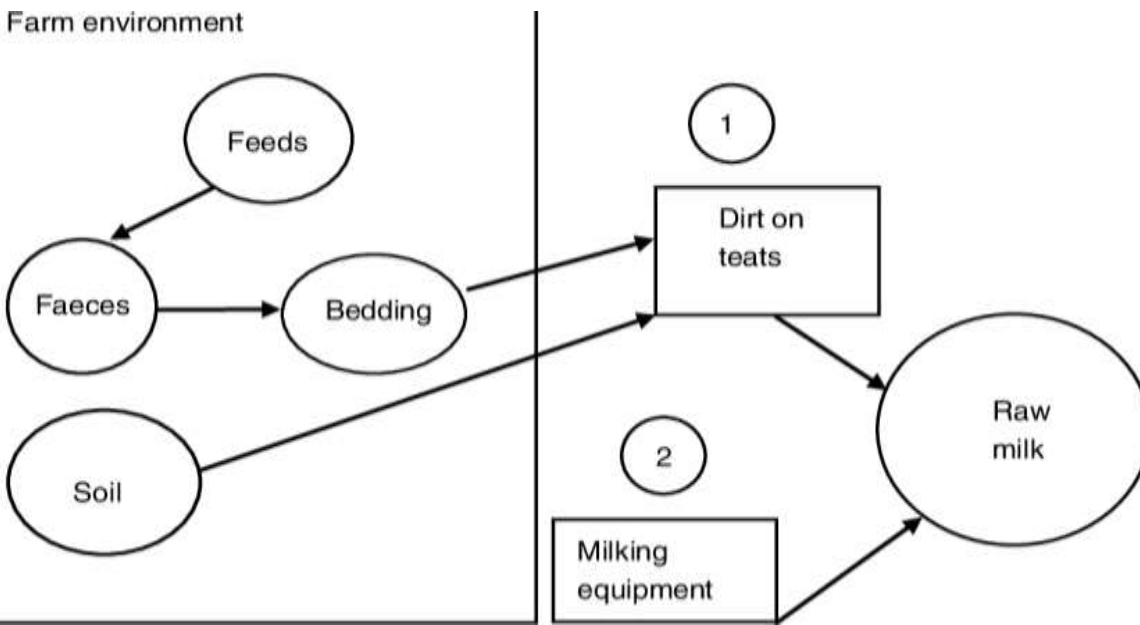
Group of microbes	Percent range
Micrococci	30-99
Streptococci	0-50
Asporogenous Gram positive rods	<10
Gram negative rods	<10
Bacillus spores	<10
Other groups of microbes	<10

**Micrococci (non-pathogenic) are slow growing, but if allowed to grow, they cause acid formation and proteolysis. *S. agalactiae* may be present in non-clinical mastitis and appears to be natural inhabitant of udder. In mastitic animal, microbial contamination within udder of animal contributes to total number of microbes in bulk milk in comparison to milk of healthy animal.**

## 2. Exterior of udder:

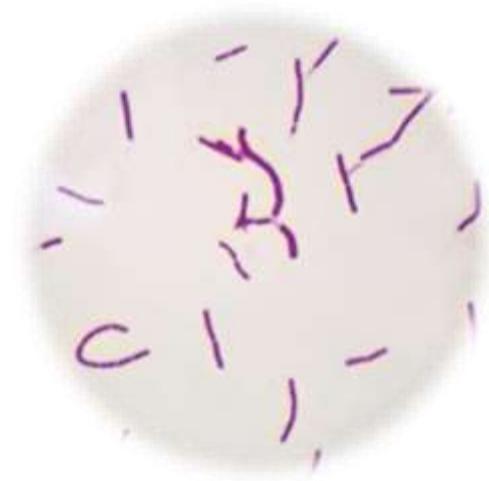
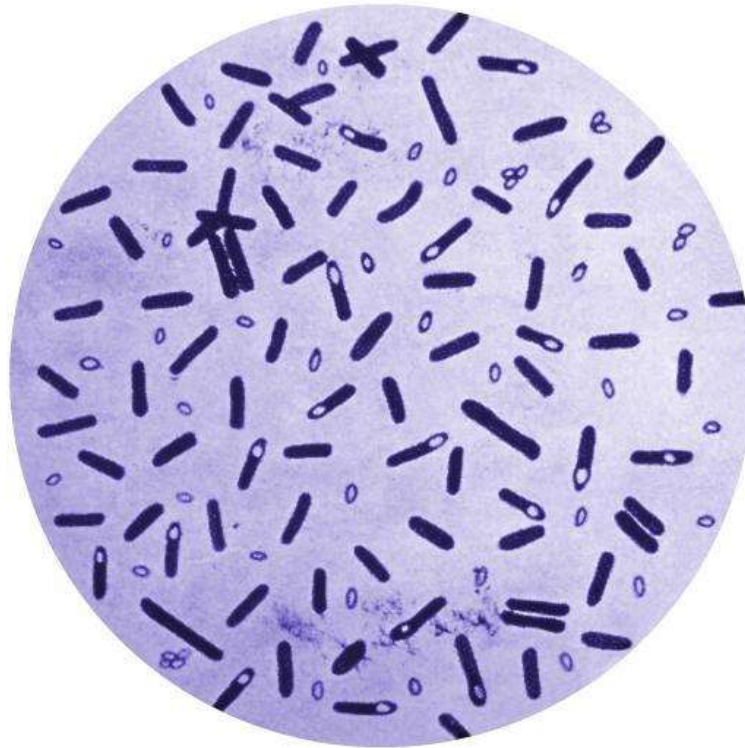
- Udder infections, unclean udder and teats of animal contribute to total bacterial counts of milk.
- Microbes naturally associated with skin of animals as well as those derived from environment, where cow is housed and milked are predominant in milk.
- Udder and teat become soiled with dung, mud, bedding material such as saw dust, straw etc. (coliforms and *Bacillus* spp.)

Udder washing with sodium hypochlorite accompanied by drying, reduces microbes.

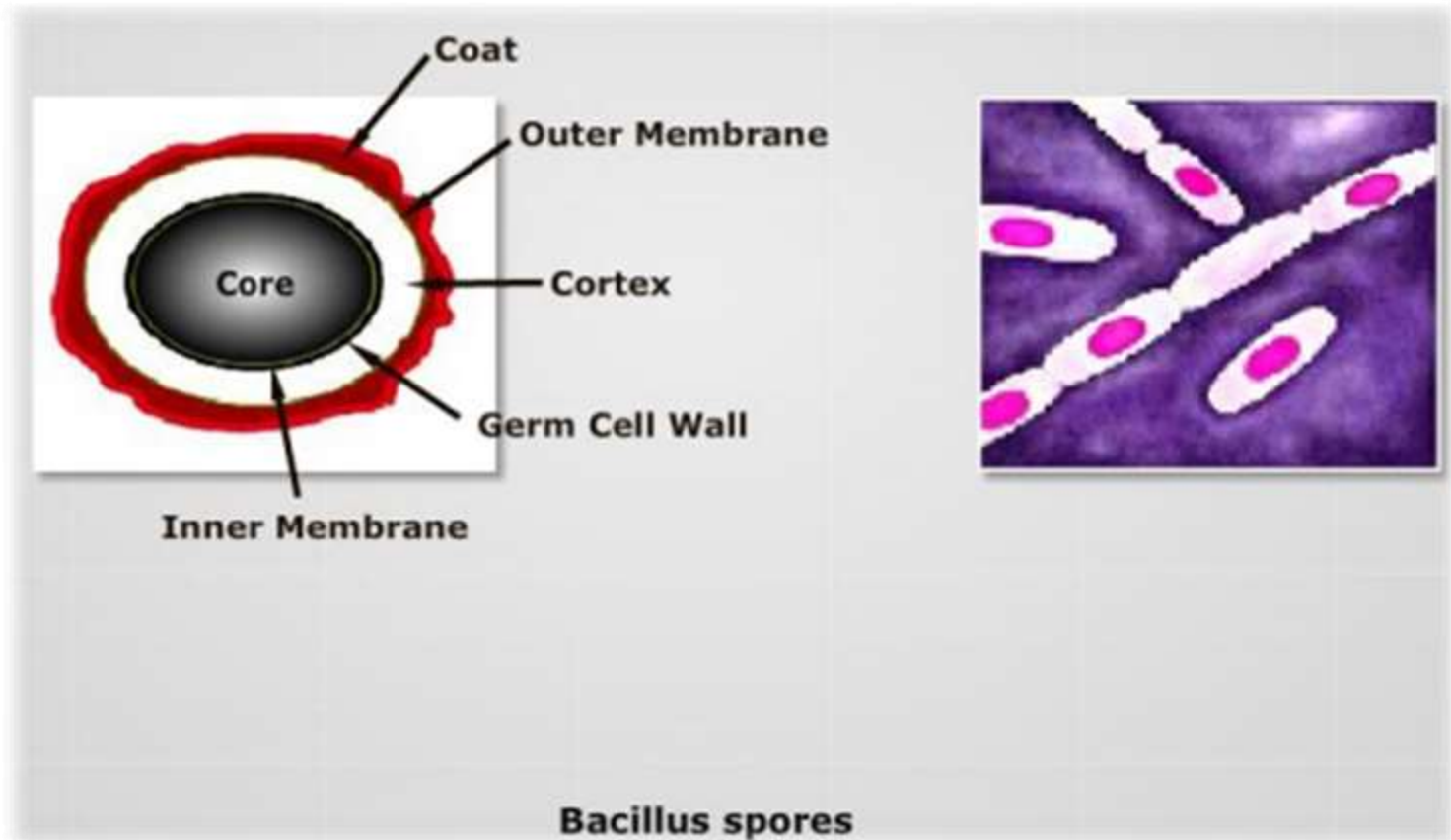




- Exterior of udder: Micrococci and coagulase negative staphylococci
- Teat surface: Faecal streptococci, *Bacillus subtilis*, clostridial spores are usually found in cow fodder, bedding and faeces.



Psychrotrophic (*P. fluorescens*) and thermophilic bacteria predominate on teat surfaces (often bacterial spores (dormant and non-reproductive structure; highly resistant to radiations, desiccation, lysozymes, high temperature and disinfectants) that are typically found in the soil. When spores enter bulk milk, they may survive during pasteurization and cause problems.



### **3. Coat of cow:**

- Coat serves as vehicle to contribute bacteria directly to milk.
- Hairs around udder, flanks and tail contribute to higher bacterial count in milk.
- Coat may carry bacteria from stagnant water pools, especially ropiness causing milk microbes.

### **4. Animal shed and surroundings:**

- Milk produced on farms with poor hygiene practices may undergo significant spoilage and has shorter shelf-life.
- Microbes associated with bedding materials include coliforms, staphylococci, streptococci and other Gram negative bacteria.

## 5. Milking staff:

- Hand contacts or dislodging of dust and dirt particles by milker may add microbes to milk.
- Risk of contamination from milker are higher, when cows are hand milked in comparison to machine-milked as well as soiled clothes.
- Milker with infected wounds on hands contributes pathogenic *Streptococcus* spp. and micrococci.
- Microbial pathogens causing typhoid, dysentery, septic sore throat, diphtheria, cholera etc. contaminate the milk.



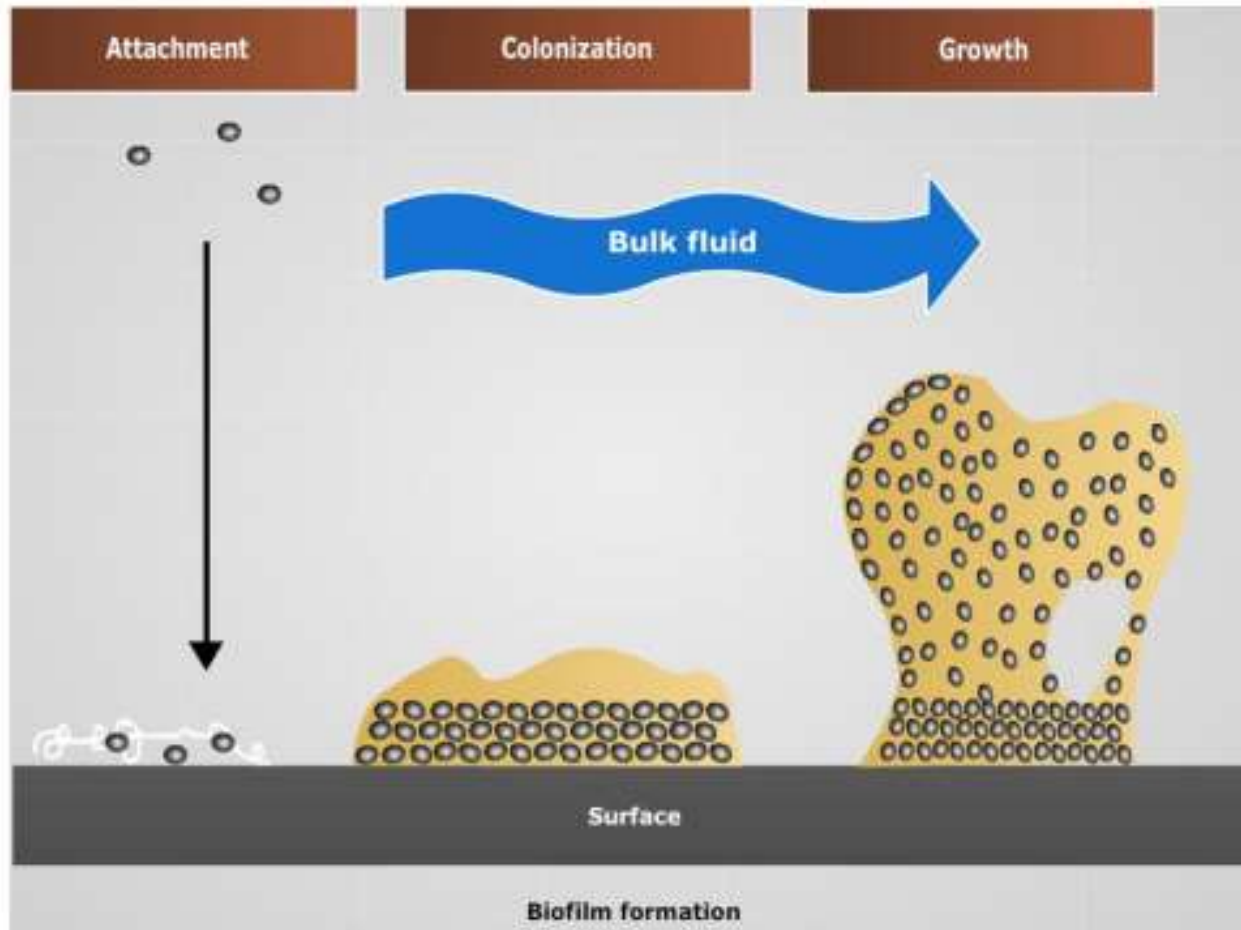


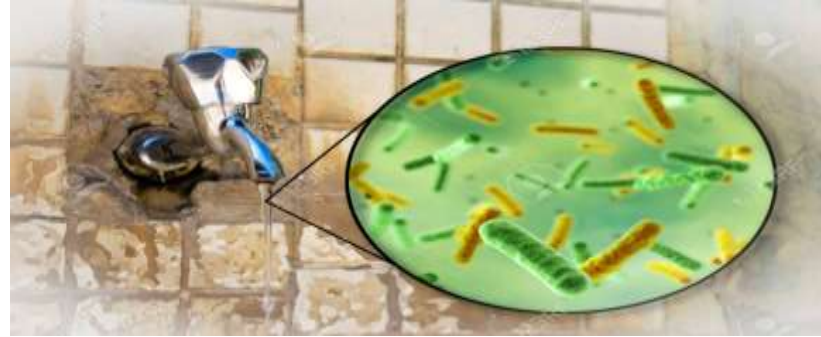


## 6. Milking equipments:

- Improperly cleaned milking and cooling equipments are main sources of milk contamination.
- Milk residues left on equipment contact surfaces supports growth of microbes.
- Certain strains associated with environmental mastitis may grow to a significant level on these equipments.
- Tanker and collecting pipes are sources of contamination, if not adequately cleaned.

- Unclean or improperly cleaned milk cans and lids if they are still moist, results in multiplication of thermophilic bacteria (*Bacillus cereus*).
- Improperly sterilized milking machines contain thermotolerant micrococci, *Microbacterium* spp.





## 7. Water supplies:

- Water can be a predominant source of microbial contamination.
- Should be of good bacteriological quality.
- Uncleaned storage tanks, untreated water supplies from natural sources (bore wells, tanks and rivers) may be contaminated with faecal microbes (coliforms).
- Saprophytic bacteria (*Pseudomonas*) may also be present in water and contaminate the milk.

## Identify Sources of Fecal Contamination



## **8. Airborne contamination:**

- Microbial counts of air in sheds rarely exceed 200 cfu/l. Micrococci account for >50% of the aerial microflora.
- Practices that increase aerial counts in milk:
- **Sweeping of floors just before milking process**
- **Handling hay and feed shortly before milking process**
- **Brushing of animals prior to milking process**
- **Having the dusty bedding materials for animals**
- **Allowing dust and dirt to accumulate on the walls or ceiling of sheds**