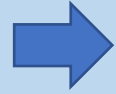


# Changes in Mastitis Udder

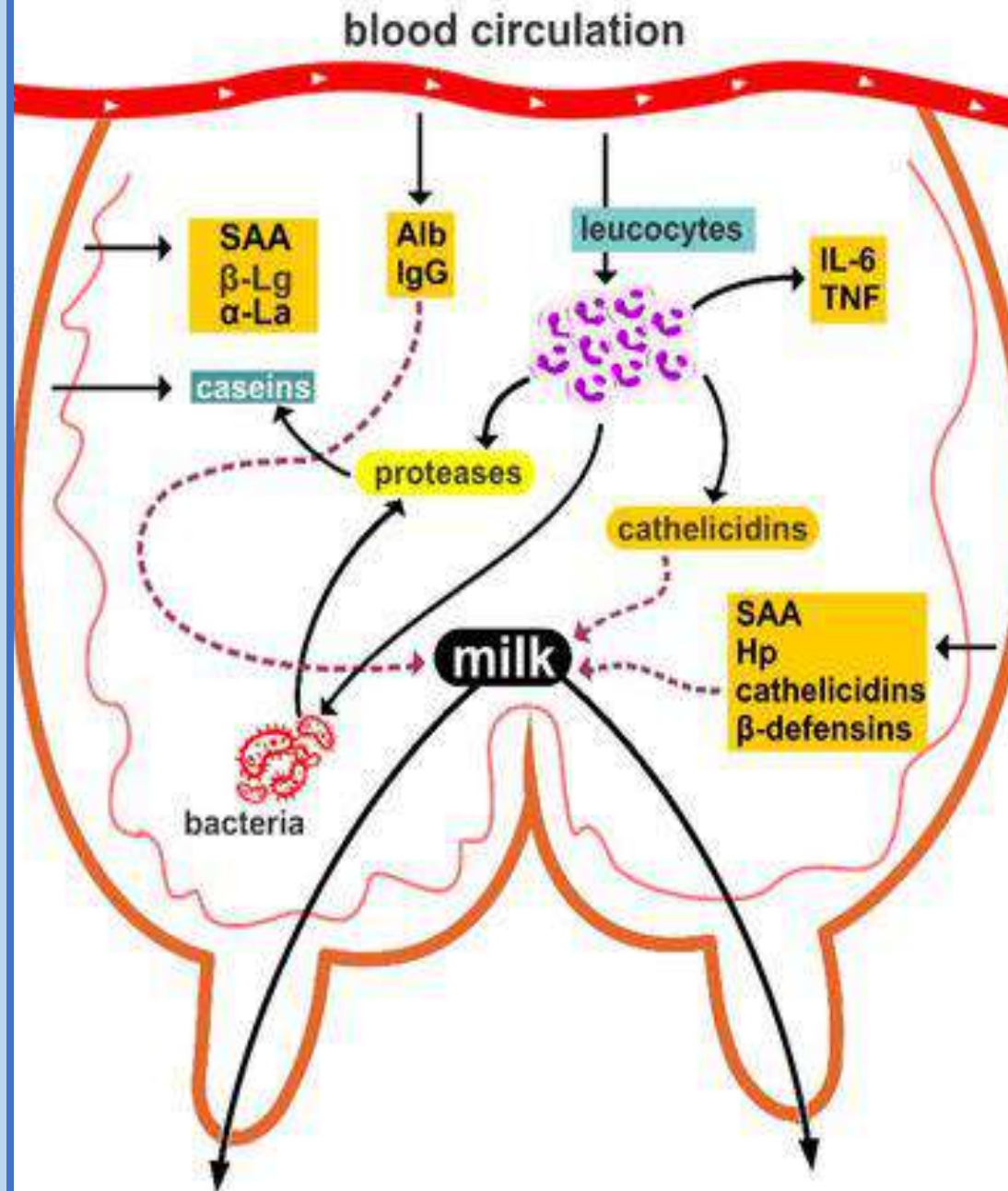
Dr. Taha A. Ghattas

Professor of Clinical Pathology, Biology Dept.  
Animal Reproduction Research Institute,  
Agriculture Research Center, Egypt.



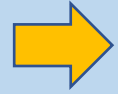
## Input

- Nutrition
- Digestion
- Circulation
- Neuromuscular
- Endocrine
- Immunity
- Physiology



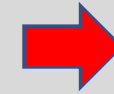
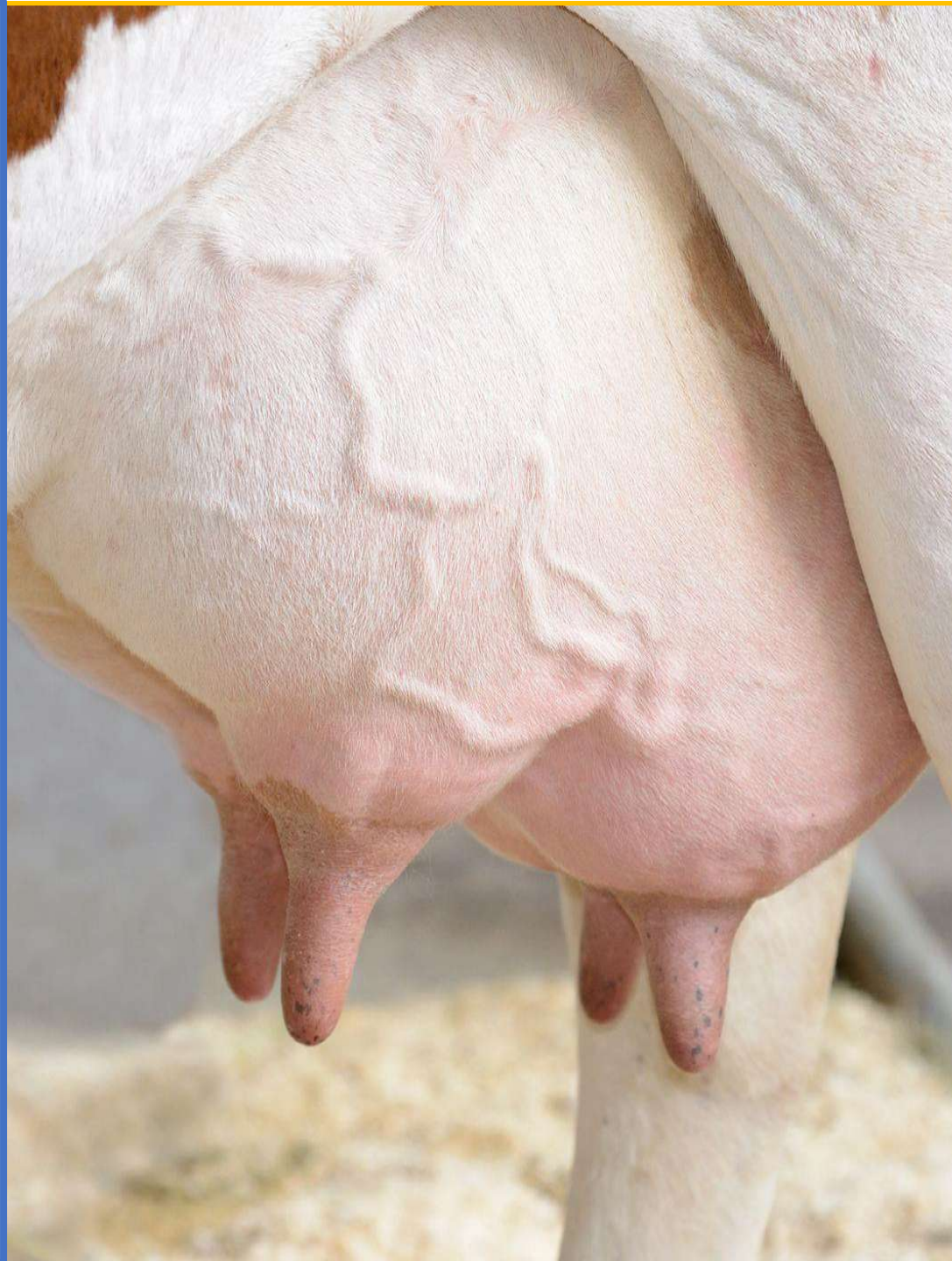
## Output

- Milk
- Nutraceutical compounds.
- Antioxidants

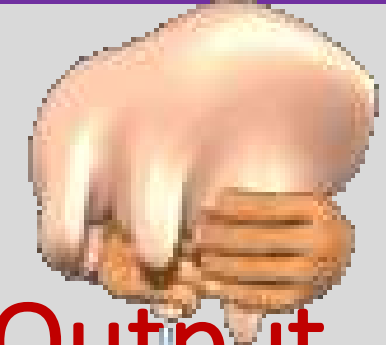


## Input

- Nutrition
- Digestion
- Circulation
- Neuromuscular
- Endocrine
- Immunity
- Physiology



## Output



- Milk
- Nutraceutical compounds.
- Antioxidants

# The significance of bovine mastitis

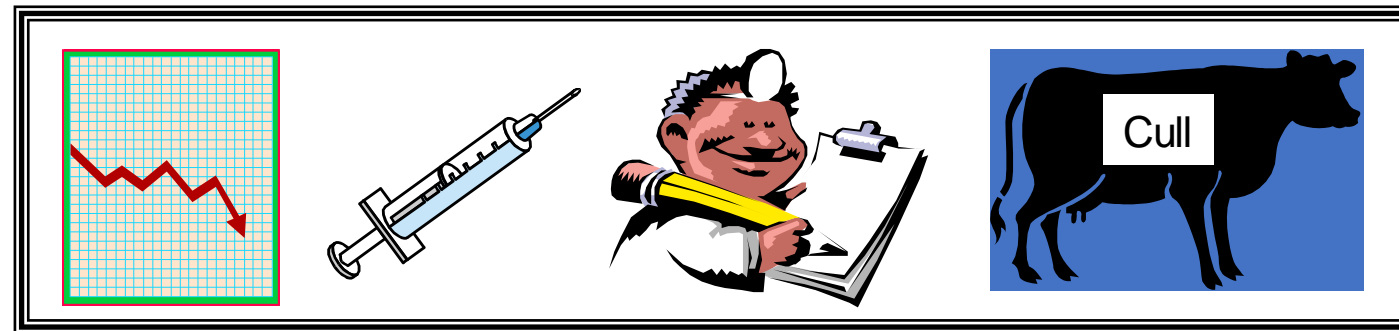
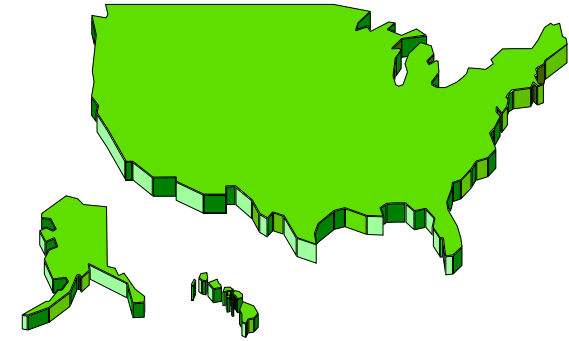
The **most costly disease** affecting dairy cattle throughout the world



Causes **significant economic losses** to the dairy industry all over the world.

## In the US

- \$ 200/cow/year
- \$ 2 billion/year



# Economic Importance of Mastitis

- The most costly disease of dairy cows
- Affects 25% to 30% of animals.
- Loss of functional quarter.
- Lowered milk production.
- Poor quality milk.
- Antibiotics residues in milk.
- Death of cow.
- 200 \$ /cow/year

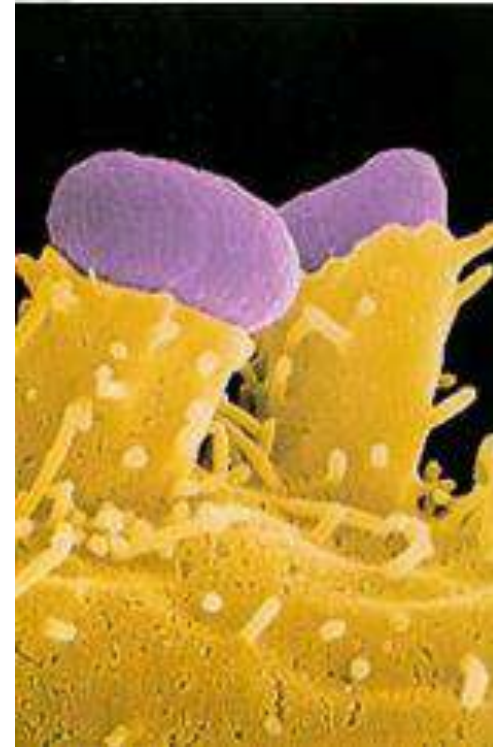


# What is Mastitis?

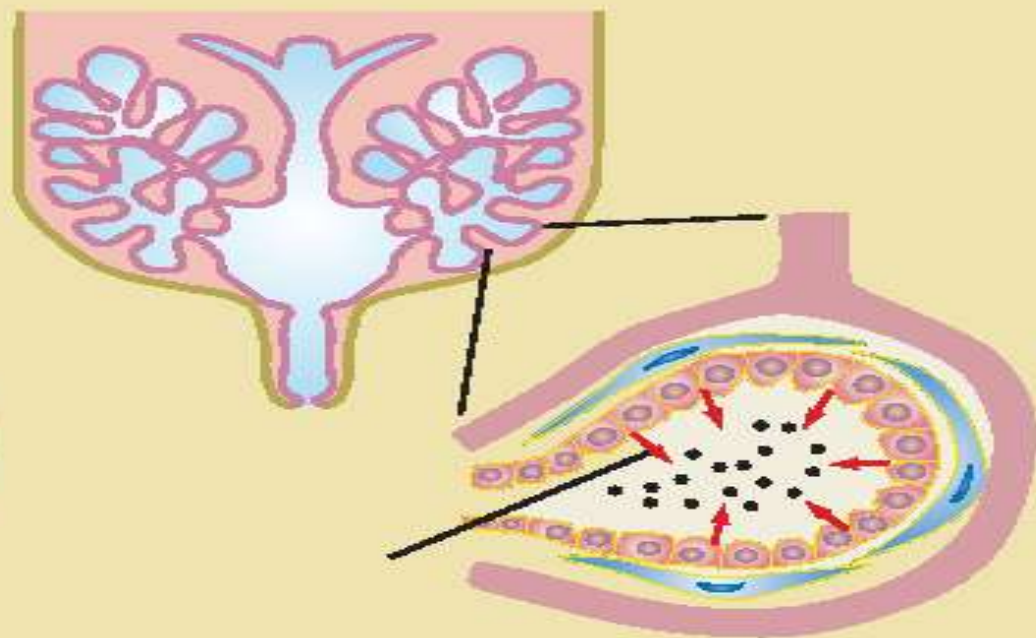
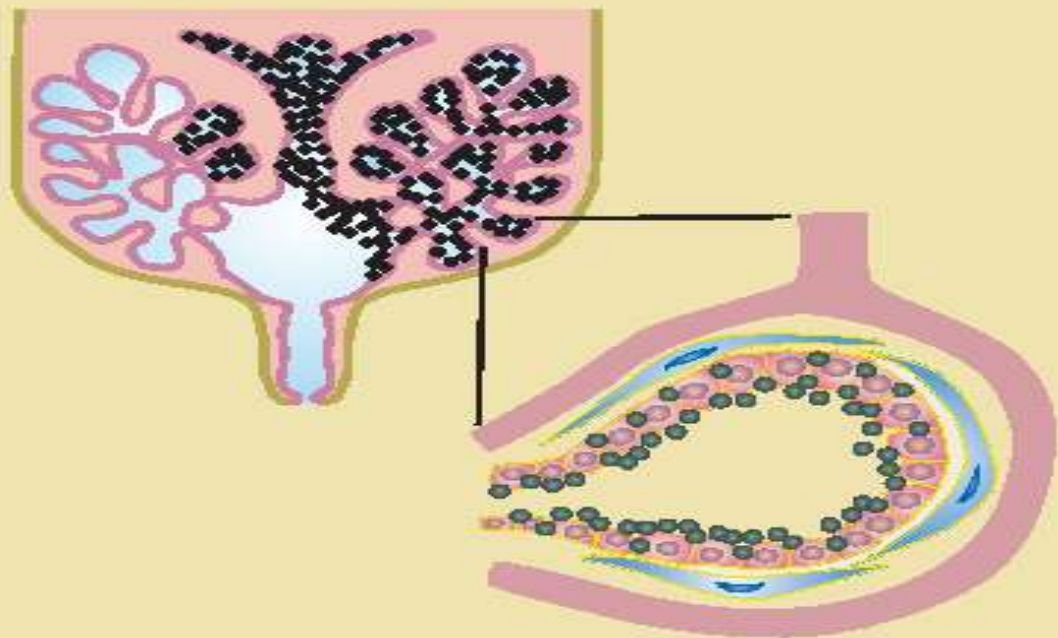
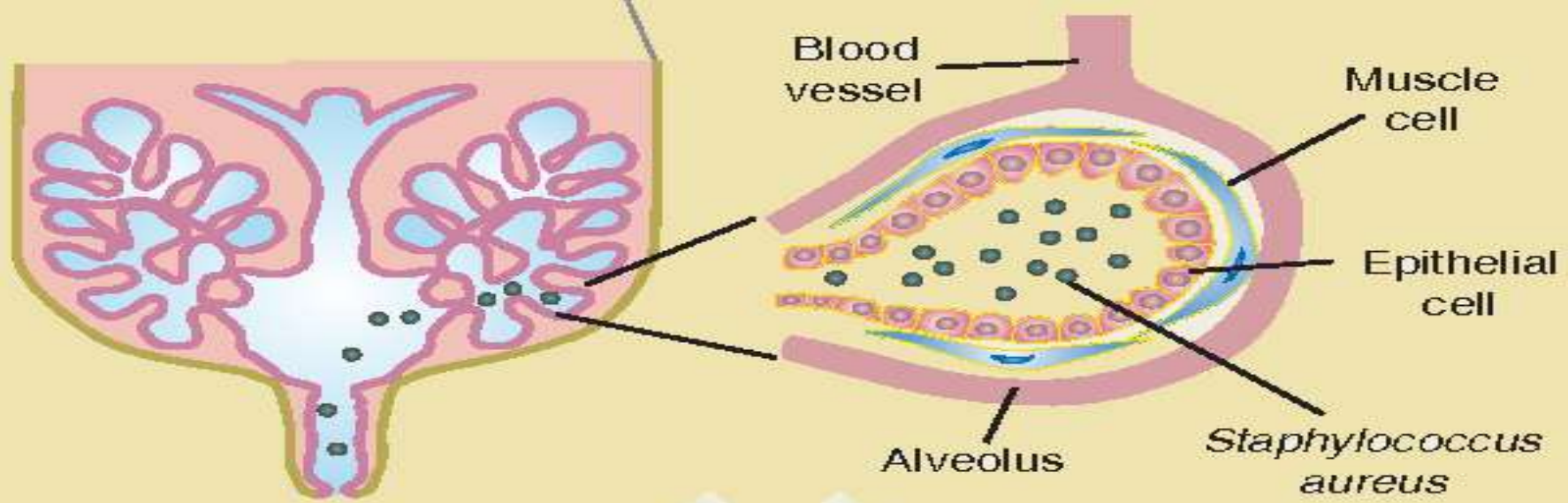
Inflammation of mammary gland accompanied by physical and pathological changes of udder and physical, chemical and bacteriological changes of milk with or without systemic reaction.



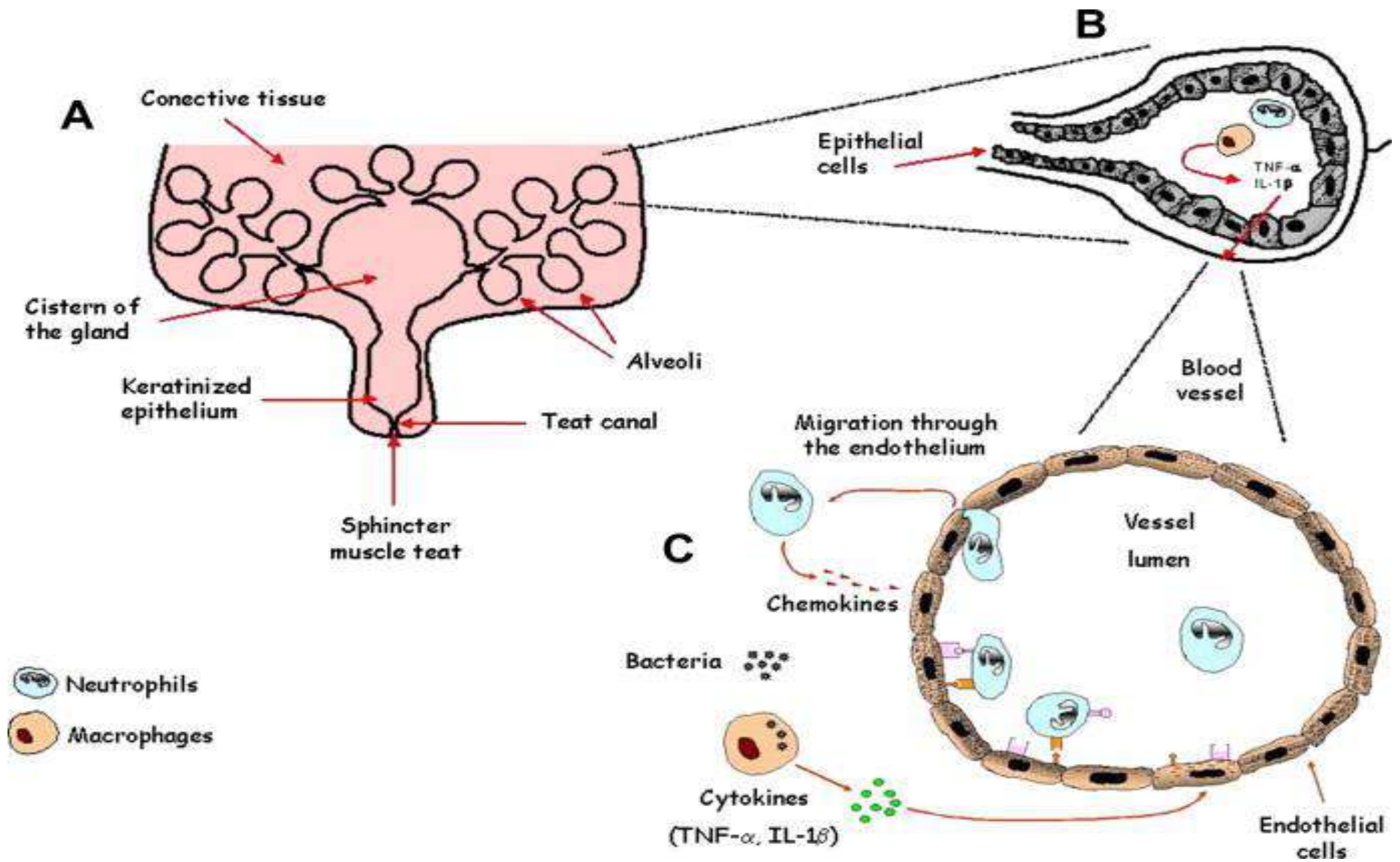
- **Bacteria 70%**
- **Yeast & molds 2%**
- **Unknown 28%**  
(physical - Trauma – Extreme weather.....).

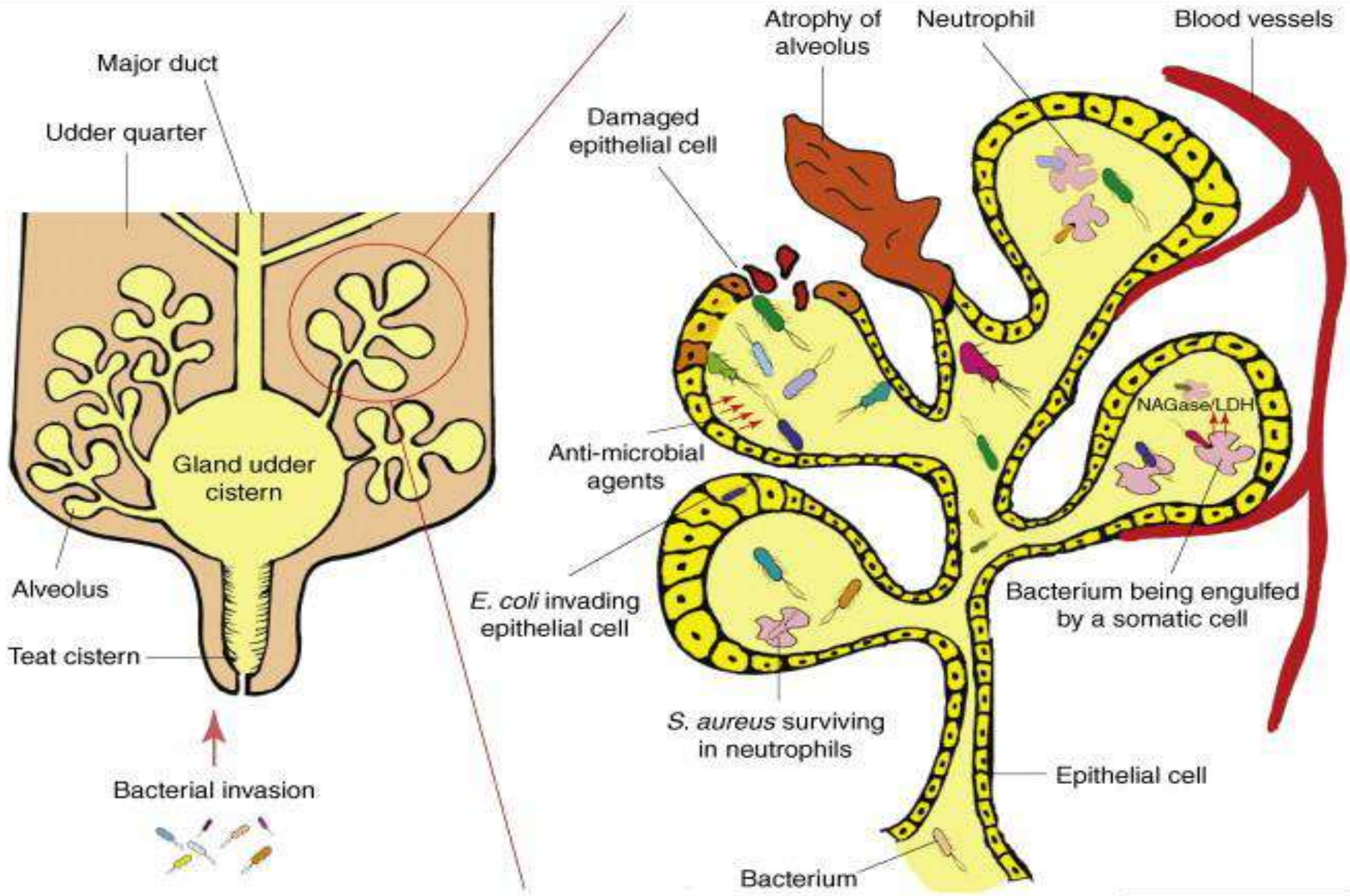


Milk is considered an excellent media for pathogen growth affected by many factors as the unhygienic condition of the farm, improper management, teat injuries as predisposing factors for mastitis.









# Changes associated with mastitis includes:

- Changes in the factory:

A. Gross lesion

B. Microscopic



- Changes in the yield product:

A. Quantity

B. Quality



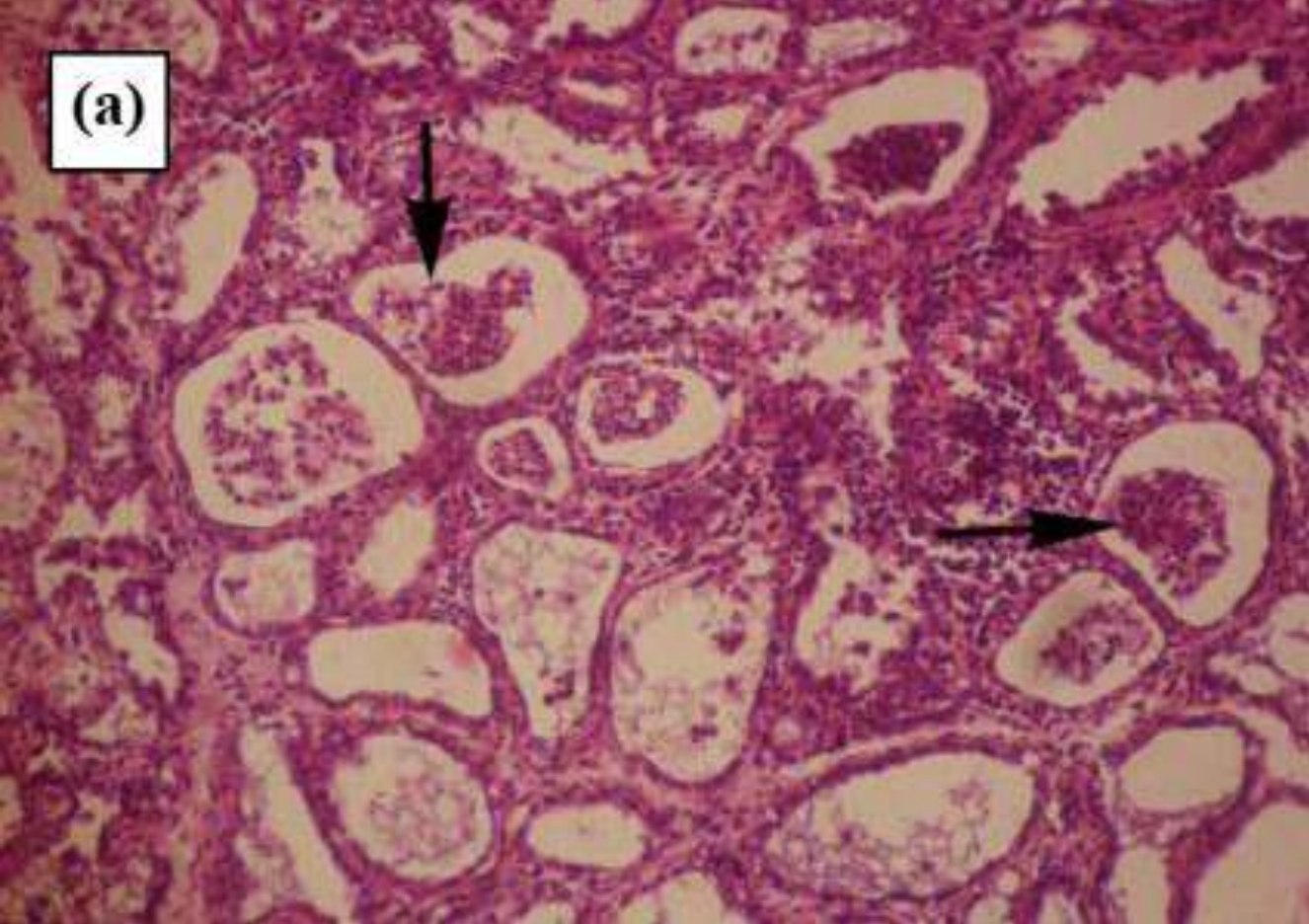
# Changes in udder tissues:

## A. Gross lesion:

**Clinical examination:** Inspection and palpation for detection of cardinal signs of inflammation (redness, hotness, pain and swelling).



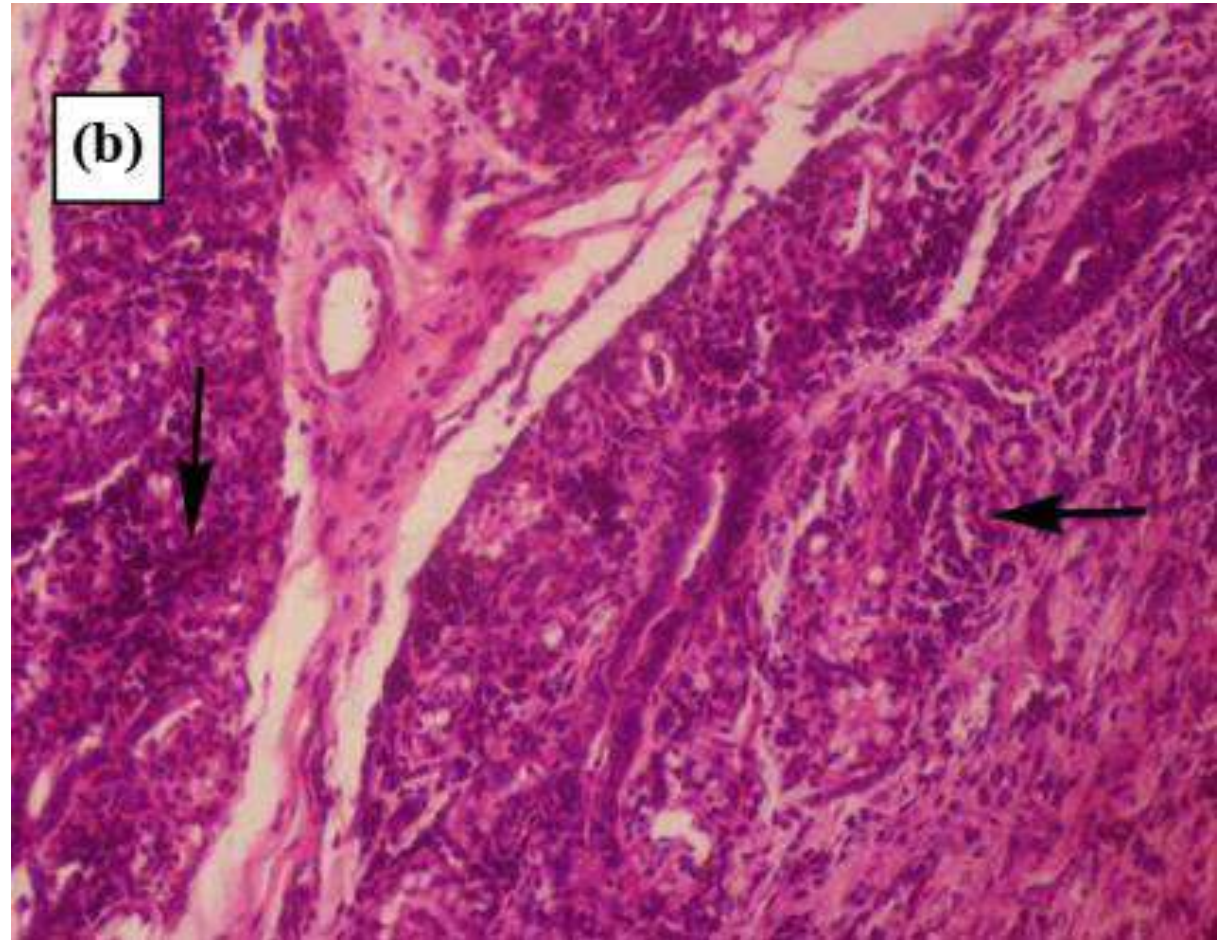
(a)



## B. Microscopic lesion

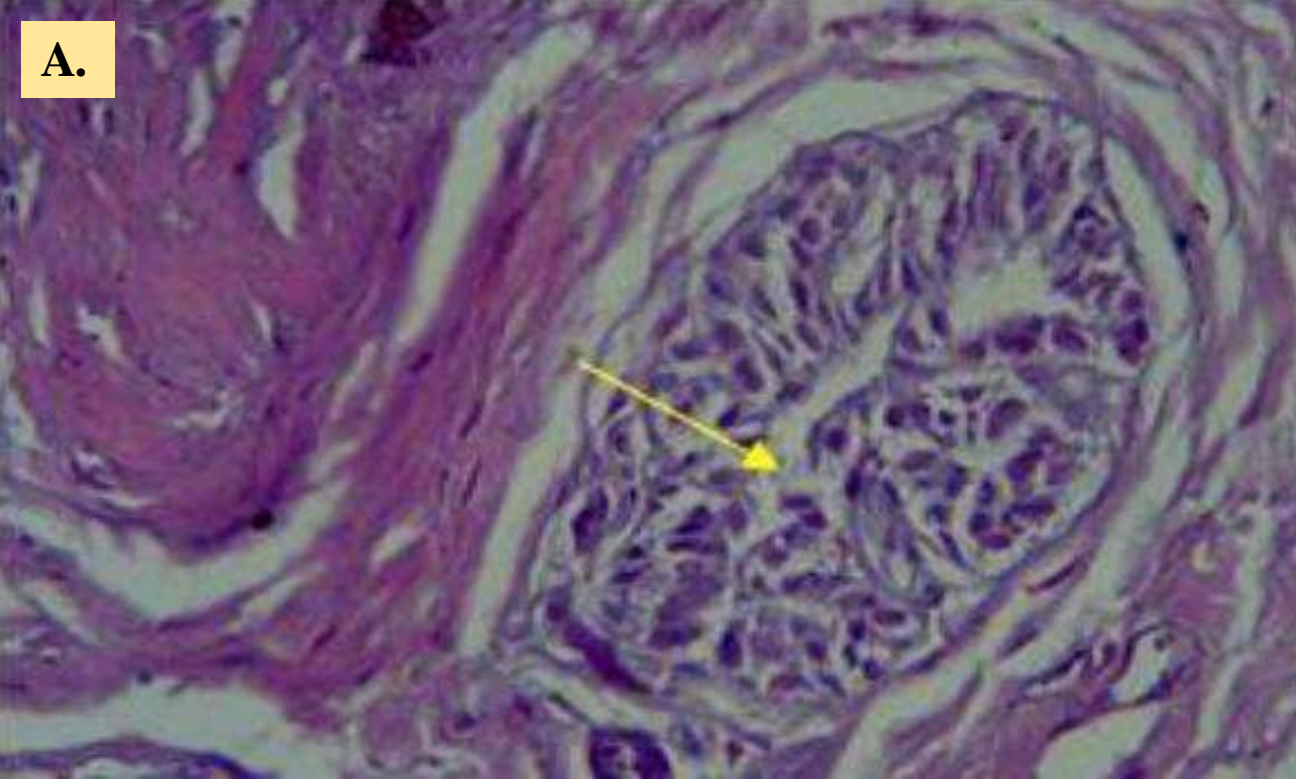
Sections of buffalo mastitis mammary tissue (a) showing atrophic alveoli containing cellular exudates and infiltration of mononuclear cells.

(b)



(b) showing disappearance of alveoli and connective tissue proliferation from mastitis buffalo. 200X, H & E.

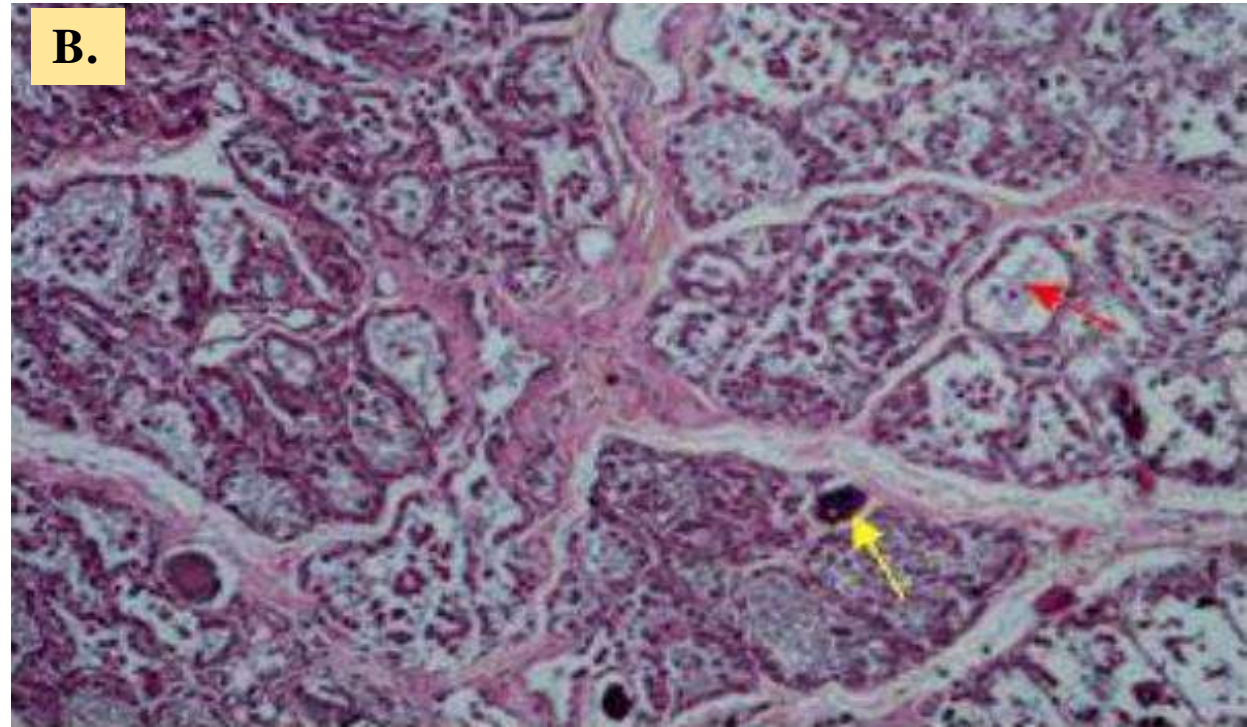
**A.**



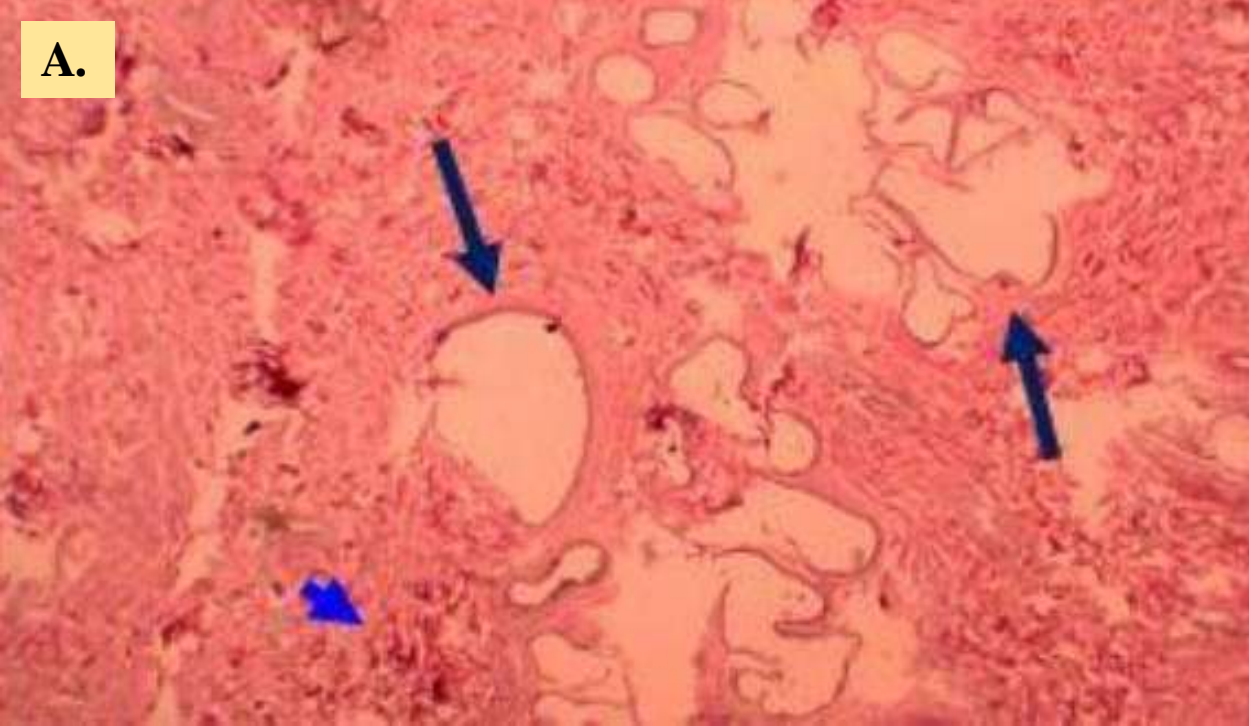
**A.** Goat mammary gland showing mild vacuolar degeneration of alveolar epithelium (H&E, X400).

**B.** Chronic mastitis showing vacuolar degeneration, destruction and desquamation of acinar epithelium. Interstitial fibrosis and corpora amylacea were present (H&E, X100).

**B.**



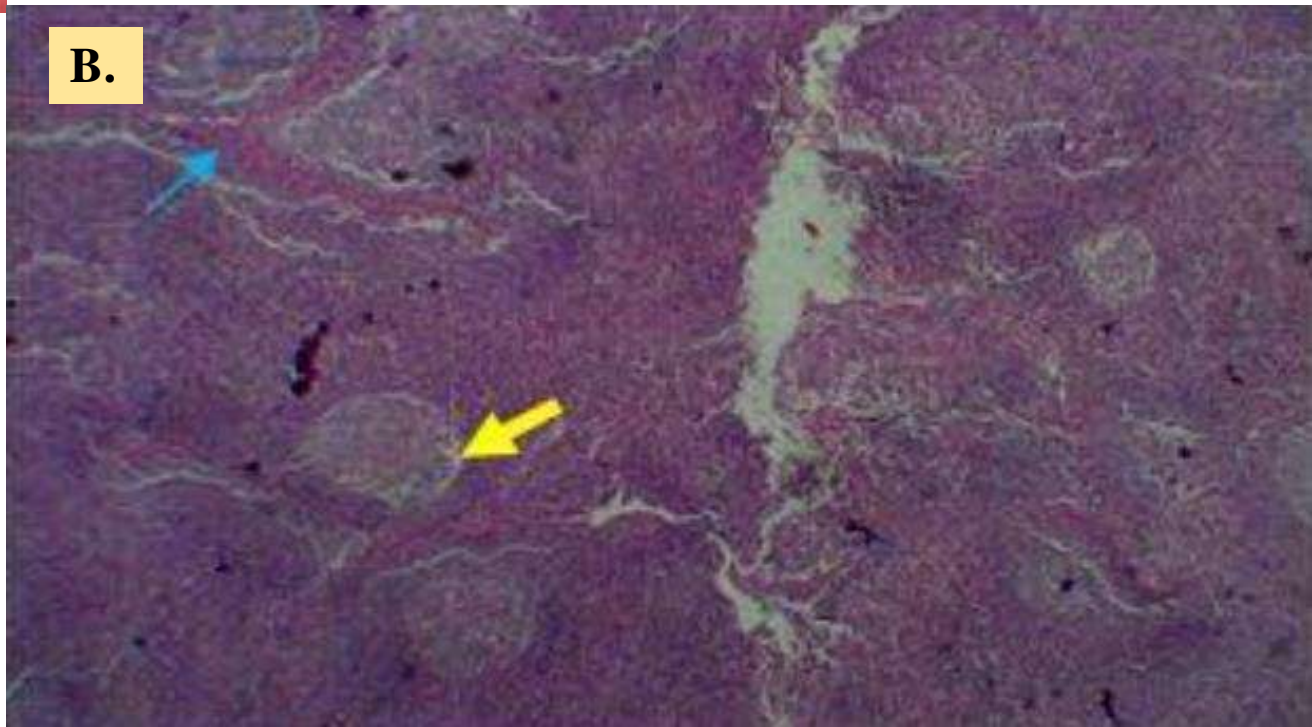
**A.**



A. Goat teat showing hyperkeratosis and cystic dilatation of lactiferous ducts (arrows). Focal mononuclear inflammatory cell infiltrations (arrowhead) mainly lymphocytes were seen (H&E, X40).

B. Goat supramammary lymph node affected with chronic mastitis showing lymphoid depletion with the destruction of some lymphoid follicles (yellow arrow) and extravasated blood (blue arrow) into cortical and medullary regions (H&E, X40)

**B.**

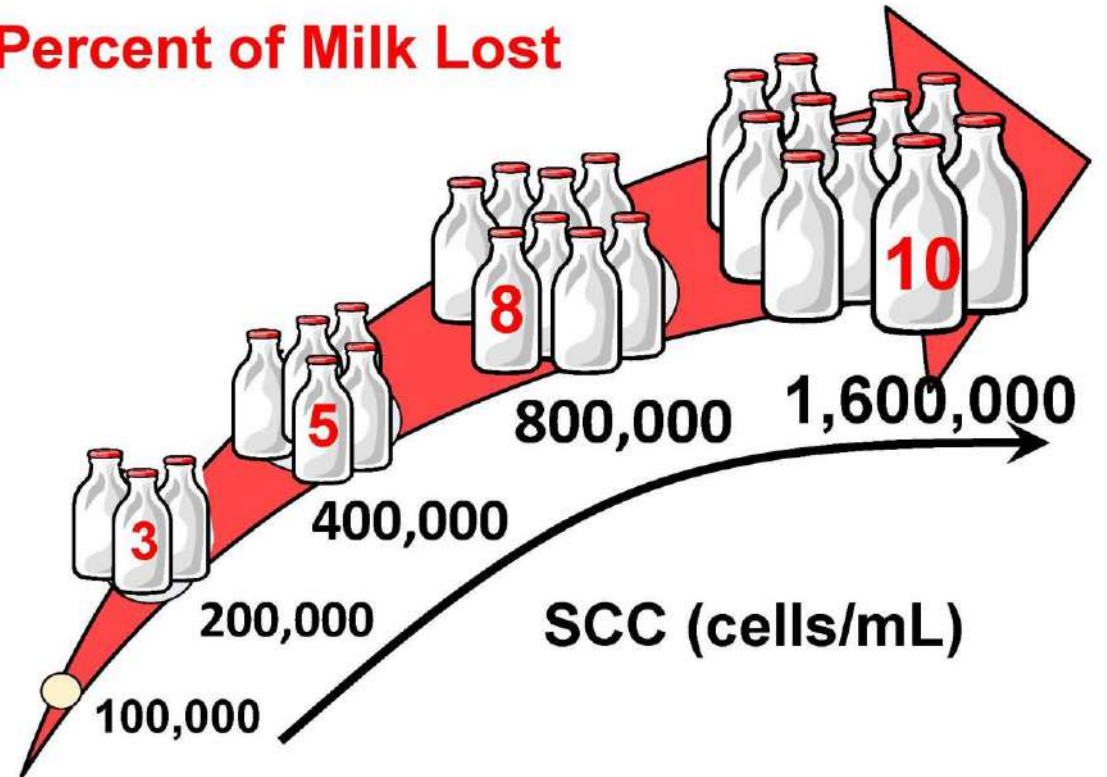


# Changes in secreted milk:

## A. Quantity:



## Percent of Milk Lost





- **Milk leukocytes count**  
Increase total somatic cell count
- **Decrease alveolar diameter ( $\mu\text{m}$ ).**
- **Decrease no. of alveoli/plate.**
- **Decrease alveolar cell number**



## B. Quality

- ✓ Normal function of the udder is disrupted. As a result, milk composition will change.
- ✓ The bacterial contamination of milk render it unfit for human consumption and may spread of diseases like tuberculosis, sore-throat, Q-fever, brucellosis, leptospirosis etc.
- ✓ Mastitis is associated with a decrease in lactose,  $\alpha$ -lactalbumin, and fat in milk.
- ✓ The higher levels of free fatty acids in high cell count milk may produce a rancid flavor.
- ✓ Mastitis causes a decrease in the concentration of milk lactose.
- ✓ Low quality milk in dairy biproducts.

### I- Physical changes

#### 1- Color

**Red:** Dicumarol toxicity, Leptospirosis, Staphylococcosis

**Green:** Corynebacterium

**Yellow:** Most of bacterial Mastitis.



## 2- Consistency:

*Abnormally:*

- ① Watery milk (decrease consistency) **Streptococcal mastitis.**
- ② Increase consistency **corynebacterial mastitis.**



## 3- Odor

*Abnormally*

- ① Putrefied odor: ***Gangrenous Mastitis, Dry cow Mastitis.***
- ② Fecal odor: ***Coliform Mastitis.***
- ③ Acetone odor: ***Ketosis.***
- ④ Rancid odor: ***Milking in bad ventilated place***
- ⑤ Antiseptic odor: ***excessive dipping of teat.***

## II- Chemical changes

### 1. pH:

Normally 6.4 – 6.8 (average 6.6).

### 2. minerals

**Chloride, potassium and sodium** ions released during mastitis in addition to inorganic and organic cations and anions.

### 3. Enzymes

- Many of the indigenous enzymes increase in milk during inflammation.
- The milk synthesis enzymes decrease & the inflammation enzymes increase.
- The phagocytes enzymes increase exponentially, as **NAGase**, and **catalase**.
- The blood enzymes increase, as **plasminogen** that activated locally to **plasmin**.
- Milk arginase activity used for the diagnosis of subclinical mastitis.



## **Area for research**

- **To what degree do we challenge Udder more and more?**

**In quantity and quality product**

- **How can the output of alveoli be maximized and retained?**
- **Why does udder tissue cope with cases of bacterial invasions successfully and fail in others?**

A close-up photograph of a cow's udder, showing the teats and the surrounding skin. The cow has white fur with brown patches. The text "THANK YOU" is overlaid in a bold, red, sans-serif font across the center of the image.

**THANK YOU**