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Popular Article

Mastitis

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DEFINITION

Mastitis is inflammation of the parenchyma of the mammary gland regardless of the cause. It is therefore characterized by a range of physical and chemical changes in the milk and pathological changes in the glandular tissue.

Important changes in the milk include: discoloration, the presence of clots and the presence of large numbers of leukocytes.

Important changes in the mammary gland: swelling, heat, pain and edema.

ETIOLOGY:

Bovine mastitis is associated with many different infectious agents, commonly divided into those causing

Contagious Mastitis: which are spread from infected quarters to other quarters and cows.

Opportunistic Mastitis: those that are normal teat skin inhabitants and cause

Environmental Mastitis: which are usually present in the cow's environment and reach the teat from that source.

Contagious Pathogens: *Staphylococcus aureus*, *Streptococcus agalactiae*, *Mycoplasma bovis* and *Corynebacterium bovis*

Teat Skin Opportunistic Pathogens: coagulase-negative staphylococci

Environmental Pathogens: environmental *Streptococcus* spp. including *Streptococcus uberis* and *Streptococcus dysgalactiae*, which are the most prevalent; less prevalent is *Streptococcus equinus*.

Environmental coliforms: include the Gram-negative bacteria *Escherichia coli*, *Klebsiella* spp. and *Enterobacter* spp., and *Arcanobacterium pyogenes*



Methods of transmission

1. Teat canal
2. Infection originating from either an infected udder or the environment;
3. Inert carrier: milking machine liners, milkers' hands, wash cloths.
4. Flies
5. Contact

Risk Factors

Age and parity: The prevalence of infected quarters increases with age, peaking at 7 years.

Stage of lactation: Most new infections occur during the early part of the dry period and in the first 2 months of lactation.

Breed: Generally, the incidence of mastitis is greater in Holstein-Friesians than in Jerseys

Udder hygiene: Dirty udders are associated with increased prevalence of intra mammary infection due to contagious pathogens.

Nutritional status: Vitamins E and A and selenium may be involved in resistance to certain types of mastitis.

Zoonotic potential

Bacterial contamination of milk from affected cows may render it unsuitable for human consumption by causing food poisoning. Tuberculosis, streptococcal sore throat and brucellosis may be spread in this way.

PATHOGENESIS

Invasion: is the stage at which pathogens move from the teat end to the milk inside the teat canal.

Infection: is the stage in which the pathogens multiply rapidly and invade the mammary tissue.

Inflammation: follows infection and represents the stage at which clinical mastitis occurs with varying degrees of clinical abnormalities of the udder.

Abnormalities of the udder include marked swelling, increased warmth and, in acute and per-acute stages, gangrene in some cases and abscess formation and atrophy of glands in chronic stages.

- The most significant sub-clinical abnormality of the milk is the increase in the somatic cell count.
- Milk somatic cells in a healthy gland consist of several cell types, including neutrophils (< 11 %), macrophages (66-88%), lymphocytes (10-27%), and a smaller percentage of epithelial cells (0 -7%)



- Neutrophils are the predominant cell type found in mammary tissues and secretions during inflammation.
- In the healthy lactating mammary gland, the scc is less than 100 000 cells/mL of milk. During intramammary infection, the glandular sec can increase to more than 1000000 cells/mL.

CLINICAL FINDINGS

3 categories of clinical mastitis: abnormal milk, abnormal gland and an abnormal cow.

Severity is characterized as:

Per-acute: severe inflammation, with swelling, heat and pain of the quarter, with a marked systemic reaction, which may be fatal

Acute: severe inflammation without a marked systemic reaction

Sub-acute: mild inflammation with persistent abnormality of the milk.

Abnormal milk:

Blood-staining or wateriness Clots or flakes. Blood clots are of little significance in a mastitis case, neither are the small plugs of wax that are often present in the milk during the first few days after calving (in heifers). Flakes at the end of milking may be indicative of mammary tuberculosis in cattle.

Abnormal gland:

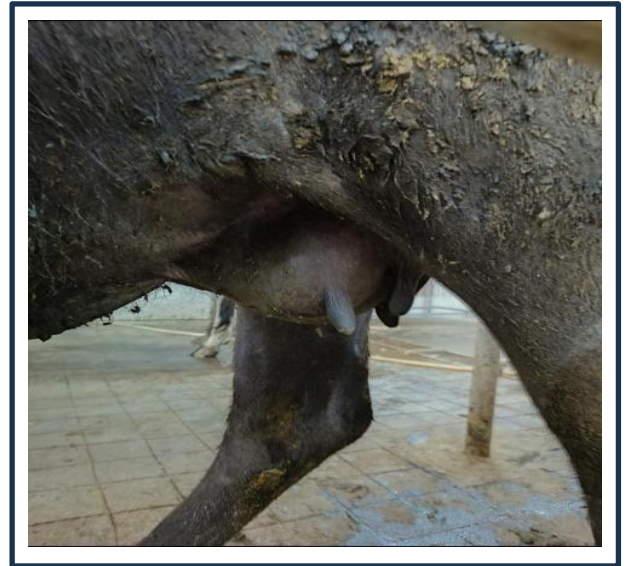
Abnormalities of size and consistency of the quarters may be seen and felt

The supra-mammary lymph nodes should also be palpated for evidence of enlargement.

The terminal stage of chronic mastitis is atrophy of the gland. On casual examination an atrophied quarter may be classed as normal because of its small size, while the normal quarter is judged to be hypertrophic. Careful palpation may reveal that, in the atrophic quarter, little functioning mammary tissue remains.

Abnormal cow (systemic response):

Toxemia, fever, tachycardia, ruminal stasis, depression, recumbency and anorexia may or may not be present, depending on the type and severity of the infection.



DIAGNOSIS:

Detection at the herd level

The prevalence of sub-clinical mastitis or intramammary infection is monitored by determining the bulk tank milk SCC and by culturing bulk tank milk. These two methods are recommended to diagnose the presence and prevalence of mastitis pathogens on a herd basis.

Detection at the individual cow level

Individual cow examination and application of an indirect (screening) test for infection, such as the SCC of a composite milk sample.

Culture of individual cow milk - Individual quarter samples are preferred.

If individual quarter samples are collected, screw-cap vials are most satisfactory. If there is delay between the collection of samples and laboratory examinations, the specimens should be refrigerated or frozen. Freezing of milk samples appears to have variable effects on bacterial counts, depending on the bacteria.

Indirect tests for sub-clinical mastitis

California Mastitis Test

Increases in electrical conductivity of milk

Increases in the activity of cell associated enzymes (such as NAGase) in milk.

ELISA tests to detect neutrophil components

Of these indirect tests, only the CMT and electrical conductivity can be used cowside, with CMT providing a more accurate screening test than electrical conductivity.



The CMT is also known as the Rapid Mastitis test, Schalm test or Mastitis-N-K test, was developed in 1957.



Procedure:

Add milk in 4 chambers of plastic paddle



reagent in equal amounts Cell lysis



Gel is formed (due to increased leukocytes)



More the gel and more is the infection



California Mastitis Test Scores			
Correlation of CMT Score with Somatic Cell Count			
CMT Score	Somatic Cell Range		
N	0	to	200,000
T	200,000	to	400,000
1	400,000	to	1,200,000
2	1,200,000	to	5,000,000
3	Over 5,000,000		
Jasper, D.E. 1967. Proceedings of National Mastitis Council (adapted)			

N-Negative T- Trace

The NAGase test:

The NAGase test is based on the measurement of a cell-associated enzyme (N- acetyl-B- D- glucosaminidase) in the milk, a high enzyme activity indicating a high cell count.

NAGase is an intracellular lysosomal enzyme derived primarily from neutrophils but also from damaged epithelial cells.

Biopsy of mammary tissue

A biopsy of mammary tissue can be used for histological and biochemical evaluation in research studies.

TREATMENT

Antibiotics - penicillin, Cephalosporin, Gentamicin, Tetracyclines Pulv. Mammidium + jaggery (As an adjuvant to antibiotic therapy) @50gm daily for 4 days Intramammary infusions - Mastiwok- Cefoperazone sodium - Mammicef

Topical: Mastilep spray & gel - used as prophylactic and treatment for mastitis

- Wisprec advanced cream
- Inflamin vet cream



Supportive therapy:

Supportive treatment, including the intravenous administration of large quantities of isotonic crystalloid fluids, is indicated in cattle with severe systemic illness.

Dry cow therapy

Is the use of intramammary antimicrobial therapy immediately after the last milking of lactation and is an important component of an effective mastitis control program. Intramammary infusions at drying off decrease the number of existing infections and prevent new infections during the early weeks of the dry period.

Blanket dry cow therapy is treatment of all four quarters at drying off, compared to selective dry cow therapy based on treatment of only those quarters that are infected

Permanently drying off chronically affected quarters

If a quarter does not respond to treatment and is classified as incurable, the affected animal should be isolated from the milking herd or the affected quarter may be permanently dried off by inducing a chemical mastitis.

The best method for permanently drying off a quarter is infusion of 120 mL of 5% povidone-iodine solution (0.5% iodine) after complete milk-out and administration of flunixin meglumine (1 mg/kg BW, intravenously). This causes permanent cessation of lactation in the quarter but does not alter total milk production by the cow.

