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Mastitis in Dairy Animals: Recognize Early, Treat Wisely and Prevent Milk Losses

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Key Points

- Mastitis is one of the most important production-limiting diseases of dairy animals, causing reduced milk yield, altered milk quality and increased treatment costs.
- Subclinical mastitis can remain unnoticed while causing significant milk-production losses and increased somatic cell count.
- Early diagnosis using clinical examination, California Mastitis Test (CMT), somatic cell count (SCC) and, where appropriate, milk culture helps improve treatment decisions.
- Treatment should be based on the severity of disease, likely pathogens, veterinary assessment and responsible antimicrobial use.
- Clean milking practices, proper udder hygiene, teat disinfection, dry-cow management and a clean environment are the foundation of mastitis prevention.

Abstract

Mastitis is an inflammatory disease of the mammary gland and is one of the most important health and economic problems affecting dairy cattle and buffaloes. It is commonly associated with bacterial infection, although other infectious and non-infectious factors may also contribute. Mastitis may occur in clinical or subclinical forms. Clinical mastitis is characterized by visible abnormalities in the udder and milk and may be accompanied by systemic illness, whereas subclinical mastitis produces no obvious clinical signs but can substantially reduce milk yield and quality. Diagnosis involves clinical examination, California Mastitis Test (CMT), somatic cell count and, when indicated, bacteriological culture and antimicrobial susceptibility testing. Treatment depends on the severity and type of mastitis and should follow veterinary assessment and principles of responsible antimicrobial use. Supportive therapy is important in severe cases. Prevention depends primarily on hygienic milking, teat disinfection, proper milking-machine management, environmental hygiene, early detection and appropriate dry-cow management. Effective mastitis control can improve animal health, milk quality, farm profitability and antimicrobial stewardship.

Keywords: Mastitis, dairy cattle, buffalo, clinical mastitis, subclinical mastitis, CMT, somatic cell count, milk culture, udder health

Introduction

Milk production is closely linked to the health of the mammary gland. Among the diseases affecting dairy animals, mastitis remains one of the most important causes of economic loss because it reduces milk production, affects milk quality and increases treatment and management costs.

Mastitis is an inflammatory condition of the mammary gland, most commonly associated with bacterial infection. Trauma, poor udder hygiene, environmental contamination, teat-end damage and inadequate milking practices can further increase the risk of disease. Mastitis can affect both cows and buffaloes and may occur at any stage of lactation, although the risk may increase around calving and during periods of high milk production.

The disease is particularly challenging because not all cases are clinically obvious. Subclinical mastitis may persist for weeks or months without visible changes in the udder or milk, resulting in production losses before the farmer recognizes a problem. Effective control therefore requires early detection, appropriate diagnosis, rational treatment and consistent preventive management.

What is Mastitis?

Mastitis is inflammation of one or more quarters of the mammary gland. The inflammatory response may result from bacterial infection or may be associated with other predisposing factors such as trauma, poor hygiene and environmental contamination.

Common mastitis-associated pathogens include *Staphylococcus* spp., *Streptococcus* spp. and *Escherichia coli*, among others. The relative importance of individual pathogens varies between farms and production systems.

Clinical and Subclinical Mastitis

1. Clinical Mastitis

Clinical mastitis produces visible abnormalities in the milk and/or udder and may be accompanied by systemic signs.

Udder-related signs

- Swelling of the affected quarter
- Pain or tenderness
- Increased udder temperature
- Redness or firmness
- Asymmetry of mammary quarters

Milk abnormalities

- Flakes or clots
- Watery or discoloured milk
- Blood or altered colour
- Foul odour in some infections
- Reduced milk quantity

Systemic signs in severe cases

- Fever or abnormal body temperature
- Depression
- Loss of appetite
- Dehydration
- Weakness
- Reduced rumination
- Marked reduction in milk production
- Recumbency in severe cases

Severe mastitis accompanied by systemic illness requires prompt veterinary attention.

2. Subclinical Mastitis

Subclinical mastitis is particularly important because the udder may appear normal and the milk may show no obvious abnormality to the naked eye. Nevertheless, persistent inflammation or infection can reduce milk production and affect milk quality.

Common indicators include:

- Increased somatic cell count
- Reduced milk yield
- Changes in milk composition
- Persistent infection
- Recurrence of infection

Because there are no obvious clinical signs, regular screening is important for identifying affected animals and quarters.

Major Risk Factors

Several factors can increase the risk of mastitis:

- Poor udder hygiene
- Dirty or wet bedding
- Contaminated housing
- Improper milking technique
- Inadequate teat disinfection

- Teat-end injury
- Mechanical trauma
- Overcrowding
- Poor milking-machine maintenance
- Incomplete or excessive milking
- Milk leakage between milkings
- Previous history of mastitis
- Poor nutrition and general health
- Inadequate dry-cow management

Mastitis should therefore be considered a management-related disease as well as an infectious disease. Improving hygiene, housing, milking practices and general animal health is essential for long-term control.

Clinical Signs

The severity of mastitis can range from mild local inflammation to severe systemic disease. The main signs include changes in the udder, abnormalities in milk and, in severe cases, systemic illness.

The udder may become swollen, hot, painful or firm, and individual quarters may become visibly asymmetric. Milk may contain flakes or clots or may become watery, discoloured or reduced in quantity.

In severe cases, animals may develop fever, depression, loss of appetite, dehydration, weakness, reduced rumination and recumbency. Such cases require immediate veterinary attention.

Diagnosis

Accurate diagnosis helps distinguish clinical from subclinical mastitis, identify affected quarters and guide appropriate treatment decisions.

1. Clinical Examination

The udder and all four quarters should be examined carefully for:

- Udder size and symmetry
- Temperature
- Pain and tenderness
- Consistency of mammary tissue
- Teat condition
- Milk appearance
- General health of the animal

A proper clinical examination is essential because abnormal milk or udder inflammation may also occur due to conditions other than infectious mastitis.

2. California Mastitis Test (CMT)

The California Mastitis Test is a simple and practical screening test for subclinical mastitis. It can be performed quarter-wise and helps identify increased somatic cell activity in milk.

CMT is particularly useful for:

- Screening apparently healthy animals
- Identifying affected quarters
- Monitoring herd udder health
- Selecting milk samples for further investigation

CMT results should be interpreted together with clinical findings and herd history.

3. Somatic Cell Count (SCC)

Somatic cell count is an important indicator of mammary gland inflammation. An increased SCC can indicate intramammary inflammation, although it should not be interpreted as stand-alone proof of bacterial infection. SCC is useful for monitoring individual animals as well as herd-level udder health.

4. Milk Culture and Antimicrobial Susceptibility Testing

Milk culture can help identify the causative microorganism. When clinically appropriate, antimicrobial susceptibility testing can assist in selecting an effective antimicrobial.

Culture is particularly valuable in:

- Recurrent mastitis
- Severe mastitis
- Treatment failures
- Herd outbreaks
- Cases involving suspected resistant pathogens
- Situations where antimicrobial selection is uncertain

Differential Diagnosis

Abnormal milk or udder inflammation may occur due to several conditions. Differential diagnoses may include:

- Traumatic udder injury
- Teat injury
- Udder oedema
- Abscess formation
- Other inflammatory conditions

- Physiological changes associated with parturition

A proper clinical examination is therefore essential before treatment is initiated.

Therapeutic Management

The treatment plan should depend on the severity of mastitis, affected quarter, suspected or confirmed pathogen, lactation status and general health of the animal.

1. Antimicrobial Therapy

Antimicrobials may be required in selected bacterial mastitis cases. However, antimicrobial treatment should be based on veterinary assessment and, where appropriate, culture and susceptibility results.

Important principles include:

- Use the appropriate drug for the suspected or confirmed pathogen.
- Use the correct dose and treatment duration.
- Follow the approved product label.
- Observe milk and meat withdrawal periods.
- Avoid unnecessary antimicrobial use.
- Reassess animals that fail to respond to treatment.

Routine and indiscriminate use of antibiotics can contribute to antimicrobial resistance and may not improve treatment outcomes in every case.

2. Intramammary Treatment

Intramammary therapy may be appropriate for selected cases of mastitis, depending on the pathogen, severity of disease and approved veterinary product. Proper teat-end preparation and hygienic administration are essential to avoid introducing additional pathogens into the mammary gland.

3. Supportive Therapy

Supportive treatment is particularly important in moderate to severe cases and may include:

- Fluid and electrolyte therapy
- Anti-inflammatory or analgesic treatment
- Correction of dehydration
- Nutritional support
- Monitoring of body temperature
- Monitoring of milk production and general condition

4. Severe Mastitis

Animals showing systemic illness require prompt veterinary attention. Important considerations include:

- Hydration status
- Circulation
- Body temperature
- Electrolyte disturbances
- Acid-base status
- Udder condition
- Concurrent disease

Early and appropriate intensive treatment can improve the chances of recovery.

Milk Handling During Mastitis

Milk from affected quarters should be handled separately according to veterinary advice and applicable food-safety regulations. Milk containing antimicrobial residues must not enter the human food chain during the prescribed withdrawal period.

Affected animals should be clearly identified, and accurate treatment records should be maintained to prevent accidental mixing of unsuitable milk with saleable milk.

Prevention and Control

Prevention is the most cost-effective approach to mastitis control. A successful control programme should focus on hygienic milking, teat health, equipment maintenance, environmental cleanliness, dry-cow management and regular herd monitoring.

1. Clean Milking Practices

Before milking:

- Clean visibly dirty teats appropriately.
- Use clean towels or individual disposable towels.
- Ensure the milker's hands are clean.
- Keep milking equipment clean.

Milking should be performed calmly and hygienically.

2. Teat Disinfection

Appropriate pre-milking and post-milking teat disinfection can reduce the transmission of mastitis pathogens. The disinfectant should be used at the correct concentration and according to product instructions.

3. Proper Milking Technique

Avoid:

- Rough handling of the udder
- Excessive squeezing
- Incomplete milking
- Over-milking

- Milking animals with dirty hands or equipment

Proper milking technique helps minimize teat injury and contamination.

4. Milking Machine Management

Where machine milking is practiced:

- Maintain appropriate vacuum and pulsation settings.
- Check liners and replace worn components.
- Clean and sanitize equipment properly.
- Identify and correct abnormal machine function.

Poorly maintained equipment can contribute to teat-end damage and mastitis transmission.

5. Environmental Hygiene

The housing environment should be maintained with:

- Clean bedding
- Dry resting areas
- Good drainage
- Adequate ventilation
- Clean feeding and watering areas

Wet and dirty housing increases environmental exposure to mastitis pathogens.

Dry-Cow Management

The dry period is an important opportunity for udder recovery and prevention of new infections.

Important measures include:

- Maintaining good body condition
- Providing balanced nutrition
- Monitoring udder health before drying off
- Using approved dry-cow therapy when indicated
- Maintaining a clean and dry environment
- Monitoring animals during the dry period and around calving

Dry-cow therapy should be implemented under veterinary guidance and according to current herd-level mastitis-control recommendations.

Herd-Level Mastitis Control

Successful mastitis control requires regular monitoring rather than treating individual cases alone. Useful herd-level indicators include:

- Clinical mastitis cases
- CMT results

- Somatic cell count trends
- Milk yield
- Treatment outcomes
- Recurrence of infection
- Pathogen distribution
- Culling associated with chronic mastitis

Maintaining proper records helps identify recurring problems and evaluate whether control measures are working.

Economic Importance

Mastitis causes economic losses through:

- Reduced milk production
- Altered milk quality
- Discarded milk
- Treatment costs
- Veterinary expenses
- Increased labour requirements
- Premature culling
- Reduced productive life
- Increased risk of antimicrobial resistance

Subclinical mastitis may be particularly costly because production losses can continue without obvious clinical signs.

Practical Approach for Dairy Farmers

A simple herd-level approach can help reduce mastitis:

Observe → Detect → Test → Treat appropriately → Record → Prevent recurrence

Farmers should routinely observe milk appearance and udder health and report abnormalities at the earliest opportunity. Regular CMT screening can help identify subclinical cases before substantial production losses occur.

Treatment should be guided by veterinary assessment, while prevention should focus on hygiene, proper milking practices, environmental management, teat health, dry-cow management and continuous herd monitoring.

Conclusion

Mastitis is not merely an udder infection; it is a major animal-health, production and economic problem in dairy farming. Both clinical and subclinical mastitis can reduce milk production, affect milk quality and adversely affect farm profitability.

Early recognition, appropriate diagnostic testing and rational treatment are essential for managing individual cases. However, long-term control depends mainly on prevention through hygienic milking, proper teat disinfection, clean housing, effective milking-machine management, appropriate dry-cow management and regular herd monitoring.

A well-designed mastitis-control programme protects animal health, maintains milk quality, reduces unnecessary antimicrobial use and supports the long-term productivity and profitability of dairy farms.

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