



Mastitis in Dairy Cattle: From Early Detection to Prevention

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Mastitis is one of the most important health challenges in dairy cattle, affecting milk production, milk quality, animal welfare and farm profitability. It is an inflammatory condition of the mammary gland, usually caused by bacterial infection, and occurs in both clinical and subclinical forms. While clinical mastitis is characterised by visible changes in milk and udder tissues, subclinical mastitis often remains unnoticed despite its negative effects on productivity and udder health. Early detection through regular udder examination, the California Mastitis Test (CMT), somatic cell count (SCC) and bacteriological investigation can support timely and appropriate management. Effective prevention depends on hygienic milking practices, clean and dry housing, proper milking-equipment maintenance, teat disinfection and sound dry-period management. Responsible antibiotic use, guided by veterinary assessment and laboratory findings where appropriate, is essential for effective treatment and reducing antimicrobial resistance. This article discusses the causes, early detection, prevention and management of bovine mastitis, highlighting practical strategies to improve udder health and promote sustainable dairy farming in India.

Keywords: Bovine mastitis, dairy cattle, subclinical mastitis, California Mastitis Test, somatic cell count, udder health, antimicrobial resistance.

Healthy Udder, Healthy Herd: Why Mastitis Deserves Attention

Milk production is vital to the livelihoods of millions of dairy farmers in India. Mastitis is a major udder-health problem that reduces milk yield and quality, compromises animal welfare and increases farm expenditure. It may present visible symptoms or remain undetected, causing significant economic losses. Mastitis is inflammation of the mammary gland, usually caused by bacterial infection. Its occurrence is influenced by milking hygiene, environmental conditions, stage of lactation and previous infections. Effective control requires early detection, preventive management and appropriate veterinary care. A 2024 review highlighted the importance of bedding hygiene in preventing environmental mastitis, while Indian research has explored practical methods for detecting subclinical infections [1, 2].

What Is Mastitis, and How Does It Develop?

The bovine udder consists of four mammary quarters. Mastitis develops when pathogens enter through the teat canal, triggering inflammation that can damage mammary tissue and reduce milk production. Common causative organisms include *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus uberis*, *Escherichia coli* and *Klebsiella* species.

Mastitis pathogens are broadly classified into two groups:

1. **Contagious pathogens:** Spread mainly between cows during milking through infected milk, contaminated hands and equipment.
2. **Environmental pathogens:** Found in bedding, manure, soil and contaminated water, exposing cows to infection through teat-end contact.

Identifying the likely source of infection helps develop effective herd-control strategies.

Clinical and Subclinical Mastitis: Mastitis occurs in two main forms, depending on the presence of visible signs.

Clinical Mastitis: It causes visible changes in milk and the udder. Milk may contain clots, flakes or watery secretions, while the affected quarter may become swollen, warm and painful. Severe cases can involve fever, weakness, dehydration and reduced appetite, requiring urgent veterinary attention.

Subclinical Mastitis: It produces no obvious changes in milk or udder appearance but causes inflammation and often increases the somatic cell count (SCC). Somatic cells, primarily immune cells and shed mammary epithelial cells, increase in response to inflammation. Subclinical infections can reduce milk yield and quality while remaining undetected. Regular udder-health monitoring is therefore essential, particularly in herds with recurrent infections.

Early Detection and Diagnosis

Early diagnosis helps identify infected cows, guide treatment and reduce transmission.

Common detection methods include:

1. **Milk and udder examination:** Check for swelling, pain, teat injuries and abnormal milk before milking. A strip cup can help identify clots, flakes or watery secretions.
2. **California Mastitis Test (CMT):** A practical, low-cost screening test that detects changes in milk consistency associated with increased somatic cell counts. It does not identify the causative pathogen.
3. **Somatic Cell Count (SCC):** Measures cells associated with udder inflammation. Individual-cow and quarter-level testing can help identify persistent problems, although an elevated SCC does not confirm the responsible microorganism.
4. **Bacterial culture and antimicrobial susceptibility testing:** Laboratory analysis identifies pathogens and may guide treatment, particularly in recurrent infections, severe cases and treatment failures. A 2025 Indian study reported better diagnostic performance for SCC than CMT and electrical conductivity across the measures evaluated, supporting its role in mastitis screening [3].
5. **Emerging technologies:** Milk-conductivity sensors, automated milking systems and infrared thermography can support early detection. However, they should complement veterinary examination and appropriate diagnostic testing.

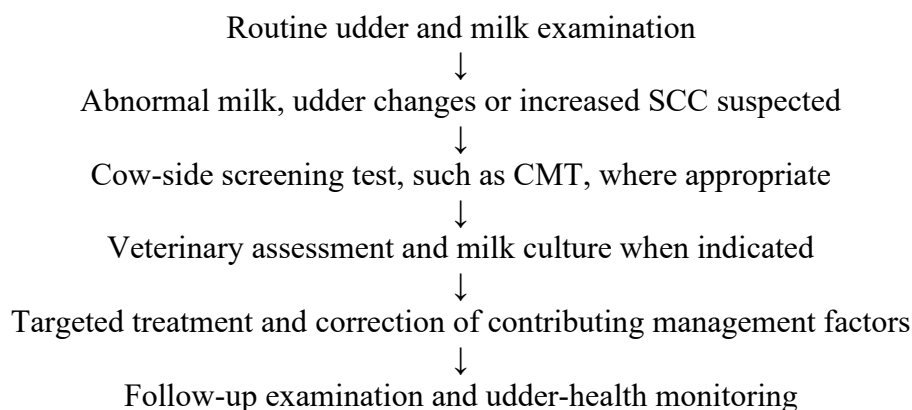


Figure 1. Suggested workflow for identifying and managing suspected mastitis. Clinical cases with systemic illness require prompt veterinary assessment.

Figure 1. A practical pathway for mastitis detection

Prevention Begins at the Milking Shed

Good milking hygiene is essential for preventing mastitis and maintaining milk quality. Consistent management practices can reduce pathogen transmission and improve udder health.

- **Clean hands and equipment:** Maintain hand hygiene and clean milking equipment regularly. Inspect machines and replace damaged liners when necessary.

- **Proper teat preparation:** Clean teats when required and dry them thoroughly using individual clean towels to prevent cross-contamination.
- **Teat disinfection:** Follow recommended premilking and postmilking disinfection procedures using suitable approved products [4].
- **Environmental hygiene:** Maintain clean, dry bedding, adequate drainage and proper manure disposal to minimise exposure to environmental pathogens.
- **Consistent milking practices:** Handle infected cows carefully and follow veterinarian-recommended control measures to limit the spread of contagious infections.
- **Teat health:** Inspect teats regularly and promptly address injuries, teat-end damage and milking equipment problems.

A 2024 review highlighted the importance of bedding hygiene and management in reducing exposure to environmental mastitis pathogens [1].

Treatment: The Importance of Appropriate Decisions

Mastitis treatment should be guided by disease severity, clinical findings, diagnostic results and veterinary advice. Severe cases involving fever, weakness or dehydration require urgent veterinary attention and may need supportive care. Antibiotics should be used only when indicated by veterinary assessment. Bacterial culture and antimicrobial susceptibility testing may help guide treatment, particularly in recurrent or non-responsive cases. Unnecessary antibiotic use can contribute to antimicrobial resistance. Farmers should follow prescribed treatments and avoid using leftover medicines. Milk and meat withdrawal periods must be strictly observed to prevent veterinary drug residues from entering the food chain. Follow-up examinations are important in persistent cases to assess treatment outcomes and identify underlying management problems.

Dry-Period Management: Protecting the Next Lactation

The dry period provides an opportunity to manage existing udder infections and reduce the risk of mastitis in the next lactation. Dry-cow treatment should be based on veterinary assessment, infection history, somatic cell count (SCC) records and laboratory findings where available. Selective dry-cow therapy may be appropriate in suitable herds, combining targeted antibiotic treatment with non-antibiotic preventive measures. Internal teat sealants may also be considered under veterinary guidance where appropriate. Clean housing, adequate nutrition and close monitoring around calving further support udder health.

Mastitis and Antimicrobial Resistance: A One Health Concern

Mastitis control is closely linked to antimicrobial stewardship and food safety. Inappropriate antibiotic use can promote antimicrobial resistance, while treatment failures may result from incorrect diagnosis, persistent infection or unsuitable treatment. Guidance on prudent antimicrobial use emphasises appropriate medicine selection, accurate treatment records and compliance with withdrawal periods [5]. Preventing infections through hygiene, early detection and effective herd management reduces the need for antibiotics and supports animal welfare and food safety.

Practical Mastitis-Control Checklist

- Examine udders and milk regularly.
- Screen for subclinical mastitis using suitable diagnostic tests.
- Maintain clean milking equipment and hygienic teat preparation.
- Apply appropriate teat disinfection.
- Provide clean, dry bedding and adequate drainage.
- Record mastitis cases and treatment outcomes.
- Seek veterinary advice for severe or recurrent infections.
- Use antibiotics responsibly and observe withdrawal periods.

Conclusion: Prevention Is Better Than Repeated Treatment

Mastitis reduces milk production, compromises animal welfare and increases dairy farming costs. Subclinical infections are particularly challenging because they may persist without visible signs. Effective control requires hygienic milking, clean housing, regular monitoring, early diagnosis and appropriate veterinary treatment. Although modern diagnostic technologies can support detection, consistent management remains fundamental. For Indian dairy farmers, preventive practices and timely veterinary intervention are essential for improving udder health, maintaining milk quality and ensuring sustainable dairy production.

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