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Mastitis in Dairy Cattle - Clinical Signs, Therapeutic Approaches, and Integrated Prevention Strategies

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Bovine mastitis is one of the most challenging and economically devastating diseases affecting dairy farmers and veterinarians worldwide. Considered the primary adversary of the dairy industry, mastitis induces severe physical, chemical, and bacteriological changes in the mammary gland. This leads to a drastic decline in milk yield and deteriorates milk quality to the extent that it becomes unfit for human consumption. Even with costly therapeutic interventions, affected quarters face the risk of temporary or permanent functional loss, resulting in substantial financial setbacks for dairy producers. Consequently, comprehensive awareness, early detection, prompt veterinary treatment, and proactive preventive management are critical for controlling this disease.

Etiology and Modes of Transmission

The development of mastitis is governed by a complex interaction of four primary factors:
Pathogens: Microorganisms including bacteria and fungi.
Human Factors: Poor hygiene and improper milking management.
Host Factors: The animal's physiological state, immunity, and physical injuries to the udder.
Environmental Factors: Unsanitary, damp, and poorly ventilated housing conditions.

Common Routes of Infection

Vectors and Contaminated Hands: Pathogens spread rapidly from infected to healthy udders via flies, unwashed hands of milkers, and contaminated bedding or barn surfaces.
Improperly Sanitized Milking Machines: Inadequate cleaning and disinfection of milking equipment facilitate rapid cross-contamination across the herd.
Udder and Teat Trauma: Physical injuries caused by calf biting or the long fingernails of milkers breach the skin barrier, allowing opportunistic microbes to enter the mammary tissue.
Incomplete Milking: Leaving residual milk inside the udder provides an ideal nutrient medium for rapid bacterial proliferation.
Post-Milking Negligence: The teat sphincter remains dilated for a short duration immediately after milking; failure to sanitize the teats during this window permits environmental pathogens to ascend the teat canal.

Clinical Signs and Symptoms



Mastitis manifests through distinct local changes in the udder, alterations in milk characteristics, and systemic signs in the affected animal:
Udder Changes: One or more quarters become visibly swollen, hot to the touch, and severely painful, causing the animal to resist palpation or milking.

Fibrosis: As the infection progresses chronically, the glandular tissue hardens due to fibrosis, which can lead to permanent agalactia (loss of milk production) in the affected quarters.
Milk Abnormalities: Milk exhibits clots, flakes, or stringy mucoid secretions and may turn watery or yellowish. In severe cases, milk is tainted with blood or pus and emits a foul odor.
Systemic Signs: Affected animals often develop high fever, lethargy, anorexia (loss of appetite), and reduced water intake, accompanied by a sudden drop in milk production and altered milk flavor.

Diagnostic Methods for Early Detection

Identifying mastitis at the subclinical or early clinical stage significantly minimizes economic loss. Farmers and veterinarians can utilize the following diagnostic tools:
Strip Cup / Black Cloth Test: Stripping the first few squirts of milk onto a black cloth or strip cup helps detect visible clots, flakes, pus, or blood, signaling the need for immediate intervention.
pH Paper Test: Normal milk is slightly acidic; a milk pH exceeding 7.4 indicates subclinical or clinical mastitis. Commercial indicator strips (such as Mastect or Mastrip papers) offer rapid cow-side screening.
California Mastitis Test (CMT): The CMT kit is a reliable field and laboratory diagnostic tool used to estimate somatic cell counts. Newly purchased dairy animals should always be screened using CMT before being introduced into the main herd.



California Mastitis Test

Integrated Therapeutic Management

Upon observing signs of mastitis, farmers should avoid empirical self-medication and consult a qualified veterinarian immediately, ensuring the prescribed treatment course is completed in full.

Allopathic and First-Aid Measures

Isolation: Immediately separate the infected animal from the healthy herd to prevent contagious spread.
Cold Therapy: Apply ice cubes wrapped in a thin cloth to the inflamed udder multiple times a day as first aid to reduce acute swelling and pain.
Frequent Stripping: Completely milk out the affected quarter at least three times daily. Disinfect the discarded milk with 5% phenol before safe disposal to prevent environmental contamination.
Pharmacotherapy: Under veterinary supervision, administer appropriate systemic or intramammary antibiotics (such as penicillins, tetracyclines, streptomycin, or ampicillin) alongside supportive analgesics, corticosteroids, and antihistamines to manage pain and inflammation.
Topical and Intramammary Formulations: Apply topical anti-inflammatory ointments (e.g., Mastilep, or Idex) externally, and have a veterinarian infuse intramammary antibiotic tubes (e.g., Mammitel, Pendistrin-SH, or Tilox) into the affected teats.

Ethnoveterinary and Supportive Remedies

Aloe Vera–Turmeric Paste: Grind 2 leaves of aloe vera, 25 g of slaked lime (chunam), 25 g of turmeric powder, and 20 mL of lemon juice into a smooth paste and apply it externally to the udder every hour to alleviate pain and inflammation.
Garlic Supplementation: Feeding 50–60 g of crushed raw garlic daily helps boost the animal's natural immune response.
Sprouted Horse Gram: Feed 500 g of boiled and mashed sprouted horse gram every 3–4 days. Rich in selenium and Vitamin E, this supplement helps prevent udder inflammation while improving milk yield and quality.

Preventive Measures and Herd Management

Preventing mastitis before it establishes is far more economical and effective than treating clinical outbreaks. Dairy farms should strictly implement the following management protocols:

Soft Bedding for Udder Protection: High-yielding cows and buffaloes should not lie directly on hard concrete floors. Provide a 4- to 6-inch layer of clean, dry sand, paddy straw, or sawdust. Dry sand bedding is especially beneficial for freshly calved animals as it prevents teat injuries and inhibits bacterial growth.

Milking Hygiene: Maintain clean, dry milking parlors. Wash teats with lukewarm water before milking and dry them thoroughly using an individual clean cloth or disposable paper towel for each animal.

Post-Milking Teat Dipping: Immediately after milking, dip teats into an antiseptic solution containing 1% iodine/iodophor (or hypochlorite) or 0.5%–1% chlorhexidine to seal the teat orifice against bacterial entry.



Post milking teat dipping

Preventing Immediate Recumbency: Because the teat canal remains open for 20–30 minutes post-milking, offer fresh fodder or concentrate feed immediately after milking to keep the animal standing. Allowing the calf to suckle briefly also helps close the teat orifice naturally through salivary enzymes.

Milker and Equipment Sanitation: Milkers must keep their fingernails trimmed and wash their hands and the animal's udder with a 4% potassium permanganate solution before and after milking. Milking machines and utensils must be sanitized after every session.

Routine Husbandry: Maintain consistent milking schedules, ensure rapid and complete milk letdown, clip excess hair around the udder every four months, and spray barns with safe insecticides to control fly populations.

Dry Cow Therapy (DCT)

The non-lactating rest period of approximately two months prior to calving is termed the Dry Period. Dry Cow Therapy (DCT) refers to the specialized therapeutic and management protocol administered at the start of this period to cure existing intramammary infections (IMIs) acquired during lactation and prevent new infections prior to the next calving. Proper DCT significantly enhances milk yield and quality in the subsequent lactation.

Primary Approaches to DCT

Blanket Dry Cow Treatment (BDCT): The traditional practice of administering intramammary antibiotics to all quarters of every cow in the herd at dry-off.

Selective Dry Cow Therapy (SDCT): A targeted approach in which antibiotics are administered only to cows or specific quarters confirmed to have an infection. SDCT is increasingly favored to minimize antibiotic residues in milk, curb antimicrobial resistance, and support organic dairy practices, while uninfected cows are protected using internal teat sealants alone.

Essential Precautions During DCT

- Gradually reduce concentrate feed and nutrient intake 1–2 weeks before drying off to lower milk secretion naturally.
- Thoroughly disinfect teat ends with alcohol wipes prior to infusing single-dose dry cow antibiotic tubes.
- Monitor the udder regularly for signs of swelling throughout the dry period.
- Ensure the antibiotic withdrawal period is strictly observed so no drug residues remain when the cow calves and resumes lactation.

Conclusion

Sustainable profitability in dairy farming relies heavily on maintaining optimal herd health, with udder care at its forefront. Rather than incurring substantial expenses and production losses treating clinical mastitis, dairy farmers can safeguard their livestock by adopting scientific preventive measures, strict milking hygiene, and strategic Dry Cow Therapy. Implementing these practices ensures clean, high-quality milk production and promotes long-term economic prosperity for dairy producers.

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