

International Journal of Agriculture Extension and Social Development

Volume 8; SP-Issue 6; June 2025; Page No. 23-26

Received: 21-03-2025
Accepted: 23-04-2025

Indexed Journal
Peer Reviewed Journal

Veterinary Treatment Methods for Goat Mastitis in India

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DOI: <https://doi.org/10.33545/26180723.2025.v8.i6Sa.2018>

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Abstract

Mastitis in goats is a significant health concern in India, adversely impacting milk production, animal welfare, and farm economics. This paper explores the various veterinary treatment strategies employed across the country, highlighting both conventional and alternative approaches. Antibiotic therapies remain the primary line of defense, supported by anti-inflammatory drugs and supportive care. However, rising concerns over antibiotic resistance and milk residues have prompted a growing interest in herbal, homeopathic, and Ayurvedic remedies. Management strategies including hygiene practices, early detection, and genetic selection for mastitis resistance are also discussed. The review integrates literature findings, field studies, and emerging therapies like bacteriophage and nanoparticle treatments. The study underscores the need for a holistic and evidence-based approach to mastitis control, integrating scientific advancements with traditional knowledge to ensure sustainable goat farming in India.

Keywords: Goat mastitis, veterinary treatment, antibiotic resistance

Introduction

Mastitis, an inflammation of the mammary gland, poses a significant threat to goat health and productivity in India, impacting the livelihoods of numerous farmers (Dabele *et al.*, 2021) [6]. This condition leads to alterations in milk composition and reduces both the quality and quantity of milk produced, resulting in substantial economic losses due to treatment costs, labor, and potential culling of affected animals (Islam *et al.*, 2020; Thomas *et al.*, 2015) [14, 31]. Effective management of mastitis necessitates a comprehensive understanding of prevalent treatment strategies employed by veterinarians in India, encompassing both conventional and alternative approaches. Predisposing factors, such as breed type, lactation stage, management practices, and farmer awareness, further influence the incidence of mastitis, highlighting the need for targeted interventions (Sinha *et al.*, 2014) [26]. Farmers need a good decision making process to implement control mechanisms that will prevent and treat the disease in time (Sinha *et al.*, 2014) [26].

Conventional Treatment Methods

Conventional treatment protocols for goat mastitis typically involve the administration of antibiotics to combat bacterial infections, which are a primary cause of the condition (Danev *et al.*, 2023) [7]. Veterinarians often base their antibiotic selection on bacterial culture and sensitivity testing, although empirical treatment may be initiated in some cases pending laboratory results (Tegegne *et al.*, 2021) [29]. Intramammary infusion of antibiotics directly into the

affected udder is a common practice, ensuring high drug concentrations at the site of infection (Ghafoor & Sitkowska, 2021) [11]. Systemic antibiotic administration, either through intramuscular or intravenous routes, may be warranted in severe cases or when the infection has spread beyond the mammary gland (Sinha *et al.*, 2014) [26]. Commonly used antibiotics in veterinary practice include penicillin, ampicillin, cephalosporins, and tetracyclines, but the choice depends on the specific bacteria isolated and their susceptibility profiles (Getahun *et al.*, 2025) [10]. In addition to antibiotics, anti-inflammatory drugs, such as non-steroidal anti-inflammatory drugs, are frequently administered to alleviate pain, reduce inflammation, and lower fever in affected goats (Pawłowski *et al.*, 2019) [22]. Supportive therapies, including fluid therapy and nutritional support, may be necessary to maintain hydration and overall health, especially in cases of severe mastitis with systemic involvement. The economic impact of mastitis is significant, stemming from decreased milk production, discarded milk, veterinary service costs, and premature culling (Das *et al.*, 2018; Pawłowski *et al.*, 2019; Riggio & Portolano, 2015) [8, 22, 23]. Overuse of antibiotics can result in drug-resistant bacteria (Lin *et al.*, 2016) [16].

Alternative Treatment Approaches

Due to growing concerns regarding antibiotic resistance and the potential for antibiotic residues in milk, alternative treatment approaches for goat mastitis are gaining increasing attention in India. These alternative therapies encompass a range of practices, including herbal remedies,

homeopathic treatments, and traditional Ayurvedic medicine. Herbal remedies, derived from plants with known antimicrobial and anti-inflammatory properties, are a popular choice among some veterinarians and goat farmers. Plants containing compounds such as alkaloids, terpenoids, tannins, steroids, and flavonoids have antimicrobial properties (Makumi *et al.*, 2021) ^[17]. Common herbs used in mastitis treatment include turmeric, garlic, aloe vera, and neem, which are administered orally or topically to reduce inflammation and combat infection. Homeopathic treatments, based on the principle of "like cures like," involve the use of highly diluted substances to stimulate the body's self-healing mechanisms. While the efficacy of homeopathy remains a subject of debate, some practitioners report positive outcomes in mild to moderate cases of mastitis. Ayurvedic medicine, an ancient Indian system of healing, employs a holistic approach to disease management, considering the balance of bodily energies and the use of herbal formulations. Ayurvedic treatments for mastitis often involve a combination of herbs, dietary modifications, and lifestyle adjustments to restore balance and promote healing. Extracts of pomegranate flowers are being investigated for antibacterial activity, presenting a possible avenue for natural mastitis treatments (Ökmen *et al.*, 2023) ^[21]. Silver nanoparticles also offer another alternative for mastitis treatment in goats (Yuan *et al.*, 2017) ^[35]. Probiotic strains from milk may help prevent and treat mastitis (Xiu-lan *et al.*, 2025) ^[34].

Management Strategies

Effective management of goat mastitis necessitates a multifaceted approach that integrates preventive measures, early detection, and appropriate treatment protocols (Fesseha *et al.*, 2021) ^[9]. Implementing good hygiene practices during milking is crucial to minimize the introduction of bacteria into the udder, including washing and disinfecting teats before and after milking, using clean milking equipment, and ensuring proper sanitation of the goat housing environment. Regular monitoring of goats for signs of mastitis, such as udder swelling, pain, redness, and changes in milk quality, is essential for early detection and prompt intervention. California Mastitis Test can be used to determine the somatic cell count in milk. Early detection enables timely treatment, preventing the progression of the disease and minimizing its impact on milk production. Maintaining optimal nutrition and providing adequate housing conditions are vital for supporting the immune system and enhancing the resistance of goats to mastitis. Additionally, proper vaccination protocols can help protect against specific mastitis-causing pathogens, reducing the incidence and severity of the disease. Selective breeding for mastitis resistance is another strategy to enhance the overall health and resilience of goat herds. Therefore, udder health is a critical factor, and control of intra-mammary infections is consequently of the greatest importance for dairy farmers (Rosa *et al.*, 2021) ^[25].

Literature Review

Numerous studies have investigated the causes, prevention, and treatment of mastitis in dairy animals (Chen *et al.*, 2022) ^[5]. Mastitis can result from microbial dysbiosis, so it is important to maintain the mammary health (Rodríguez &

Fernández, 2016) ^[24]. It occurs as a result of interactions between microorganisms and the individual genetic predispositions of each animal (Zalewska *et al.*, 2020) ^[36]. Some research has focused on the immune mechanisms and potential resistance genes, highlighting the importance of understanding the immune processes in animals to increase their resistance to mastitis (Zemanova *et al.*, 2022) ^[37]. Some investigations have explored the use of bacteriophages as an alternative therapy for mastitis, showing promising results in reducing the bacterial load in the mammary gland. (Carneiro *et al.*, 2009) ^[4]. The rise in antibiotic resistance has emphasized the need for novel approaches to mastitis control and treatment, including research into vaccines, probiotics, and herbal remedies. Some scientific literature focuses on mastitis treatment in cows, although it can be extrapolated to goats due to the similarities in the physiology of mammary glands (Tomazi *et al.*, 2018) ^[32]. The blood-milk barrier differential somatic cell count can be used to test mammary health (Jiang *et al.*, 2022) ^[15].

Methodology

In India, research on goat mastitis treatment methods encompasses diverse approaches, reflecting regional variations and traditional practices. Field surveys are conducted to gather data on the prevalence of mastitis in different goat breeds and farming systems (Tesfaye *et al.*, 2021) ^[30]. Laboratory investigations involve isolating and identifying the causative agents of mastitis, as well as evaluating the efficacy of various treatment options. Clinical trials are carried out to assess the effectiveness of different treatment protocols, including antibiotics, herbal remedies, and alternative therapies. Molecular techniques are increasingly employed to study the genetic diversity of mastitis-causing pathogens and to identify potential targets for vaccine development. Economic analyses are performed to assess the economic impact of mastitis on goat production and to evaluate the cost-effectiveness of different control strategies. These research efforts contribute to a better understanding of goat mastitis and the development of evidence-based treatment and prevention strategies.

Results

Analysis of treatment methods adopted by veterinarians in goat mastitis in India reveals a multifaceted approach, integrating conventional and alternative therapies to combat this prevalent disease (Balemi *et al.*, 2021) ^[3]. Antibiotics remain the cornerstone of treatment, with commonly used drugs including penicillin, streptomycin, tetracycline, and cephalosporins, administered systemically or intramammarily, guided by bacterial culture and sensitivity testing to ensure efficacy against prevailing pathogens. However, the growing concern over antibiotic resistance has spurred exploration of alternative therapies, including herbal remedies derived from traditional Indian medicine systems like Ayurveda, incorporating plants such as turmeric, neem, and aloe vera, known for their antimicrobial and anti-inflammatory properties, administered as topical applications or oral supplements, often in conjunction with conventional treatments to enhance therapeutic outcomes. (Hoque *et al.*, 2020) ^[13] Veterinarians also emphasize supportive care, encompassing regular milking to evacuate

infected secretions, application of antiseptic solutions to teats, and provision of nutritional support to bolster the goat's immune response, alongside advising farmers on improving hygiene practices, such as disinfecting milking equipment and maintaining clean bedding to prevent disease spread (Mitchell *et al.*, 2022) ^[19]. Furthermore, some veterinarians integrate homeopathic treatments, utilizing diluted substances to stimulate the body's healing mechanisms, while others explore innovative approaches like phage therapy, employing bacteriophages to target specific bacterial pathogens, reflecting a holistic and evolving landscape of goat mastitis management in India.

Discussion

The economic implications of mastitis in goats cannot be ignored, as the disease leads to reduced milk yield, treatment costs, and potential culling of affected animals. Economic framework research has been conducted on production diseases in animal farming. The average failure costs of mastitis were reported to be significant (Hogeveen *et al.*, 2019) ^[12]. The implementation of effective mastitis control programs is crucial for minimizing economic losses and improving the overall productivity of goat farms. Mastitis, reproductive problems, and lameness are the most common traditional production costs for dairy cattle (Wells *et al.*, 1998) ^[33]. Therefore, mastitis is one of the most expensive diseases in terms of production losses among animal diseases (Aqib *et al.*, 2021) ^[2]. The absence of rigorous animal health management programs represents a high risk to the human health (S.O. & Patil, 2019) ^[27].

Conclusion

Effective teaching of goat and sheep science and encouraging public empowerment are important for preventing and treating the disease (Aldridge *et al.*, 2018) ^[1]. Cattle health schemes encompass a variety of tools and services (Statham, 2011) ^[28]. These include data recording and analysis, veterinary investigation, advisory visits, medicine usage protocols, and economic analysis (Medeiros *et al.*, 2022) ^[18]. These programs should be encouraged and implemented at the farm level. Additionally, specialized communication strategies and continuous monitoring are needed for long-term success of goat health programs (Monau *et al.*, 2020) ^[20].

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