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Sub-Clinical Mastitis in Small Ruminants

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Abstract

Subclinical mastitis is a silent but economically devastating disease affecting goats and sheep worldwide. Unlike clinical mastitis, it progresses without visible signs of udder inflammation, allowing intramammary infections to persist undetected within flocks. This hidden condition leads to significant reductions in milk yield, deterioration of milk quality, elevated somatic cell counts, and long-term productivity losses. Bacterial pathogens, particularly *Staphylococcus* spp., *Streptococcus* spp., and coliform organisms such as *Escherichia coli*, are the primary causative agents, with poor milking hygiene and environmental contamination serving as major risk factors. Because affected animals appear healthy, routine screening using tests like the California Mastitis Test (CMT), somatic cell count estimation, and bacteriological examination is essential for early detection. Effective control depends largely on preventive strategies including hygienic milking practices, proper housing management, regular monitoring, and judicious antimicrobial use. Strengthening farmer awareness and implementing integrated herd health strategies are crucial for minimizing economic losses, improving milk safety, and ensuring sustainable small ruminant production systems.

Keywords: Goats, sheep, intramammary infection, somatic cell count, california mastitis test

Introduction

Mastitis is one of the most economically important diseases affecting small ruminants worldwide, particularly goats and sheep, due to its direct impact on milk yield, milk quality, and overall animal productivity. Among its various forms, subclinical mastitis is of greater concern as it occurs without obvious clinical signs, making its detection difficult under field conditions. Despite the absence of visible abnormalities in the udder or milk, subclinical mastitis leads to significant losses through reduced milk production, altered milk composition, increased somatic cell count, and premature culling of animals. In goats and sheep, subclinical mastitis is more prevalent than the clinical form and often remains unnoticed by farmers, allowing the infection to persist within the flock. This silent nature not only facilitates the spread of infection among animals but also compromises milk safety and quality, posing potential public health risks. In developing countries, where small ruminants play a crucial role in supporting rural livelihoods and small-scale dairy systems, the impact of subclinical mastitis is even more pronounced. The etiology of subclinical mastitis in goats and sheep is multifactorial, involving a wide range of contagious and environmental pathogens, along with management-related risk factors such as poor milking hygiene, inadequate housing, and lack of regular screening programs. Early diagnosis and effective preventive measures are therefore essential to minimize economic losses and ensure sustainable small ruminant production. Considering its high prevalence, economic significance, and diagnostic challenges, a comprehensive understanding of subclinical mastitis in goats and sheep is necessary. This article aims to provide an overview of the etiology, clinical manifestations, diagnostic approaches, and effective prevention and control strategies for subclinical mastitis in goats and sheep, with an emphasis on improving animal health, milk quality, and farm profitability.

Etiology

The etiology of subclinical mastitis in goats and sheep is complex and multifactorial, involving the interaction of infectious agents, host factors, and management practices. Bacterial pathogens are considered the primary causative agents, although environmental and management-related factors play a significant role in the establishment and persistence of infection. Among bacterial agents, ***Staphylococcus species*** are the most frequently isolated organisms from cases of subclinical mastitis in small ruminants. Both coagulase-positive and coagulase-negative staphylococci are commonly associated with intramammary infections. These organisms are well adapted to the mammary gland environment and can establish chronic infections without producing overt clinical signs, making them particularly important in subclinical cases. Other important bacterial pathogens include ***Streptococcus species***, such as *Streptococcus agalactiae* and environmental streptococci, which are often associated with poor hygienic conditions during milking. **Gram-negative bacteria**, including *Escherichia coli* and other

coliforms, may also contribute to subclinical mastitis, especially under conditions of contaminated housing, wet bedding, and inadequate sanitation. Although less frequent than staphylococci, these organisms can significantly affect milk quality and udder health. The sources of infection can be broadly categorized into **contagious** and **environmental** origins. Contagious pathogens are primarily transmitted during the milking process through contaminated hands, milking equipment, or teat skin, whereas environmental pathogens originate from soil, manure, bedding material, and housing conditions. The teat canal serves as the main portal of entry for these pathogens, particularly when teat integrity is compromised. Host-related factors such as parity, stage of lactation, immune status, and teat morphology influence susceptibility to subclinical mastitis. Additionally, management practices including poor milking hygiene, absence of teat disinfection, irregular screening, and indiscriminate use of antibiotics contribute to the persistence and spread of infection within flocks.

Clinical Signs

Subclinical mastitis in goats and sheep is characterized by the **absence of visible clinical signs**, which makes its identification difficult under routine field conditions. Unlike clinical mastitis, affected animals do not exhibit obvious inflammation of the udder, pain, swelling, or abnormal milk appearance. As a result, the condition often remains unnoticed by farmers and continues to persist within the flock. Despite the lack of overt signs, subclinical mastitis leads to **important functional and compositional changes in milk**. A reduction in milk yield is commonly observed, along with alterations in milk composition such as decreased fat, protein, and lactose content. These changes adversely affect milk quality and processing properties, particularly in small ruminant dairy systems where milk is often used for traditional products. An increase in **somatic cell count (SCC)** is one of the most consistent indicators of subclinical mastitis in goats and sheep. Elevated SCC reflects the inflammatory response of the mammary gland to intramammary infection, even in the absence of visible clinical symptoms. In some cases, subtle changes such as watery milk, presence of small flakes, or reduced milk flow may be noticed, but these signs are inconsistent and easily overlooked. At the animal level, subclinical mastitis may contribute to **poor body condition, reduced productivity, and increased susceptibility to other diseases** due to chronic inflammatory stress. At the flock level, the condition acts as a reservoir of infection, facilitating the spread of mastitis-causing pathogens during the milking process and increasing the overall prevalence of intramammary infections. The silent and persistent nature of subclinical mastitis highlights its epidemiological importance in goats and sheep. Since animals appear clinically healthy, routine screening and diagnostic testing are essential to identify infected individuals and prevent long-term economic losses.

Diagnosis

The diagnosis of subclinical mastitis in goats and sheep is challenging due to the absence of visible clinical signs, making **routine screening and laboratory-based tests essential** for its detection. Early and accurate diagnosis plays a crucial role in controlling the spread of infection and minimizing economic losses. At the field level**, indirect screening tests** are commonly employed for the detection of subclinical mastitis. The **California Mastitis Test (CMT)** is one of the most widely used field tests due to its simplicity, low cost, and rapid results. The test detects increased somatic cell concentration in milk, which correlates with inflammatory changes in the mammary gland. Similar tests such as the **Surf Field Mastitis Test (SFMT)** are also used in field conditions, especially in resource-limited settings. Measurement of **somatic cell count (SCC)** is considered a reliable indicator of subclinical mastitis in small ruminants. Elevated SCC reflects the immune response of the mammary gland to intramammary infection. However, interpretation of SCC in goats requires caution, as physiological factors such as stage of lactation and apocrine milk secretion can influence baseline SCC levels. Therefore, species-specific thresholds and repeated testing are recommended for accurate diagnosis. Definitive diagnosis involves **bacteriological examination of milk samples**, which remains the gold standard for identifying the causative pathogens. Milk culture allows for the isolation and identification of mastitis-causing organisms and provides valuable information for understanding the epidemiology of infection within a flock. Advanced diagnostic approaches, including **molecular techniques such as polymerase chain reaction (PCR),** offer higher sensitivity and specificity for pathogen detection. These methods enable rapid identification of organisms directly from milk samples, even in cases with low bacterial load. However, their use is often limited by cost and availability, particularly in field conditions. Overall, an integrated diagnostic approach combining field screening tests, SCC estimation, and laboratory confirmation is essential for the effective detection and management of subclinical mastitis in goats and sheep.

Prevention and Control

Effective prevention and control of subclinical mastitis in goats and sheep rely on a **combination of good management practices, hygienic milking procedures, regular screening, and judicious use of antimicrobial agents**. Since subclinical mastitis often remains undetected, emphasis should be placed on preventive measures rather than therapeutic interventions alone. **Milking hygiene** is one of the most critical components in controlling the spread of intramammary infections. Proper cleaning and drying of teats before milking, use of clean hands or gloves, and regular sanitation of milking equipment significantly reduce the transmission of contagious pathogens. **Post-milking teat**

disinfection using suitable teat dips has been shown to be effective in preventing new infections by eliminating residual pathogens on the teat surface. **Housing and environmental management** play a key role in controlling environmental mastitis pathogens. Maintaining clean, dry, and well-ventilated housing conditions helps minimize exposure of the udder to infectious agents present in bedding, manure, and soil. Regular replacement of bedding material and proper waste disposal further reduce the risk of infection. Routine **screening programs** using tests such as CMT and periodic estimation of SCC are essential for early detection of subclinical mastitis. Identification and segregation of infected animals help prevent the spread of infection within the flock. Chronically infected animals that do not respond to treatment may require culling to reduce the overall disease burden. Treatment decisions should ideally be based on bacteriological culture and antimicrobial susceptibility testing to ensure effective therapy and minimize the development of antimicrobial resistance. Indiscriminate or prophylactic use of antibiotics should be avoided, particularly in small ruminant production systems. **Farmer education and awareness** are crucial for successful mastitis control programs. Training farmers in early detection, proper milking techniques, hygiene practices, and the economic impact of subclinical mastitis enhances compliance with preventive measures. Integrated control strategies focusing on management, hygiene, and monitoring can substantially reduce the prevalence of subclinical mastitis and improve milk quality and productivity.

Conclusion

Subclinical mastitis in goats and sheep represents a major yet often overlooked health problem that significantly affects milk yield, milk quality, and overall productivity of small ruminants. Due to the absence of visible clinical signs, the condition frequently remains undiagnosed, allowing intramammary infections to persist and spread within flocks, leading to substantial economic losses. A wide range of infectious agents, particularly bacterial pathogens, along with host and management-related factors, contribute to the development of subclinical mastitis. Early detection through routine screening tests, somatic cell count estimation, and laboratory confirmation is essential for effective disease management. Preventive strategies focusing on milking hygiene, environmental sanitation, regular monitoring, and responsible use of antimicrobials play a crucial role in reducing disease prevalence. An integrated approach combining farmer awareness, improved management practices, and timely diagnostic interventions is vital for the sustainable control of subclinical mastitis in goats and sheep. Strengthening these measures will not only improve animal health and productivity but also enhance milk quality and support the economic viability of small ruminant production systems.

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