

PREVALENCE OF MASTITIS BACTERIA AND THEIR ANTIMICROBIAL RESISTANCE–A REVIEW

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ABSTRACT

Bacterial bovine mastitis is the most common disease in the dairy cattle industry causing significant welfare and economic implications. Bacterial mastitis also impacts milk composition and quality which adds to the economic burden. Mastitis can cause chemical and bacteriological changes in milk and pathological changes in the mammary gland of the udder. Mastitis is among the various factors contributing to reduced milk production. Bovine mastitis is the second most frequent disease next to reproductive disorders and one of the major causes of economy failure. It affects both the quantity and quality of milk. Mastitis can be manifested by a wide range of clinical and subclinical conditions. Antimicrobial resistance is the most prevalent problem which hinders the treatment process. A wide group of bacteria are responsible for the disease. This group comprises of enteric and non-enteric bacteria. Antimicrobial profile for these pathogens would provide a perfect picture of guidance for treatment of this disease

Key words: Mastitis- Bacterial pathogens- Antibiotics- Resistance

INTRODUCTION

Mastitis can be manifested by a wide range of clinical and subclinical conditions. Clinical mastitis is characterized by sudden onset, alterations of milk composition and appearance, decreased milk production, and the presence of the cardinal signs of inflammation in infected mammary quarters. It is readily superficial and visually detected. It occurs when the inflammatory response is strong enough to cause visible changes in the milk (clots and flakes), the udder (swelling), or the cow (off feed or fever). Even if there is a great loss related to both conditions, clinical mastitis continues to be a problem in many dairy herds (Leelahapongsathon, Schukken and Suriyasathaporn, 2014). It has been estimated that the mastitis alone can cause approximately 70% of all avoidable losses incurred during milk production. Mastitis is worth studying as it incurs financial losses attributed to reduced milk yield, discarded milk following antibiotic therapy, early culling of cows, veterinary costs, drug costs, increased labor, death in peracute septicemia, and replacement cost. In India, annual economic losses due to subclinical and clinical mastitis have been estimated to be Rs. 41.511 and Rs. 30.144 billions, respectively, with a total of Rs. 71.655 billions. The losses caused by clinical mastitis arise mostly from costs of treatment, culling of animals, death, and decreased milk production. Data regarding the prevalence of bovine mastitis and the knowledge of pathogens causing mastitis is important to chalk out prevention and control strategies and to adopt appropriate therapeutic protocols.

PATHOGENS

This is only possible with accurate identification of mastitis milk sample is an inflammation of the mammary gland characterized by physical, chemical, bacteriological and cytological changes in milk. Pathological changes in glandular tissues of the udder and effects on the quality and quantity of milk have been observed . Over 130 different microorganisms have been isolated from mastitis positive cow. Milk samples, of which almost all are bacteria .This disease is mainly caused by microorganisms usually bacteria, including gram-negative and gram-positive bacteria, mycoplasmas, yeasts and algae (Demme. and Abegaz.,2015). The majority of mastitis incidences are caused by only a few common bacterial pathogens namely *Staphylococcus aureus*, *Staphylococcus epidermis*, *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, *Streptococcus uberis* , *Streptococcus bovis*, *E.coli*, *Klebsiella pneumonia*, *Actinomycespyogenes*, *Proteus vulgaris*, *Pseudomonas aeruginosa*and *Bacillus subtilis*. Bacterial pathogens are majorly (70%) involved in the etiology of mastitis. Besides, minor causes (30%) include non-infectious agents such as physical trauma, mechanical injuries to the gland, etc.

Staphylococcus aureus. is currently one of the most problematic mastitis pathogens. It is more predominant in chronic or subclinical forms of the disease, causing mild, moderate, and severe infections that can cause sudden death (Abebeet.al, 2016). It invades the mammary tissues and causes necrosis through the release of lipoteichoic acid into the interstitial tissue of the mammary gland. *Escherichia coli* is the primary pathogen that causes clinical signs of mastitis (Admasu.,Hailemeskel, and Alemu.2014).. This gram negative bacterium is found in the environment and causes acute to peracute infections resulting in a rapid, sometimes fatal, immune response. *Streptococcus dysgalactiae* a common environmental pathogen that causes moderate clinical signs, which manifests as abnormal and visible changes in the mammary glands affected by clinical mastitis.. Cows infected with these pathogens require intensive care, and these bacteria are not easily eliminated. The minor pathogens include *Corynebacterium* spp.

ANTIBIOTICS

Antimicrobial therapy is commonly implemented for mastitis prevention and control. Unfortunately, despite the best possible antimicrobial treatments, failures of bacteriological cure are common due to antimicrobial resistance. Penicillin, amoxicillin, clavulanic acid, ampicillin, erythromycin ,and clindamycin are the most common antibiotics used to treat bovine mastitis with ideal cure rates (Gomes and Henriques 2016). Unfortunately, resistance to these antibiotics has been increased in Gram-positive bacteria, including *Streptococci*.

The uncontrolled use of antibiotics usually affects the microbial system of sensitive bacteria, which causes mutations, and thus allows bacteria to survive and further proliferate as antibiotic-resistant bacteria. Therefore, the antibiotic resistance rises to dangerously high levels worldwide, which is a usual threat to the ability to treat the common infectious disease (Klaas and Zadoks2018).Several strains of from mastitis case have been reported to show resistance against multiple antimicrobials such as penicillin-G, gentamicin, streptomycin, ampicillin, ciprofloxacin, oxytetracycline (Bradley and Green 2002)..Beta-lactam antibiotics are frequently used in mastitis therapy and the resistance is due to the production of beta-lactamases and low-affinity penicillin-binding protein. Methicillin-resistant (MRSA) have been isolated from mastitis milk samples and have the potential to complicate treatment of bovine mastitis. The presence of MRSA in bovine mastitis is a potential risk to other exposed cattle and farm workers including veterinarians.. In general, the emergence and transfer of AMR bacteria or genetic determinants from animals to human populations via food chain is a growing concern. Comprehensive information on the prevalence of AMR in bovine mastitis pathogens in milk is lacking in India.

CONCLUSION

It has been estimated that the mastitis alone can cause approximately 70% of all avoidable losses incurred during milk production. One important reason for treatment failure is assumed to indiscriminate use of antibiotics without testing in vitro sensitivity of causal organisms. The losses caused by clinical mastitis arise mostly from costs of treatment, culling of animals, death, and decreased milk production. Apart from financial losses, the importance of mastitis with regard to public health should not be overlooked. The extensive use of antibiotics in treatment and control of mastitis has possible implications on human health, through emergence of antibiotic resistant bacteria. The antibiotic sensitivity profile of isolated pathogens can serve as a guide for field veterinary practitioners to provide effective and timely treatment to animals affected with clinical mastitis

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