



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2020; 8(1): 1393-1395

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Received: 06-11-2019

Accepted: 10-12-2019

**Vipin Khasa**

Department of Biotechnology,  
DCR University of Science and  
Technology, Murthal  
Sonapat, Haryana, India

**Vipul Chaudhary**

Department of Biotechnology,  
DCR University of Science and  
Technology, Murthal  
Sonipat, Haryana, India

**Pamela Singh**

Department of Biotechnology,  
DCR University of Science and  
Technology, Murthal  
Sonipat, Haryana, India

**Corresponding Author:**

**Vipul Chaudhary**

Department of Biotechnology,  
DCR University of Science and  
Technology, Murthal  
Sonipat, Haryana, India

## Mastitis: A review on disease affecting livestock and its control

**Vipin Khasa, Vipul Chaudhary and Pamela Singh**

### Abstract

Mastitis is one of the leading pathological condition of udder of cattle and buffaloes, which leads to decrease in quality and quantity of milk. Various bacterial, fungal and viral agents affect udder containing milk, leading to contagious and environmental mastitis based on route of entry into udder and teat canal. Subclinical mastitis can be controlled without antibiotic whereas its use is warranted in clinical mastitis. Outcome of treatment depends on various factors like host immune response, type of causative agent and stage of detection of infection. Prolonged treatment may be required for bacteria like *Staphylococcus*, which may even leads to loss of quarter in severe cases and development of antibiotic resistance. Proper education of farmer regarding hygiene condition can help in reduction of incidence and hence keeping milk production to the optimum level.

**Keywords:** Mastitis, cattle, prevention, control

### Introduction

Milk of cattle and buffaloes has high nutritive value for human and livestock. Efficient production of milk by cattle and buffaloes satisfies the farmer's income which in turn enhances agricultural sector share of per capita income of country. One of the biggest challenges of farmer rearing high yielding cattle and buffaloes remains that despite large investment in management, large number of cows and buffaloes are getting infected due to infection causing mastitis that lowers the yield of milk quality and quantity. It is the major health issues among bovine and considered as one of the biggest threats affecting the dairy industry throughout the world [1]. Mastitis is the disease caused by trauma and microorganisms infections of udder or inflammatory mammary glands. It is the disease that cause burden in dairy livestock all over the world, the persistency of the microbes leads to invasion of tissue that can opportunistically results in mastitis. Due to invasion and bacterial infection mammary glands release white blood cells leading to secretion of toxins in response to immune response that trigger mastitis infection in bovine. There are several bacteria involved in causing mastitis however most infections are caused by Gram-negative rods like *Escherichia coli* or Gram-positive cocci mainly *staphylococcus* and *streptococci* depending on the mode of transmission and host condition [2]. Two major types of mastitis occur in herd namely contagious and environmental mastitis (Table 1). Contagious pathogens are those that are transferred from cow to cow for which udders of infected animal are the main reservoir. Environmental pathogens are those whose primary reservoirs is the environment in which the cow lives like dirty stalls, contamination from milking equipment, manure contamination, use of pond water for udder preparation before milking, improper bedding and teat trauma [3].

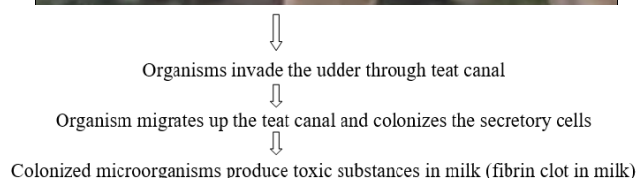
### Symptoms

Mastitis is classified according to symptoms and signs that cause intra-mammary infections as clinical mastitis and subclinical mastitis [8]. In clinical mastitis, the udder becomes swollen, sometimes painful to touch, visibility of milk with fibrin clots and bloods. Sometimes in severe cases, cow shows signs like fever, rapid pulse, anorexia, shock and loss of appetite. There can be sharp decline in milk production in clinical mastitis in severe cases. In contrast, no accurate or appropriate signs are visible in case of subclinical mastitis. Animal appears healthy, udder are normal (no redness, no inflammation and no secretions in milk) [9]. However, microorganisms and white blood cells (somatic cells) that fight infections are found at high number in the milk of sub-clinically affected animal (Fig.1). Immediately after infection, inflammatory markers like TNF-alpha, cytokines, IL-6 and IL-8, are elevated as an

event of host defence [10].

**Table 1:** Classification of pathogens responsible for mastitis in livestock

Environmental pathogens	Contagious pathogens	References
<i>Streptococcus spp.</i>	<i>Staphylococcus aureus</i>	(4) (5) (6) & (7)
<i>E. coli</i>	<i>Streptococcus agalactae</i>	
<i>Proteus spp.</i>	<i>Streptococcus dysgalactae</i>	
<i>Yeast spp.</i>	<i>Corynebacterium spp.</i>	
<i>Klebsiella pneumonia</i>	<i>Mycoplasma spp.</i>	



**Fig 1:** Mode of transmission of infection of microbe in Mastitis

**Prevention**

During early lactation, the cow’s immune systems are lowered leading to increased predisposition of host to infectious agents. The best way to avoid mastitis is to maintain herd hygiene by adopting five strategies as under:-

- Optimise hygiene starting from birth.
- Remove suckling.
- Reduce the amount of bacteria in the environment.
- Optimise feed quality.
- Reduce stress.

Treatment of infection depends on interplay of a number of factors that might be environmental, physiological, pathological and genetic. Given below are major factors whose outcome determines therapeutic success to prevent mastitis infection.

1. Environment: A clean environment which includes good housing management, milk hygiene, health and disease control [11].
2. Nutrition: Adding the amount of minerals and vitamins to cattle feed can help boost their immune system and help their body fight off the mastitis pathogens.
3. Prevention of metabolic disorder: regular testing of ketosis on daily, weekly or monthly basis.
4. Dry cow therapy: The use of antibiotic therapy, milking machine servicing help to prevent cow mastitis, and also helping to prevent new ones.

Hygienic practice and education of farmers plays major role in preventing the mastitis. Regular workshop and seminars would be helpful for farmers to learn about the hygiene and

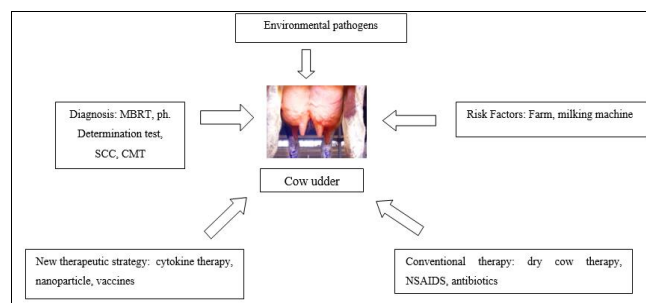
how to avoid contagious infection in herd [12]. Proper and routine milk equipment evaluation also reduces the new infection rate of non-contagious pathogens.

**Diagnosis**

It is important to find the pathogens causing mastitis infection because specific pathogens require specific pathogen management strategies [13]. Diagnosis of clinical mastitis is based on abnormality appearing in milk like off-colour milk, pus cells in milk, blood in milk or some fibroin clot seen during milking whereas subclinical mastitis were not easily appeared as symptomatically [14]. Subclinical mastitis can be measured directly by counting somatic cell count (SCC) or indirectly by California mastitis test on suspected quarters. There are reports of huge loss of quality and quantity of milk due to mastitis. In order to avoid these economic losses, it is necessary to predict the disease in early stage. Therefore early detection are necessary to treat the condition with minimal administration of antimicrobials which in turn reduces veterinarian cost burden on farmer [15].

Main and current trends in diagnosis of mastitis involves following tests:

1. California mastitis test (CMT).
2. Physical examination of udder.
3. Chloride test.
4. PH determination test.
5. Electrical conductivity test.
6. Milk anti trypsin assay (MAUM TEST)
7. Methylene blue reduction test (MBRT)



**Fig 2:** Graphical strategy of cause of mastitis

**Treatment**

Choice and outcome of treatment of infection depends upon the stage of infection of animal. In case of subclinical mastitis, animal can be treated by simple massage of udder and giving chemical substances to balance pH of udder, whereas in case of clinical mastitis, treatment depends upon the severity of infection. First line treatment for clinical mastitis is administration of antibiotic by intra-mammary infusion in teat canal and/or intravenous injection of antibiotics such as tetracycline, ampicillin and penicillin [16]. When more than one quarter is affected, antimicrobial drug should be administered systemically. Mastitis control should be the part of herd health programme and dairy management, as after development of infection, treatment can take a long course or even loss of milk in affected quarter permanently in some cases. Furthermore, long use of antibiotic may also leads to the occurrence of antibiotic strain; therefore there is worry about treatment and prevention. The biotechnology area resolves this problem at somehow by developing new era of therapeutic strategy like nanoparticles, cytokines therapy and vaccines.

## Conclusions

Bovine mastitis is truly a disease having significant impact on quality and quantity of milk production, due to which dairy industry suffers lots of economic losses all over the world. The wide spread incidence of occurrence of mastitis worldwide, highlight an urgent need to develop effective strategy of prevention and control, particularly for developing countries. Regular health campaign and programs should be organised by government for farmers that help them to know about hygiene during milking, avoid using of contaminated equipment, herd hygiene and feed given to cattle. Besides that, fundamental significance to detect which organisms are predominant in the dairy farm and what type of medicines can be used to prevent and control infection, plays key role to treat the mastitis more effectively.

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