# MASTITIS CONTROL IN DAIRY ANIMALS

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## INTRODUCTION

Milk is one of the most important foods of human beings. It is universally recognized as a complete diet due to its essential components (Javaid *et al*., 2009). Its quality is being deteriorated by mastitis. Mastitis is the most important and expensive disease of dairy industry. It results in severe economic losses from reduced milk production, treatment cost, increased labor, milk withheld following treatment and premature culling (Miller *et al.,* 1993). Globally, the losses due to mastitis amount to about 53 billon dollars annually (Ratafia, 1987). It is recognized that if this disease is diagnosed in early stages, the greater portion of this loss can be avoided. This disease is characterized by physical, chemical and bacteriological changes in the milk and pathological changes in the glandular tissue of the udder. The most important changes in the milk include discoloration, presence of clots and presence of large number of leukocytes. The bacterial contamination of milk from the affected cows render it unfit for human consumption, as it can provide a mechanism of spread of diseases like tuberculosis, sore-throat, brucellosis and leptospirosis, and has zoonotic importance. Compared to developed countries, mastitis is a major problem in the dairy industry of developing countries like Pakistan. This paper summarizes the guidelines for the mastitis control in dairy animals.

## PATHOGENS AND PREVALENCE OF MASTITIS

The organisms involved in mastitis vary from community to community. The most common causative organisms of udder disease include: Staphylococci (*S. aureus* and *Staph. epidermidis*), Streptococci (*Str. agalactiae, Str. dysgalactiae, Str. uberis* and *Str. bovis*) and coliforms (mainly *E. coli* and *Klebsiella pneumoniae*). Other less frequent agents include: Pseudomonads, Nocardia, Mycoplasma and yeast (McDonald, 1979). Staphylococci, streptococci, *E. coli* and pseudomonas are found in buffaloes suffering with mastitis (Anwar and Chaudhary, 1983). Coagulase negative Staphylococcus (CNS) is also the prevalent bacterial pathogen in udder infections (Lafi *et al.,* 1994). Among all the pathogens of bovine mastitis, *S. aureus* is the predominant organism (Kapur *et al.,* 1992).

The most common mastitis pathogens are contagious and environmental pathogens. Among the contagious pathogens, the most common are *S. aureus* and *Str. agalactiae*. These spread from infected to clean udders during the milking process through contaminated milker's hand and cloth towels used to wash or dry udder of more than one animals and by flies. Contagious organisms are responsible for most of clinical cases and *S. aureus* is at the top of the list in dairy animals (Allore, 1993). Among environmental pathogens, the most common bacteria are *Strep. uberis, Str. dysgalactiae*, coliforms such as *E. coli* and Klebsiella. Transmission of the environmental pathogens occurs between milkings. Coliform infections are usually associated with unsanitary environment, while Klebsiella are found in sawdust that contains bark or soil. Coliform infections manifest symptoms of abnormal milk, swollen udder/quarters, watery milk and depressed appetite.

In India and Pakistan, prevalence of sub-clinical mastitis is 17-93% in cows and 4-48% in buffaloes (Allore, 1993). The dairy industry is facing a great set back due to high prevalence and incidence of mastitis in milch animals. The infection rate of mastitis in cows with pendulous udder is higher than those with non-pendulous udder (Sori *et al.,* 2005). The pendulous udder exposes the teat to injury, and pathogens may easily adhere to the teat and get access to the gland tissue. The infection rate in cows with teat lesions is more than cows with normal teats. Cows with disk-shaped, inverted, pointed and round shaped teat ends have 88.46, 61.54, 54.17 and 40.86% rates of infection, respectively.

As mastitis is caused by a variety of pathogens and prevalence of mastitis is high in our dairy animals, a mastitis control programme is needed that is well suited under Pakistani conditions for running a profitable dairy business.

## MASTITIS CONTROL PROGRAMME

Mastitis is the outcome of interaction between various factors associated with the host, pathogen(s) and environment. Most of the cases of mastitis occur in lactating cows, often soon after calving. If the development of clinical mastitis is predicted, then treatment prior to the appearance of visible signs results in fewer cases of clinical mastitis, reduces the severity measured by cell count at detection, shortens convalescent period and somatic cell counts (SCC) return to normal level. The efficacy of therapy during

non-lactating period is better than during lactation. Conventional treatment is the use of antibiotic therapy, although alternatives including herbal and homeopathic approaches assume some importance. The early treatment of mastitis gives better prospect for elimination of bacteria (Milner *et al.*, 1997).

Mastitis cannot be totally eliminated form a herd, the incidence can be held to a minimum. However, advances in detection systems have not produced effective cow-side methods to achieve this better care. All dairy animals usually have a period of 6-10 weeks prior to calving (usually annually) as a dry or resting period, a non-lactating phase. At this time, the cow remains susceptible to new intra-mammary infections, especially soon after the 'drying off' or cessation of milking, and around calving (Hillerton and Berry, 2005).

The dry cow treatment with antibiotics showed a prophylactic benefit of 82% reduction in the rate of new intra-mammary infections in the dry period and higher rate of eliminating infections than treating in lactation (Smith *et al.*, 1967). The mastitis control plans can reduce the duration of existing infections and reduce the likelihood of new infection by managing exposure and means of transmission.

Early diagnosis of sub-clinical mastitis with reliable tests facilitates successful treatment and control. The key elements in the control of mastitis include: sound husbandry practices and sanitation, post milking teat dip, treatment of mastitis during non-lactating period, and culling of chronically infected animals. *Str. agalactiae* can be eradicated from dairy herds with effective mastitis control practices, including teat dipping and dry animal therapy. *Str. agalactiae* may live almost anywhere; in the udder, rumen, and faeces and in the barn, they can be controlled with proper sanitation and moderately susceptible antibiotics.

Environmental mastitis is caused by organisms such as *E. coli* which do not normally live on the skin or in the udder but enter the teat canal when the cow comes in contact with a contaminated environment. The primary reservoir of environmental pathogens is the cow's environment, housing, bedding, etc. Incidence of environmental mastitis may occur at any time, from any source in the cow's surroundings, although the rate of infection is higher in dry period, especially during two weeks following dry off, and two weeks prior to calving. Infections acquired during this period may persist up to the following lactation. The mammary gland is particularly susceptible to clinical environmental infection in the peri-parturient and early lactation period. Cases of environmental mastitis rarely exceed 10% of the total mastitis cases in the herd. The most important environmental mastitis pathogens include: gram-negative bacteria (such as *E. coli* and Kebsiella spp.) and Strept. spp. (such as *Str. uberis* and *Str. dysgalactiae*). Control of environmental mastitis can be achieved by reducing the number of bacteria to which teat is exposed. The animal environment should be as clean and dry as possible. The animals should have no access to manure, mud or pools of stagnant water and calving area must be clean. Post milking teat dip with a germicidal is recommended. Control of environmental mastitis during dry period, using either germicidal or barrier dips, have been unsuccessful. Proper antibiotic therapy for all quarters of all animals at drying off helps to control environmental streptococci during early dry period. The mastitis caused by environmental pathogens cannot be eradicated from a dairy herd but it can be controlled by reducing exposure and by increasing immune resistance of the cow through post milking teat dipping with a germicidal and treatment of all quarters with antibiotics during drying off (Smith and Hogan, 1993).

Contagious mastitis is transmitted from cow to cow by pathogens for which the udder is the primary reservoir. It tends to be sub-clinical in nature. The economic impact of this form of mastitis is mostly due to production loss, reduced milk quality (high SCC), premature culling and the eventual cost of control programme. It is mostly caused by bacteria that live on the skin of the teat and inside the udder. Common contagious pathogens have been reported to infect 7 to 40% of all cows (Fox and Gay, 1993). Contagious mastitis can be transmitted from one cow to another during milking process and new infections are most often acquired during the lactation period. The primary reservoir of contagious pathogens is the mammary gland itself. Frequency of contagious pathogens among mastitis cases is greater (Sori *et al.*, (2005). The use of dry cow therapy, post milking teat disinfectants and effective pre-milking hygiene are effective control procedures for most contagious mastitis pathogens (Fox and Gay, 1993). With the use of antibiotics and improved herd hygiene, the incidence of streptococcal mastitis has been greatly reduced throughout the world but the incidence of staphylococcus mastitis has increased greatly. In most countries, staphylococcus is the most predominant cause of sub-clinical mastitis (Singh and Buxi, 1982) and is also isolated from the clinical cases (Kapur *et al.*, 1992). Monitoring SCC and prompt identification and treatment of mastitis in dairy animals help in the reduction of mastitis. Dry animal therapy can eliminate 70% of environmental streptococcal infections.

The fundamental principle of mastitis control is that the disease is controlled by either decreasing the exposure of the teat to potential pathogens or by increasing resistance of dairy animals to infection. The teat canal remains open up to 2-3 hours after milking to resume its normal confirmation. This is the reason for providing feed and water immediately after milking to encourage animals to remain standing and the reason

for having freshly cleaned and bedded stalls when the cows do lie down. Injury to the teat muscle and/or keratin lining caused by crushing, inappropriate treatment or manipulation of the teat canal or form the development of teat end lesions associated with faulty milking equipment or chronic over milking can cause an increase in new infections. Post milking teat dipping in an antiseptic solution helps in the prevention of mastitis, the length of dipping period was related to the effectiveness of post-milking teat dipping as an aid in the prevention of sub-clinical mastitis in cows (Jafri, 1981). *S. aureus* and *Str. agalactiae* can be controlled by proper sanitation and with effective mastitis control practices.

Major pathogens cause high increase in mean milk SCC. The major pathogens i.e. streptococci spp., *S. aureus* and coliforms are responsible for most of clinical infections (Dohoo and Meek, 1982). Effective udder washing and drying, post-milking teat dip and drying, inter-cow hand-washing, and disinfection in the milking routine decrease risk of isolation of major pathogens of mastitis (Sori *et al.*, 2005).

Microorganisms colonizing the mammary gland e.g. *Corynebacterium bovis* or coagulase negative staphylococci (CNS) are minor pathogens or commensals. The minor pathogens include bacteria which are normal inhabitants of the teat canal and may be frequently isolated from milk samples, but which have limited pathological significance and seldom cause inflammation. Minor pathogens cause less increase in mean milk SCC. Environmental pathogens are most often responsible for clinical cases. Dry period antibiotic therapy can eliminate 70% of environmental streptococcal infections (Jones, 2006).

Developed countries like United Kingdom give consideration on following points for controlling mastitis; i) Treatment all cases of clinical mastitis promptly with an effective remedy to limit exposure and reduce duration. ii) Use of a longer acing antibiotic on all quarters of all cows at the end of the lactation to eliminate persisting infections and prevent new infections in the dry period to reduce duration and minimize exposure. iii) Culling all cows suffering from recurrent infection. iv) Dipping teats of all cows in an effective disinfectant after every milking to reduce exposure.

In addition to above, the following recommendations for mastitis control are necessary to carry out in Pakistani conditions. Routine mastitis detection through mastitis detection tests should be carried out. Any animal positive for sub-clinical mastitis should be separated and treatment should be started. For mastitis detection different tests can be used. The first streaks of milk should be observed for presence of clots, streaks of blood, milk may be off color or watery, all these indicate presence of mastitis. Surf field mastitis test (SFMT) is the most reliable, easy to carry out, quick and cheap test for detection of sub-clinical mastitis in dairy animals (Muhammad *et al.*, 2005).

As the weaning is not practiced by most of dairy farmers in Pakistan and direct calf suckling is practiced from the dam udder, the calf during feeding often damages the udder and infection develops. During suckling the pathogens may get entry into the teat. Calf suckling must be avoided at all costs in dairy animals.

Due to rapid urbanization, in urban and peri-urban areas, dairy animals are kept in closed areas within the boundary walls of the house and animals get with very less open and covered area. In this type of housing, over crowding of animals results and chances of spread of disease increase. Proper ventilation and good sanitation at the farm building is necessary to decrease the exposure of pathogens to the mammary gland.

The milker's hand should be properly washed, dried and cleaned so that chances of spread of disease can be minimized. All milking utensils should also be clean and dry.

The floor conditions of the farm should be proper. Cemented/hard, smooth and dry floor is recommended for keeping dairy animals in covered areas. Soiled floor may be used for open areas in the farm. Uneven floors are harmful to the animals. During sitting and standing, the animal should feel comfortable. Similarly, dry bedding should be provided. The dung and urine should be removed immediately, as these are constant source of infections at the farm. Any bad odor within the animal shed indicates the infection. Lice, flies and ticks control strategies should be adapted. These are often vectors and carriers of the disease. Cracks and crevices at the farm are the breeding sites of ticks. Cool and humid places promote breeding of the flies. All cracks should be filled and any humid and wet place should be dried immediately.

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