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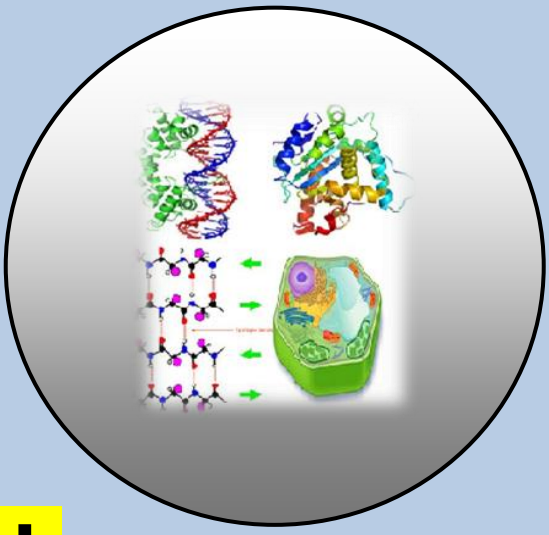

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Dr. Subha Ganguly
http:// www.sasjournals.com
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jbiolchemres@gmail.com
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REVIEW ARTICLE

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Summer Mastitis in Cattle: A Review

Kausar Qadri, *Subha Ganguly, **Parveez Ahmad Para, ***Praveen Kumar Praveen and ****Rajesh Wakchaure

Department of Veterinary Medicine, *Department of Veterinary Microbiology, **Department of Livestock Products Technology, ***Department of Veterinary Public Health and Epidemiology, ****Department of Animal Genetics and Breeding, Arawali Veterinary College (Affiliated with Rajasthan University of Veterinary and Animal Sciences, Bikaner), N.H. - 52 Jaipur Road, V.P.O. Bajor, Dist. Sikar, Pin - 332001, Rajasthan, India

ABSTRACT

The general health and well being of individuals depends largely on meeting basic nutritional needs. Milk and fermented milk products such as cheese, cultured milks and yoghurt have formed an important part of daily nutrition, and the variety of products produced from milk has increased dramatically over the years, as modern food processing technologies have improved. An increase in global population coupled with the increasing demands for milk as an economic food and as an industrial raw food product has necessitated an increase in production by dairy farmers.

Key words: Cattle, Milk, Summer Mastitis and Nutrition.

INTRODUCTION

Consumption of dairy products has also increased at similar levels with a sharper increase in recent years, primarily due to a larger personal income base for individuals (Mantovani *et al.,* 2002). Improving udder health and decreasing the incidence of udder infection and inflammation in dairy herds, will result in increased milk production. “Mastitis” describes an inflammatory reaction in the mammary gland. The term comes from the Greek derived word elements *masto-* referring to the mammary gland and *–it is* meaning – “inflammation” (Blood and Studdert, 1999). Animal care, hygiene, and management are important factors in the dairy cows. Mastitis continues to be the most costly disease of dairy animals affecting the entire Dairy industries throughout the world. With overuse of antibiotics in bovine mastitis and continuing appearance of antibiotic-resistant bacteria, search for alternative substances for antibiotics is imminent (Kulkarni and Kaliwal, 2013). Mastitis continues to be the most costly disease of dairy animals. Clinical mastitis is characterized by sudden onset, swelling, and redness of the udder, pain and reduced and altered milk secretion from the affected quarters. The milk may have clots, flakes or of

watery in consistency and accompanied by fever, depression and anorexia. The sub clinical mastitis is characterized by having no visible signs either in the udder or in the milk, but the milk production decreases and the Somatic cell count (SCC) increases, having greater impact in older lactating animals than in first lactation heifers. A negative relationship generally exists between SCC and the milk yield (Khan and Khan, 2006).

Summer mastitis is a type of mastitis that is seen in dry cows usually, as the name suggests during the summer months. It is when the dry udder is infected by one or more gram-positive bacteria such as *Corynebacterium pyogenes*, causing low grade mastitis with the cow often being clinically well but with a very enlarged and painful quarter. Flies are implicated in transmission of the infectious agents and infection often results in the quarter being unproductive in following lactations (Hurley 1989). Summer mastitis is a serious disease likely to cause the loss of the quarter and a severe clinical illness (Lean *et al*., 1987).

AETIOLOGY

Corynebacteriun pyogenes causes summer mastitis in cattle (Zastempowska and Henryka, 2012). The fly Hydrotaea irritants are universally regarded as the most important vector of summer mastitis. The annual losses caused by summer mastitis are substantial. The incidence of summer mastitis varies annually and monthly. Summer mastitis is particularly observed on sandy soil, less often on peat and hardly ever on clay. This is in accordance with the habitats of Hydrotaea irritans. Summer mastitis is a term for the type of mastitis which tends to occur during the warmer months in dry cows and heifers at pasture. It differs from other types of mastitis in several ways, and is classed neither as contagious nor environmental in its origin. It is often called 'August bag'. Summer mastitis is associated with late summer and autumn but can occur at other times of the year. The seasonality is probably related to calving patterns, and also the time of the year when the sheep head fly [*Hydrotaea irritans*] is most active. These flies have been shown to carry the summer mastitis organisms even in the absence of disease and are believed to be the major means of transmission. They prefer woods, damp ground and stagnant water, sheltered from wind. The flies live in bushes and trees and only fly out to feed on cattle when wind speeds are low, generally less than 20km per hour, and in the absence of rain. They favour landing on the legs, abdomen and udder. 60% of summer mastitis infections occur in the front quarters, and it has been suggested that these are reached more easily. Possibly, the swishing effect of the tail removes flies more from the hind teats (Madut and Gadir, 2011).

PATHOGENESIS

Mastitis in dairy animals occurs when the udder becomes inflamed and bacteria invade the teat canal and mammary glands. These bacteria multiply and produce toxins that cause injury to the milk secreting tissue, besides, physical trauma and chemical irritants. These cause increase in the number of leukocytes, or somatic cells in the milk, reducing its quantity and adversely affecting the quality of milk and milk byproducts. The teat end serves as the first line of defense against infection. From outside, a sphincter of smooth muscles surrounds the teat canal which functions to keep the teat canal closed (Murphy *et al.,* 1988). It also prevents milk from escaping, and bacteria from entering into the teat. From inside, the teat canal is lined with keratin derived from stratified squamous epithelium. Damage to keratin has been reported to cause increased susceptibility of teat canal to bacterial invasion and colonization. The keratin is a waxy material composed of fatty acids and fibrous proteins in the teat. The fatty acids are both esterified and non-esterified, representing myristic acid, palmitoleic acid and linolinic acid which are bacteriostatic (Treece *et al.,* 1966). The fibrous proteins of keratin in the teat canal bind electrostatically to mastitis pathogens, which alter the bacterial cell wall, rendering it more susceptible to osmotic pressure.

Inability to maintain osmotic pressure causes lysis and death of invading pathogens (Murphy and Stuart, 1953). The keratin structure thus enables trapping of invading bacteria and prevents their migration into the gland cistern. During milking, bacteria present near the opening of the teat find opportunity to enter the teat canal, causing trauma and damage to the keratin or mucous membranes lining the teat sinus (Capuco *et al.,* 1992). The canal of a teat may remain partially open for 1-2 hr after milking and during this period the pathogens may freely enter into the teat canal (Jones, 2006).

SYMPTOMS

Initial symptoms are a swollen, painful teat or quarter, and can be easily identified by careful observation, particularly when flies become attracted to the teat's unpleasant-smelling yellow secretions, which as the disease progresses will become worse. If left untreated, the bacterial toxins will damage the udder tissues irreversibly; in many cases the quarter affected will be lost entirely or so badly affected by the infection that it will be effectively lost. Further signs as the illness becomes systemic are swelling of the hind legs, obvious lethargy and separation from the herd, abortion and even death (Oliver and Sordillo, 1988).

DIAGNOSIS

Diagnisis can be done on the basis of history of flies, season etc., on the basis of clinical signs, California mastitis test and Somatic cell count (Waage *et al.,* 2001).

TREATMENT

Treatment is most often via regular and repeated stripping of the affected quarter, to remove as much affected material as possible, followed by intra-mammary antibiotics and an antibiotic injection to counter the systemic effects of bacterial toxins. Heifers and cows with summer mastitis are best isolated to prevent the spread of the illness (Radostitis *et al.,* 2000).

Different *Corynebacterium* species were isolated from the clinical cases of mastitis. *Corynebacterium* species isolated, found to be highly sensitive to Gentamycin. *Corynebacterium pyogenes was* resistant to Penicillin G, (100%) and sensitive to Cephalexin and Gentamicin (100%) (Madut and Gadir, 2011).

PREVENTION AND CONTROL

Summer mastitis can be avoided by various measures. Having effective dry cow therapy, including the use of long-term intra-mammary antibiotics, teat end sealants and good hygiene measures at drying-off. In some circumstances, intra-mammary antibiotics may require re-administration during the dry period, although care should be taken with milk withdrawal periods. Implementing measures to control and minimize exposure to flies. Flying insects should be controlled from early on in the fly season by the use of pour-on anti-parasitic treatments, the use of fly ear tags, and the application of teat fly repellents to teats, such as traditional Stockholm tar and brown salves. Maintaining good teat condition pre-drying off, having good dry cow nutrition and observing/checking cattle on a regular basis are required. Avoiding areas where teats may be damaged or areas where flies are a particular problem, such as near rivers and woods. Several measures to prevent summer mastitis are available to farmers. When fly repellents or agents protecting the teat openings are used, fair results are obtained. Synthetic pyrethroids would appear to offer better prospects, however, because of their long-acting character. Results obtained using *C. pyogenes* vaccines are disappointing. Long-acting antibiotics offer good prospects in yearlings in the 1-2 year range. (Diergeneeskd, 1983).

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Corresponding Author: Dr. Subha Ganguly, M.V.Sc., Ph.D., F.S.A.Sc., Associate Professor and Head, Department of Veterinary Microbiology, Arawali Veterinary College (Affiliated with RAJUVAS, Bikaner), Sikar, Rajasthan, India.
Email: ganguly38@gmail.com