

THE MASTITIS PROBLEM

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Cause of Mastitis

Mastitis is defined as an inflammation of the mammary gland. The inflammation is the result of a localized immune response to an irritant within the gland. The irritant can be in the form of pathogens, toxins, or physical trauma. The goat mounts an immune response in an attempt to destroy or neutralize the irritant, and return the mammary gland to normal function.

Mastitis implies that an infectious agent is present in the mammary gland and is nearly always caused by bacteria. Bacteria invade the udder by entering the teat orifice, multiply and die within the gland, and in the process, produce and release toxins that cause injury to secretory tissue and stimulate an immune response. Besides bacteria, other pathogens such as yeast, *Mycoplasmas*, and algae can infect the mammary gland. Bacteria which infect the mammary gland are classified into two major categories, contagious or environmental pathogens. Mastitis caused by these pathogens is generally referred to as contagious mastitis or environmental mastitis.

Contagious pathogens are spread from an infected udder to a noninfected udder during the milking process. The source of bacteria is an infected udder. The most prevalent contagious pathogens associated with mastitis are *Streptococcus agalactiae* and *Staphylococcus aureus*. As the name implies, environmental pathogens that infect the mammary gland are present in the goat's surroundings. The reservoirs for these pathogens include feces, soil, and bedding. Transmission of pathogens from the environment to the udder mainly occurs between milking, but can also occur during milking. Environmental pathogens commonly isolated from infected udders are coliform bacteria, *Streptococcus* species other than *Strep. agalactiae*, and *Staphylococcus* species other than *Staph. aureus*.

Pathogenesis, Detection, and Diagnosis of Mastitis

However, during the course of mastitis, bacteria and secretory cells within the mammary gland produce various chemical messengers that enter the blood circulation within the udder. These chemical messengers attract a specialized type of somatic cell called neutrophils to the mammary gland. Therefore, as a result of the intramammary bacterial infection, a tremendous amount of neutrophils is mobilized into the udder in order to combat the infection. The increase of this cell type within milk is the primary cause of increased milk somatic cell counts associated with mastitis.

On the farm, mastitis is usually detected by the observance of abnormal milk. The udder producing this milk may become swollen, red, feverish, and hard. This condition is known as clinical

mastitis and is observed in less than 5% of animals in a well-managed dairy herd. The nonobservable form of mastitis, such as no visible abnormalities of either the milk or the udder, is known as subclinical mastitis. In excess of 50% of animals in a herd can have subclinical mastitis at any given time. A sudden rise in milk somatic cell count observed in normal milk from normal udders may indicate the presence of subclinical mastitis. Animals which have subclinical mastitis are usually not producing milk to their full potential and can serve as a potential source of infection to healthy udders.

The best method to diagnose mastitis is to conduct a bacteriological analysis of milk samples from udder halves that were collected in a sterile manner. Milk samples should be taken from goats with clinical mastitis and goats that exhibit a substantial increase in somatic cell count. Bacterial pathogens isolated from milk samples can be accurately identified by the analysis. This allows for the determination of the source of infection, such as a contagious or environmental pathogen. The identification of the type of infective organism will help the producer make sound management decision to prevention and control mastitis.

Prevention of Mastitis

The success of a dairy is highly influenced by the prevention and control of mastitis. The dairy farmer must be conscience of the impact mastitis may have on public health issues, the economy of the farm, and the well being of the goat. Mastitis pathogens in milk pose a low threat to public health if the milk is pasteurized. However, the improper use of antibiotics to eliminate mastitis pathogens can become a public health concern. The careless application of antibiotic therapy against mastitis can lead to residues in milk and meat, the selection of antibiotic resistant strains of bacteria, and the introduction of pathogens into the mammary gland by contaminated infusion cannula. The economics of the disease must also be of a concern to the dairy farmer. Mastitis is the most economically important disease in the bovine dairy industry. Estimated losses range from \$185.00 to 265.00 per cow per year. This places annual losses in excess of \$2 billion or about a 10% loss of total productive capacity. Generally, sources of economic loss include reduced milk production, animal replacement due to culling, discarded milk due to antibiotic treatment, cost of treatment, veterinary service, and extra labor cost to care for the animals. Although the effect of mastitis on the economy of the dairy goat industry has not been established, the trend of lost dollars due to this disease should closely parallel what is observed in the bovine dairy industry.

The key to disease prevention is to control exposure to pathogens. In the case of mastitis, a good control program must reduce the exposure of teat ends to bacteria. Contagious pathogens are transmitted to uninfected halves at milking time, therefore, teat preparation before milking is very important. Milk only clean, dry teats. Gloved hands that have been disinfected and dried between handling of goats will decrease the likelihood of spreading bacteria from an infected goat to a noninfected goat. Decreasing the exposure of teat ends to contagious pathogens following milking can be accomplished by killing bacteria on teat skin with a postmilking teat dip. Also, maintaining healthy teat skin and teat ends are also important. Teat lesions have been shown to harbor bacteria, such as *Staphylococcus aureus* and *Streptococcus* species, that can cause mastitis.

Exposure of teat ends to environmental pathogens is more difficult to control than contagious pathogens. Sources of infection include manure, bedding material, feedstuff, dust, dirt, mud, and water. The bacteria load in those sources can increase significantly in situations where overcrowding, poor ventilation, and a damp environment exist, in other words, in situations where there is a general lack of cleanliness and poor sanitation. Therefore, reduced teat end exposure to environmental bacteria can be accomplished by providing goats with a clean and dry pasture or barn. As noted in the control of contagious pathogens, good milking time hygiene, such as milking clean and dry teats can control exposure to environmental pathogens. Predipping teats before milking may also reduce the risk of infecting udder halves with environmental pathogens. In theory, utilization of a premilking teat sanitizer will eliminate bacteria from the teat skin before the milking units are attached and therefore, reduce the risk of infecting udder halves during the milking process.

Since the elimination of environmental pathogens from the goat's surrounding is impossible to accomplish, enhancement of the animal's immune response to infection may be an alternative method of control. Immunization against coliform bacteria has been shown to be effective in reducing the number and severity of clinical coliform mastitis in dairy cows.

Other general practices to prevent contagious and environmental mastitis include the milking of infected animals last and preventing the animals from laying down after milking. This can be accomplished by feeding them immediately after milking to insure that they are standing for at least 30 minutes. This should allow enough time for the proper closure of the teat orifice.

Treatment of Mastitis

Perhaps the most commonly employed treatment of mastitis is to do nothing. This practice may be most common in cases of subclinical mastitis where the disease goes unnoticed. In most instances a spontaneous cure of the intramammary infection occurs, but at the expense of reduced milk production and possible permanent damage to milk secretory tissue in the mammary gland. Antibiotic therapy is usually prescribed when clinical symptoms of mastitis are presented. If detected early, antibiotic therapy is very effective in curing and controlling the spread of contagious pathogens. However, antibiotic therapy is not effective against environmental pathogens, especially coliform bacteria. Culling is another method of control especially when dealing with chronically infected animals. This eliminates the potential source of infection at the expense of purchasing a replacement animal.

Management of Mastitis

A sound herd health management program is needed to be successful in the control and prevention of mastitis. This would include the implementation of an udder health monitoring program such as the Dairy Herd Improvement (DHI) testing for milk somatic cell counts. In the bovine dairy industry, the milk somatic cell count serves as an excellent index to determine the status of mammary gland health. However, the milk somatic cell count of goat milk may not be a reliable indicator of mastitis. Research in dairy cows has shown a very high degree of association between increased somatic cell counts and intramammary bacterial infection. The milk somatic cell count of the

uninfected mammary gland of cows ranges between 40,000 and 200,000 cells per milliliter of milk, and increases to more than a million cells during mastitis. However, in dairy goats, the milk somatic cell count in healthy, uninfected udder halves can vary between 50,000 and more than 1,000,000 cells per milliliter of milk. This is especially noticeable at the beginning of lactation and near dry off. Therefore, the microbiological analysis of milk collected from suspect udder halves must be conducted to determine if an increase in milk somatic cell count is due to a bacterial infection. Once the cause and source of infection (contagious or environmental pathogens) are identified, treatment strategies such as antibiotic therapy or culling can be devised and management practices can be reviewed or modified in order to prevent the spread of infection. Other management practices that can be employed to effectively control mastitis are to evaluate milking practices and routines, evaluate the housing condition of animals, and provide adequate nutrition for each stage of lactation.

Summary and Conclusion

Mastitis is a very economically important disease to the dairy industry. There are established procedures and protocols for the prevention and control of mastitis, but those procedures and protocols can only be effective if an udder health monitoring program is in place. The monitoring program will be successful if the farmer diligently manages the herd and maintains accurate records of individual animals.

There are six basic elements of an effective mastitis control program. They include: 1) proper milking procedures and milking machine function, 2) teat dipping after milking, 3) providing the goats a clean, comfortable, and dry environment between milking, 4) use antibiotic therapy at dry off to eliminate existing infection, 5) cull chronically infected goats to prevent the spread of infection, and 6) keep accurate production and health records of individual goats.

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