Coliform Mastitis

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Coliform mastitis is tremendously important to the dairy industry for several reasons. First, it has become the predominant form of clinical mastitis and current management practices favor an increase in incidence. Second, coliform organisms cause some of the most severe cases of clinical mastitis. Third, as present trends in the dairy industry of increasing milk quality continue, environmental mastitis, principally coliform mastitis, is becoming the single most economically important form of mastitis. Finally, clinical coliform mastitis can have a devastating impact on milk production. In one study it was reported that a case of coliform mastitis resulted in a combined loss of 876 lb of milk. Another study reported that approximately 40% of glands affected by coliform mastitis did not return to production and approximately 75% of the cows with non-productive glands were subsequently culled.

The clinical severity of coliform mastitis varies from mild flare-ups of a gland to extreme life-threatening, systemic disease. Studies have shown that while 60-80% of coliform mastitis infection results in clinical disease, 15-23% of infections cause acute systemic signs. In a recent study of 43,000 cows, 13.3% of coliform mastitis cases were classified as very severe and 37.3% were classified as severe. The wide range in severity of coliform mastitis suggests that there may be differences in the ability of strains of coliform organisms to cause disease, or differences in how individual cows respond to infection.

Signs of an acute coliform mastitis infection (hot, swollen, painful glands; off feed, depression, dehydration, rumen shut down, etc) are believed to be primarily due to release of a toxin (endotoxin) from the cell wall of infecting bacteria. Most experimental coliform mastitis studies are based on infusing endotoxin directly into the gland and have concluded that disease severity is directly related to the amount of endotoxin present in the gland. Recommendations for therapy are based primarily at removing or neutralizing the toxin. While these studies have added to our understanding of coliform mastitis, it is important to note that they have failed to account for differences that may occur in the natural disease condition.

Recently, we reported findings from a study of cows with naturally occurring coliform mastitis that differ from those of experimentally infected cows. We found cows with natural infections have more persistent changes in blood and serum parameters, prolonged recovery of bacteria from milk of affected glands, and a high prevalence of bacteremia (presence of bacteria in the blood). These findings indicate significant differences between naturally occurring disease and experimental models.

A study is currently underway at Colorado State University to further characterize naturally occurring coliform mastitis based on physical examination, blood and serum parameters, and blood culture findings. Cows with suspected coliform mastitis are being sampled from five local dairies. Cases are classified based on physical examination as

either mild (signs restricted to the gland), moderate (few systemic signs), or severe (extensive systemic signs). Preliminary findings have revealed a trend of decreasing white blood cells in the peripheral blood (?) with increasing severity of disease. We have observed bacteremia in 1.6% of cows classified as mild (61 cows), 16% of cows classified as moderate (25 cows), and 38.5% of cows classified as severe (13 cows). Techniques are also being used to determine if bacteria isolated from blood are the same as (therefore originating from) bacteria infecting the mammary gland. As suspected, initial results indicate that when E. coli is isolated from the blood, it is identical to that isolated from the gland. Interestingly, we also have found different species of bacteria (Pasteurella) in the blood of some cows with severe coliform mastitis. Based on these findings we suspect that severe coliform mastitis may allow systemic infection by bacteria originating from other organ systems (respiratory or gastrointestinal). These preliminary results suggest that bacteremia is an important aspect of naturally occurring coliform mastitis and that physical examination can be used to identify cows at risk for bacteremia. These findings are especially important in light of results from earlier studies which suggest that the use of systemic antibiotics in cows with coliform mastitis is unwarranted since systemic infection is rare. In contrast, our studies would suggest that systemic antibiotics may indeed be indicated in cows with coliform masttits, especially cows with moderate to severe clinical signs.

Recently, funding has been obtained to continue research into naturally occurring colifom mastitis. During the next year we will utilize techniques to characterize all of the bacterial isolates collected from the previous year's study. We hope to determine if any specific strain of coliform bacteria is associated with the different levels of disease severity. Concurrent studies will also be conducted to determine how long bacteria are shed in the milk of cows with coliform mastitis and how often "chronic" coliform mastitis occurs. The overall goal driving these research efforts is to determine what strategies can be identified to better prevent and treat coliform mastitis.