

E. coli & Coliform Mastitis

Escherichia coli is a Gram-negative bacteria, frequently grouped with other coliform bacteria of the family *Enterobacteriaceae*. Other coliforms include *Klebsiella* and *Enterobacter* species.

Source / Transmission

E. coli and other coliform bacteria are found in high concentration in organic matter, such as bedding and manure. Udders become infected with coliform bacteria through contact with organic matter in the environment or during milking.

Infection

Once inside the udder, *E. coli* multiply rapidly, causing an influx of inflammatory cells. As neutrophils ingest and kill bacteria, endotoxin (LPS) is released and along with other inflammatory mediators causes severe local inflammation. This inflammatory response is characterized by increased vascular permeability, changes in milk composition and damage to the mammary epithelial cells – all of which may result in the characteristic watery or serous milk secretion.

Because of the robust immune response, the majority of clinical coliform cases are mild and short-duration, and many infections may go undetected. However, clinical symptoms are a result of the inflammatory process and frequently include a hot, hard or swollen quarter. Coliform bacteria may be implicated in 50 – 70% of severe mastitis cases.¹ In these cases, systemic illness is caused by endotoxin release into the bloodstream, and the affected cow may exhibit an initial high fever followed by subnormal temperature, depression, anorexia, rumen stasis, diarrhea, and potentially progressing to recumbancy and death. In one study of acute coliform mastitis, bacteria were isolated from the bloodstream in 32% of cases.²

Risk Factors

New infections can occur throughout lactation, however cows most at risk for coliform mastitis are those early in lactation and immediately after dry-off. Poor environmental hygiene, such as manure

contaminated bedding, and poor hygiene practices during milking are also risk factors.

Treatment

Several studies have found that undifferentiated cases of mild or moderate coliform mastitis have a high rate of spontaneous cure^{3,4}, meaning that the cow's immune system is able to clear the infection without antimicrobial therapy. Based on this fact, some dairy producers choose not to use intramammary antibiotics for mastitis cases that are caused by Gram-negative bacteria. However, recent work suggests that mastitis cases caused by *Klebsiella spp.* have a lower spontaneous cure rate and therefore may benefit from intramammary therapy.⁵ In addition, some proportion of coliforms, including *E. coli*, may become chronic or recurrent infections.⁶ Cows with severe cases of coliform mastitis should be treated with systemic and supportive therapies, including fluids, anti-inflammatories and systemic antimicrobial therapy.

Control

Maintaining a clean, dry environment for cows is important to reduce exposure of the teat end to dirt and manure. This includes frequent scraping of alleys and holding pens, and keeping stalls or areas where cows lie down clean and well-bedded. Pre- and post-milking teat disinfection and good milking practices are also important. Coliform mastitis vaccines have proven effective at reducing the severity of clinical cases and are recommended in most herds.

References

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- ⁴ Wilson et al. 1999. Comparison of seven antibiotic treatments with no treatment for bacteriological efficacy against bovine mastitis pathogens. *J. Dairy Sci.* 82:1664-1670.
- ⁵ Schukken et al. 2011. Randomized clinical trial to evaluate the efficacy of a 5-day ceftiofur hydrochloride intramammary treatment on nonsevere gram-negative clinical mastitis. *J. Dairy Sci.* 94:6203-6215
- ⁶ Schukken et al. 2004. Chronic and Recurrent Coliforms: Implication for Lactation Therapy. *NMC Annual Meeting Proceedings*, pp35-40