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## Mastitis Causing Pathogens: *Klebsiella* species

### Background

*Klebsiella* species are Gram-negative coliform bacteria that can cause mastitis, leading to significant economic losses on dairy farms. *K. oxytoca* and *K. pneumoniae* are the species that are responsible for causing clinical mastitis.

### Source and Transmission

Like other coliforms, *Klebsiella* are found in manure. Manure easily contaminates the environment of the dairy cow causing mastitis infections if cattle and environmental hygiene are not well maintained. Drinking water, feed, other cows, and bedding (especially wood by-products used as bedding) are potential sources of environmental *Klebsiella* infections. Infection of the teats can lead to spread of the pathogen during milking as milk from an infected cow contaminates the milking unit and transmits the infection to the next cow that is milked.

### Disease Pathogenicity

Of all *Klebsiella* mastitis cases, approximately a third are mild (abnormal milk), a third are moderate (abnormal milk and swollen udders), and a third are severe (systemic signs, including fever, off feed, decreased milk production, shock, and/or recumbency). *Klebsiella* invades deep into the secretory tissue of the udder, compromising the secretory capacity of the mammary gland. Consequently, many *Klebsiella* infections become chronic infections causing cows to experience a long-term reduction in milk production.

### Treatment

Once a cow is tested positive for *Klebsiella*, the somatic cell count (SCC) history of the cow should be reviewed to decide whether treatment should be instituted. One or more months of a SCC exceeding 200,000 cell/mL is an indication of a chronic infection and antimicrobial treatment would be warranted. However, no intramammary antimicrobials are currently labeled for the treatment of *Klebsiella* infections in the U.S. Intramammary

antimicrobial usage for *Klebsiella* infections are considered extra-label drug use and must be supervised by a veterinarian. In severe cases of *Klebsiella* mastitis, treatment consists of fluids, anti-inflammatories, as well as systemic antimicrobial therapy.

### **Prevention and Control**

Identification of chronically infected cows is crucial in the control of transmission; an effective culturing program should be implemented for the early detection of infected cows. Cows with chronic mastitis should be segregated and milked last, as well as considered to be culled when possible. Proper milking practices, including pre- and post-milking teat disinfection, are important for good udder hygiene and minimizing spread of the infection during milking. Maintaining a clean, dry environment is important in reducing teat-end exposure to manure. Since *Klebsiella* is associated with certain types of bedding, the bedding should also be taken under consideration as a source of infection. Finally, coliform mastitis vaccines have proven to be effective at lessening the severity of clinical cases but further investigative research is required for their efficacy and use.

### **References**

Zadoks, R. N., Schukken Y. H. *Klebsiella* Mastitis: Prevention and Treatment Recommendations. Moredun Research Institute. Cornell University.