



TECHNICAL BULLETIN

Moraxella bovoculi

Abstract

Pinkeye, officially known as Infectious Bovine Keratoconjunctivitis (IBK), is the most common eye disease of cattle. *Moraxella bovis* has been accepted as the primary cause of pinkeye. *M. bovis* can be isolated from eyes showing lesions and from normal appearing eyes. To satisfy Koch's postulates, ultraviolet irradiation followed by a challenge with *M. bovis* can result in IBK lesions. Other bacteria have also been isolated from cattle with IBK either in conjunction with or without *M. bovis* also being isolated. Some of the non-*M. bovis* isolates are hemolytic gram-negative cocci. A proposed name for these cocci has been *Moraxella bovoculi* sp. nov.¹ Like *M. bovis*, *M. bovoculi* can be isolated from diseased eyes as well as non-diseased eyes. It has been speculated that *M. bovoculi* is an opportunist that may cause disease following eye trauma or irritation caused by dust.²

History

M. bovoculi is a gram-negative cocci or diplococci (occurs in pairs). For comparison, *M. bovis* is a short gram-negative rod. *M. bovoculi* may not be a new bacterium associated with IBK.

In 1917, a translation of a 1911 manuscript reported on a gram-negative micrococcus isolated from calves with IBK. In a 1966 manuscript, hemolytic gram-negative cocci were isolated from calves with severe keratitis and corneal ulceration. This study isolated *Neisseria* spp. from 24 of 25 outbreaks of IBK in Northern Scotland. However, *M. bovis* was only isolated from two of these outbreaks.²

There has been a progression of names given to gram-negative cocci isolated from IBK. In 1970, *Neisseria (Branhamella) catarrhalis* was reportedly isolated from 45% of IBK cases. A specific *Neisseria* species was *N. ovis* later renamed

Historically, isolates of hemolytic gram-negative cocci from cases of IBK have been designated as *M. ovis* or *M. ovis*-like.

During a drug efficacy trial conducted by Dr. John Angelos et. al., IBK-affected eyes were cultured. In most calves, gram-negative cocci were isolated but not *M. bovis*. These researchers subsequently characterized the isolate using biochemical and molecular data that showed the isolates were distinct from *M. bovis* and *M. ovis*.

The researchers proposed the name *Moraxella bovoculi* sp. nov., and then developed a polymerase chain reaction (PCR) test that can differentiate *M. bovoculi* from *M. bovis* and *M. ovis*. Dr. Angelos' group speculates that *M. bovoculi* may have been the bacteria found many years ago in reports of calves where gram-negative cocci or *Neisseria* species were isolated.

Evidence of Pathogenicity

One trial using ultraviolet irradiation of the eye did not result in lesions following inoculation of eyes with *M. bovoculi*. Dr. Angelo speculates that other factors, besides irradiation, may be necessary for *M. bovoculi* to cause disease.² IBK is a complex disease requiring ultraviolet light, irritation and opportunistic bacteria. This isn't unlike bovine respiratory disease which often requires a combination of stress, virus and bacteria to cause respiratory lesions.

In Northern California, *M. bovoculi* was cultured from the eyes of dairy and beef calves affected with IBK.¹ Swabs from 138 cultures were gathered from calves between the ages of 3 to 9 months. Gram-negative cocci were isolated for 68 ulcers and *M. bovis* from 29 ulcers.

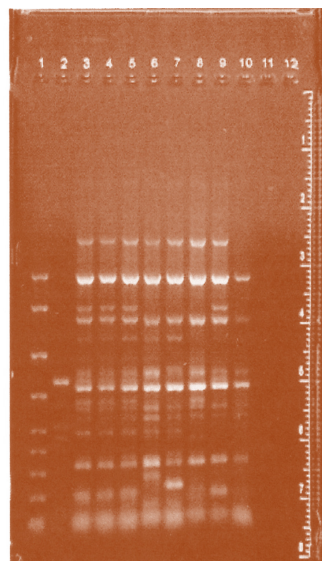
For *M. bovis*, pathogenicity is linked to a cytotoxin – RTX. *M. bovis* has four genes that encode proteins for cytotoxin activation. *M. bovoculi* contains similar genes that encode for the RTX cytotoxin. This suggests a possible role for *M. bovoculi* in the pathogenesis of IBK.

Vaccination with *M. bovis* vaccine in one field trial resulted in *M. bovoculi* being isolated more frequently from vaccinated calves vs. non vaccinated control calves. Some researchers suggest that vaccination against *M. bovis* and *M. bovoculi* may be important when both organisms are circulating in a herd.²

Diagnosis and Prevention

Affected eyes from several animals should be swabbed **and the eyes should be cleaned before swabbing**. The swabs should be sent to MVP or another veterinary diagnostic laboratory, making sure they stay moist and cool while being shipped. Some diagnostic laboratories may not be able to differentiate between *M. ovis* and *M. bovoculi*. Recently, Iowa State University Veterinary Diagnostic Laboratory began offering biochemical tests to differentiate between *M. ovis* and *M. bovoculi*. The ISU lab doesn't offer PCR testing.³

MVP offers a PCR assay that can differentiate *M. bovoculi* from *M. bovis* and *M. ovis*. Among the different strains of *M. bovis*, *M. bovoculi*, and *M. ovis*, a differentiation can also be done by comparing the soluble protein profile of each isolate. A dendrogram can be created using the soluble protein profile and antigen selection can be made.



It is suggested that pinkeye vaccines be given twice, 3 to 4 weeks apart. Young calves should be immunized prior to pasture turnout. Breeding animals should be vaccinated once prior to turnout.

MVP can also assist the submitting veterinarian with the necessary USDA paperwork, so the vaccine can be used in the herd or herds of origin and in adjacent and non-adjacent herds.

¹ Angelos JA, Spinks PQ, Ball LM, & George LW. *Moraxella bovoculi* sp. nov., isolated from calves with infectious bovine keratoconjunctivitis. Int J Syst Evol Microbiol 2007; 57:789-95.

² Angelos JA. *Moraxella bovoculi* and Infectious Keratoconjunctivitis: Cause or Coincidence? Vet Clin Food Anim 26 (2010) 73-78.

³ http://vetmed.iastate.edu/diagnostic-lab/diagnostic-services/diagnostic-sections/bacteriology/#m_bovoculi

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