

Diagnostic Note – Infectious Bovine Keratoconjunctivitis (Pinkeye)

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Moraxella bovis is the primary known cause of infectious bovine keratoconjunctivitis or pinkeye, the most important ocular disease of cattle worldwide. It is most commonly seen in the warmer months. While the disease is not a significant cause of mortality, it does cause considerable economic loss due to secondary problems related to corneal ulcers. It is well known that certain risk factors, such as ultraviolet radiation, dust, chaff, grass awns and face flies predispose an animal to pinkeye. Based on recent biochemical analysis, there are fifteen distinct subgroups of this bacteria, some of which are pathogenic and some not. Pathogenic strains possess proteins that allow them to attach to corneal epithelial cells, and cytotoxins that can degrade corneal proteins thus leading to ulcers and the clinical signs associated with them (tearing, sensitivity to light, and conjunctivitis).⁶ Commercial vaccines provide protection against only a few pathogenic strains; therefore they will not be 100% effective against disease.

Moraxella (now being changed from *Branhamella* to *Moraxella*) *ovis* has also been isolated from cases of pinkeye, but experts do not universally agree that it is a cause of pinkeye. The organism can be isolated from normal bovine eyes as well. Recent research shows that *M. ovis* produces toxins that degrades bovine red blood cells, white blood cells and corneal epithelial cells, and therefore may play a role in clinical disease.³ It is not uncommon to isolate *M. bovis* and *M. ovis* from cases of pinkeye, suggesting a synergistic effect between the two organisms.

Moraxella (formerly *Mycoplasma*) *bovoculi* is a recently identified related organism that has been isolated from calves with pinkeye.^{2,5} Recent studies indicate that the organism may contribute to pinkeye, and has been confused with *Moraxella ovis*.¹ A polymerase chain reaction (PCR) assay to differentiate *M. ovis* from *M. bovoculi* was recently developed, and can be performed on presumptive *M. ovis* isolates at the NDSU-VDL. The problem of cause is further confused by the fact that *Moraxella bovoculi* can be isolated from normal bovine eyes as well. Recent vaccine trials with an autogenous bacterin to *M. bovoculi* were unsuccessful in preventing clinical disease in infected groups of calves.⁴ This further calls into question the significance of *M. bovoculi* as a pathogen, and highlights the fact that more information is needed to define this organism as a cause or contributor to pinkeye.

Currently, then, *M. bovis* is the only known cause of pinkeye, and can be isolated from ocular swabs and identified. It is not currently definitively known if *M. ovis* and *M. bovoculi* can cause pinkeye, and, while we can culture the organisms, PCR is needed to tell the two apart. There are no commercial vaccines that include protection against *M. ovis* and *M. bovoculi*. Autogenous vaccines can be made against these bacteria if isolated, but consulting with your veterinarian is advised when considering the efficacy and administration of such vaccines.

From a standpoint of pathogenesis, it seems likely that some sort of trauma or co-infection causes enough damage to the surface of the eye that colonization by resident conjunctival bacteria becomes possible. This would explain why both *M. ovis* and *M. bovoculi* can be found in normal eyes, but can also be isolated from diseased eyes. Therefore, the need to differentiate *M. ovis* from *M. bovoculi* by PCR needs to be considered on an individual basis by the producer and the practitioner. *M. bovis* is clearly a cause of pinkeye and it's recovery from ocular swabs should encourage some combination of management, therapy and vaccination. Consult your veterinarian and diagnostic laboratory with any questions.

¹Angelos J. A., and Louise M. Ball. Differentiation of *Moraxella bovoculi* sp. nov. from other coccoid moraxellae by the use of polymerase chain reaction and restriction endonuclease analysis of amplified DNA. *J Vet Diagn Invest* 19:532-534 (2007).

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- ⁴Funk L.,A.M. O'Connor, M. Maroney,T. Engelken, V.L. Cooper,J. Kinyon and P. Plummer. A randomized and blinded field trial to assess the efficacy of an autogenous vaccine to prevent naturally occurring bovine keratoconjunctivitis (IBK) in beef calves. *Vaccine* 27:4585-4590 (2009).
- ⁵Levisohn S., S.Garazi, I. Gerchman, and Jacob Brenner. Diagnosis of a mixed mycoplasma infection associated with a severe outbreak of bovine pinkeye in young calves. *J Vet Diagn Invest* 16:579-581 (2004).
- ⁶Postma C. G., J.C. Carfagnini, and Leonardo Minatel. *Moraxella bovis* pathogenicity: An update. *Comp Immun Micro and Inf Dis* 31:449-458 (2008).

