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Bovine Pinkeye Considerations

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Over the past several years there has been a debate within academic circles regarding the underlying bacterial agent or agents that cause pinkeye in cattle (also known as bovine keratoconjunctivitis, or IBK for short). *Moraxella bovis* historically has been the bacteria of concern for IBK, and the target for both treatment with antibiotics and prevention through vaccination. Over a decade ago, another bacteria now named *Moraxella bovoculi* began to be recognized as a common isolate from ocular swabs of IBK cases. The apparent increase in *Mor bovoculi* may be related to herd management, bacterial ecology, or simply targeted diagnostic techniques.

Mor bovis is a relatively fastidious (fussy) organism that is most easily isolated very early in the disease process during the initial signs of increased tearing and ocular irritation. Swabs taken after corneal ulceration is present are more likely to isolate other opportunistic bacteria. Furthermore, the type of swabs used to sample infected animals and the handling of those swabs for transport to a lab can affect whether *Mor bovis* survives the process or is overwhelmed by other bacteria such as *Mor bovoculi*.

Regardless, it is important to note that experimental challenge studies have failed to demonstrate a role for *Mor bovoculi* in causing corneal ulcers associated with IBK. In other words, studies published to date have not proven a direct causal role for *Mor bovoculi* in IBK. Nonetheless, ongoing investigations into the role of *Mor bovoculi* in causing IBK have demonstrated a cellular toxin and possible attachment proteins (pili) similar to those found in *Mor bovis*. It is possible that *Mor bovoculi* may assist in *Mor bovis*-associated ocular colonization or spread, similar to the role of other pathogens such as *Mycoplasma* spp and infectious bovine rhinotracheitis (IBR; bovine herpesvirus).

For those who have dealt with IBK in their herd, a primary frustration has to do with the potential for an annual recurrence of disease even in animals that have dealt with IBK in the past. In those situations it is always worth evaluating herd management related to ocular irritation (dust, long-stemmed grass), fly control, and nutrition (macro- and micro-mineral balance in particular). A possible cause of reinfections may be related to antigenic diversity within bacteria. For example, exposure to a particular strain of *Mor bovis* may lead to selective immunity against that strain's pili. However, within a population of animals there may be multiple strains of bacteria present, and immunity against one or more strains may simply present alternate strains a window of infective opportunity. This concept of selective immunity has been proposed as a reason for commercial vaccine failures. Vaccines are limited in the number of strains that

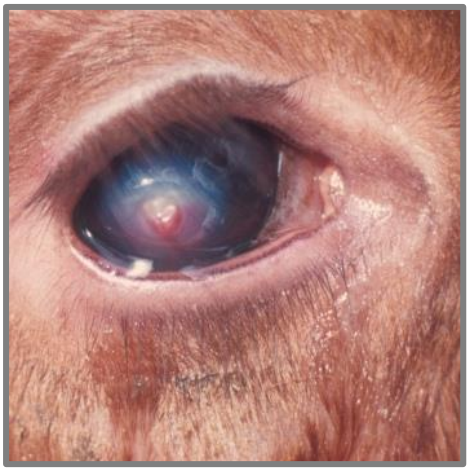

Photo Credit: CS McConnel

can be included while still stimulating immunity, and the strains that are included may not represent circulating strains within a given herd.

Vaccines against *Mor bovis* are registered for prevention and control of IBK but a review paper (Burns & O'Connor. *Vaccine*. 2008. Vol 26.) revealed that *Mor bovis* vaccines may not be highly effective in protecting cattle from IBK. In fact, a recent paper (Cullen et al. 2017. *JAVMA*. Vol 251. No 3.) investigated the use of a commercial vaccine against *Mor bovis* and found no reduction in the cumulative incidence of IBK in beef calves. Interestingly, a previous trial that evaluated a farm-of-origin autogenous *Mor bovis* vaccine also revealed no greater protection from IBK in vaccinated versus unvaccinated calves (O'Connor et al. 2011. *J Vet Intern Med*. Vol 25). Unfortunately, similar results hold true for both commercial and farm-of-origin vaccines against *Mor bovoculi*. In separate trials at the Iowa State University cow-calf research unit, researchers were unable to document a protective effect from either autogenous or commercially available *Mor bovoculi* bacterin vaccines (O'Connor et al. 2019. *J Vet Intern Med*. Vol 33; Funk et al. 2009. *Vaccine*. Vol. 27).

Irrespective of the roles of *Mor bovis* and *Mor bovoculi* in causing IBK and influencing duration and severity, there is a need to develop more effective vaccines for the prevention of this painful, production-limiting disease. Currently, all commercially available vaccines contain only *Mor bovis* antigens, aside from the one newly available commercial vaccine containing 8 different *Mor bovoculi* isolates (Addison Biological Laboratory, Inc.; conditionally licensed as efficacy and potency have not been fully demonstrated). There are also options for the development of farm-specific autogenous vaccines through Newport and Addison labs targeting both *Mor bovis* and *Mor bovoculi*. However, given the lack of rigorous field trials demonstrating vaccine efficacy, these vaccine options should be used in conjunction with veterinary input and an evaluation of herd management practices.

The reality is that there is no magic pill that can eradicate IBK. Best management practices should reduce case numbers and severity but many herds will experience IBK outbreaks periodically. In the face of an outbreak, antibiotic therapy may provide the timeliest intervention. Consult with your veterinarian to determine the most cost effective and efficacious antibiotic therapy given your herd dynamic. If you choose to incorporate a vaccine into management it may be prudent to isolate both *Mor bovis* and *Mor bovoculi* at the start of an outbreak to use in the development of an autogenous vaccine. Consult with your veterinarian to determine the best methods for recovering the bacteria and submitting samples. As importantly, you may want to discuss options with your veterinarian for conducting an in-house field trial examining the effect of either commercial or autogenous vaccines on lesion frequency and severity. It is never too early to develop a plan for dealing with an IBK outbreak—preparedness will help alleviate the stress of the situation and limit poor choices made in haste.

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