# Pointers for Pinkeye Prevention

## Prevent pinkeye in three easy steps.

*by **Tim Parks** and **Lowell Midla***

Infectious bovine keratoconjunctivitis (IBK) – or pinkeye – costs cattle producers at least $150 million each year, according to estimates. Losses include the cost of treatment, lost animal performance and discounts for eye lesions at the time of sale.

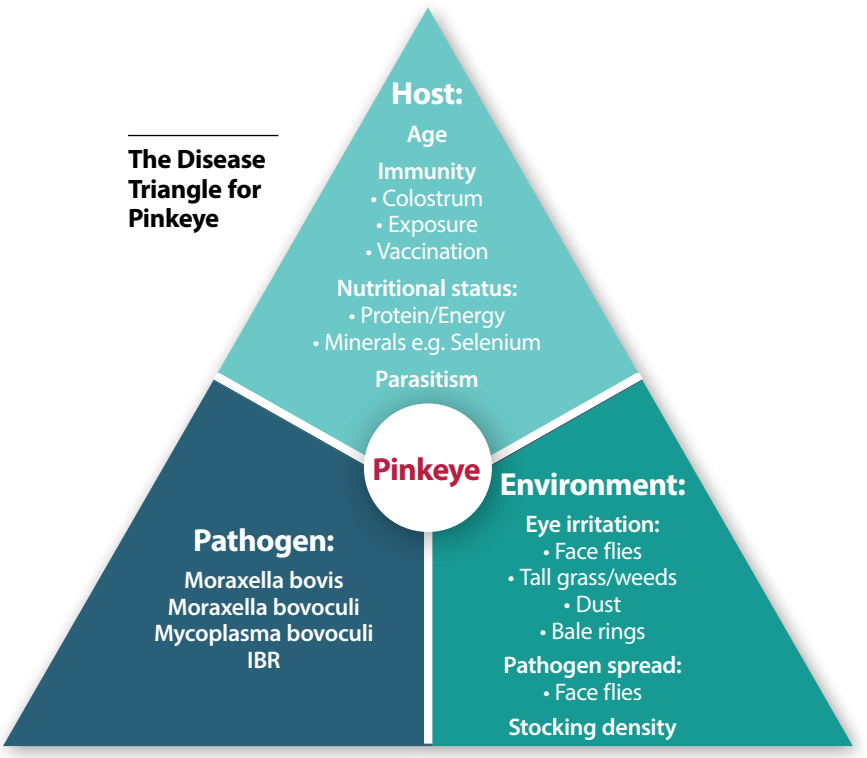
Reduced performance is largely due to the pain associated with ulceration of the cornea. Anyone who has suffered a corneal abrasion or arc welder burn knows corneal lesions are painful. The pain associated with pinkeye compromises not only performance but also animal welfare, so pain mitigation should be considered.

### Moraxella bovis

*Moraxella bovis* is the only infectious agent definitively shown to cause IBK. It is critical to understand that *Moraxella bovis* generally does not cause IBK in the absence of damage to the cornea. *Moraxella bovis* is a commensal organism of the bovine eye meaning that it can be found on the eyes and periocular tissues of healthy animals nearly all the time. That it is always present, yet rarely causes disease, supports the idea that damage to the cornea is necessary for *Moraxella bovis* to cause IBK.

Corneal damage has many potential causes, such as young animals eating from stemmy round bales and exposure to ultraviolet light, which is why periocular pigment is important. However, face flies and tall grass/weeds/brush most commonly cause corneal damage. Female face flies feed nearly exclusively on ocular secretions (tears and other exudates) of cattle. They have specialized rasp-like mouth parts that damage ocular tissues and stimulate the production of the ocular secretions upon which they feed. That's why every article written about IBK emphasizes the importance of clipping pastures and controlling flies, the two most common causes of damage to the cornea. Of course, both are easier said than done. Still, no vaccine or other control measure is going to be effective until you have first clipped pastures and controlled flies. Again, without damage to the cornea, cattle generally do not develop IBK.

The first step in the pathogenesis of pinkeye is attachment of the causative bacteria to the cornea. Once attached, *Moraxella bovis* releases toxins which further damage the cornea. *Moraxella bovis* attaches with specialized pili or finger-like protrusions from the bacterial cell wall. Currently available effective vaccines induce immunity to these pili. Unfortunately, *Moraxella bovis* is very good at switching pili. This creates natural selection for survival of *Moraxella bovis* expressing pili to which the animals are not immune. This explains why animals previously infected with IBK can be




**The Disease Triangle for Pinkeye**

susceptible to reinfection, even though having had an actual disease is usually regarded to be the best possible "vaccination" against that same disease in the future.

**Moraxella bovoculi**

Recently, another bacterium — *Moraxella bovoculi* — was identified in some outbreaks of IBK. The ability of *Moraxella bovoculi* to attach to the cornea seems to be rather weak. However, *Moraxella bovoculi* has spicules that enable it to attach to *Moraxella bovis* quite well. If *Moraxella bovis* is attached to the cornea, *Moraxella bovoculi* often then overgrows the *Moraxella bovis*. Therefore, our current best understanding of IBK caused by *Moraxella bovoculi* is that *Moraxella bovis* seems to get things started and then *Moraxella bovoculi* takes over. This leads to two practical considerations. First, if your veterinarian cultures the eye of an affected animal, a pure culture result of *Moraxella bovoculi* does not mean that *Moraxella bovis* was not initially involved. Second, if you decide to vaccinate against *Moraxella bovoculi*, do not stop vaccinating against *Moraxella bovis*.

**Protection considerations**

When an IBK outbreak occurs, we often conclude that the vaccination program failed. However, there are many potential explanations for an IBK outbreak, such as:

- Failure to prevent corneal damage, i.e. failure to clip pastures and control flies.
- Failure to adequately protect via vaccination, i.e. did not vaccinate against both *Moraxella bovis* and *Moraxella bovoculi*, with both vaccines given according to label, with an appropriately timed booster dose administered if necessary.
- Other failures: see The Disease Triangle for Pinkeye.

Even in cases where we seemingly have done everything correctly, IBK can still occur; for example, due to the ability of *Moraxella bovis* to switch attachment pili.

> "…no vaccine or other control measure is going to be effective until you have first clipped pastures and controlled flies."

Producers and veterinarians searching for an easy solution led to the popularity of autogenous vaccines. In simple terms, autogenous vaccines are created utilizing strains of the infective pathogen from an infected animal. However, given the frequency of pilus switching and the time delay from sample gathering for building an autogenous vaccine to having the vaccine in hand, autogenous vaccines are inherently unlikely to be effective. These same factors make it even less likely that an autogenous vaccine created one year will be effective in subsequent years.

There is no requirement that autogenous vaccines be tested for efficacy, and when evaluated in five separate research studies, autogenous vaccines failed to show protection. In contrast, commercially available vaccines must undergo efficacy testing during the approval process and the pili selected for inclusion in most commercial vaccines are specifically selected based upon their prevalence in clinical cases and ability to stimulate cross protection against other pili.

We certainly do not yet know all there is to know about pinkeye. The best recommendations at this time are:

1. Control flies
2. Minimize other causes of corneal trauma
3. Vaccinate against both *Moraxella bovis* and *Moraxella bovoculi*.

References available upon request. HW

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