Managing and Preventing Pinkeye

Information compiled by Sandy Stuttgen, DVM, Agriculture Educator

University of WI-Madison Extension Taylor County

Summary
Managing to prevent traditional IBK (pinkeye) involves eliminating the many eye irritations listed in this report. See Stuttgen’s concluding article concerning face flies. Identifying and taking steps to resolve physical hazards of your operation are more efficacious than IBK vaccinations.

Routinely offer protection from sunlight by providing adequately sized shade. Stable cattle during the day, allowing them to graze at night when face flies are not active. Make sure mineral consumption is adequate months before the typical IBK season. Selenium, copper and zinc are vital for maintaining ocular health. In-vitro mineral testing is necessary when IBK incidence is high or treatment response is poor.

Be vigilant and immediately isolate the first case of IBK. Seek a veterinary diagnosis. Develop a treatment plan with input from your veterinarian. Yours is a more difficult task when dealing with ‘winter pinkeye’.

What is pinkeye?
The scientific name for pinkeye is infectious bovine keratoconjunctivitis (IBK). It is a disease of cornea (kerat/o) and conjunctiva (normally transparent mucus membrane covering the eye and inner surface of the eyelids). IBK is reported as the most common cause of ocular disease in all breeding females and calves more than three weeks old. Second only to calf scours, IBK is the most prevalent condition affecting pre-weaned calves (Dewell).

The first symptom with any eye irritation, including IBK, is often tearing, tear staining, and eyelid spasm. Tearing often increases as ocular disease progresses. Tearing may be your first indication of pinkeye; however, IBK can suddenly appear as an opaque spot on cornea, making early recognition difficult. Conjunctivitis of varying severity is sometimes seen but not in every case. Conjunctivitis may be a secondary consequence of the corneal ulceration. Corneal ulceration may arise due to infection from the inflamed conjunctiva.

Some cases of IBK spontaneously resolve. Others result in severe damage to cornea. The corneal ulcer may lead to prolapse of the interior eye components. The US beef industry loses $150 million annually to IBK. It is costly and labor intense to treat. Suffering cattle have decreased appetite because of pain or decreased vision which results in inability to locate food and water. Cattle with scared or ‘blue’ eyes, eyes with prolapsed corneas, or blind cattle have reduced value at the market.

Associated pinkeye factors
Normal eyes have adequate defense mechanisms to prevent the infection and subsequent corneal ulceration. For disease to occur, there first needs to be some underlying irritation to the eye. Any form of eye irritation assists pathogens in penetrating the cornea:

- Physical trauma from aggression between animals, knocks, bumps, handling during transport; head to head contact over crowded bunks, self-feeders; abrasive bedding, grazing close to field margins where thorns, barbed wire and tufts of dry stalks of grass can scratch the cornea; rust/corrosion and the sharp edges from galvanized handling systems and penning; tail switching especially when crowded together under shade
- Blowing dust and sand, weed seeds/chaff and stubble
- Face flies
- Antibiotic powders used for treatment can scratch the eye
- UV irradiation (bright sunlight) causes cell damage to the conjunctiva and cornea
- Chemical trauma, for example fresh nitrogen on the pasture

Other IBK associated factors include stress from shipping, processing, and insects which can all be immunosuppressive. Younger cattle are more susceptible to IBK than are older cattle. Cattle with white faces, except Brahman cattle, appear to have a higher incidence of IBK. It has been suggested to add Brahman genetics to your herd if you have trouble with recurrent IBK. Mineral deficiencies involving selenium, copper and zinc have been established in recurrent IBK herd outbreaks. Herds having recurrent cases year after year are encouraged to perform in-vitro mineral testing of their cattle.

Microbial agents involved with pinkeye
The eye has a limited number of ways to respond to disease or injury; clinical symptoms look the same for a variety of reasons. Since the 1970’s, Moraxella bovis is accepted as the cause of traditional IBK (‘summer pinkeye’), and it is currently the only agent for which Koch’s postulates have been established. M. bovis is a gram negative rod shaped or diplobacillus bacteria which have pili, allowing them to attach to eye surface. M. bovis also produces a toxin and hemolysin which play roles in pathogenicity. M. bovis can be isolated from normal eyes; asymptomatic carriers reside in herds.

Other Moraxella species are discovered to be involved with IBK. The first such species was named Moraxilla ovis. Moraxilla bovoculi was next characterized in 2007 using polymerase chain reaction (PCR) diagnostics. Since 2007, it has become clear that the vast majority of M. ovis recovered from bovine eyes prior to the ability to identify M. bovoculi would now be

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reclassified as *M. bovoculi*. Koch’s postulates for the causal role of *M. bovoculi* or *M. ovis* in naturally occurring IBK has not yet been established. (Connor et al)

According to the 2010 Iowa State University study conducted by Connor et al, “Our understanding of the epidemiology of IBK has changed little since the 1970’s and almost all work since has focused on *M. bovis* as a single causal pathogen.” The Iowa State study found *M. bovoculi* could be isolated with or without *M. bovis* from calves with IBK. Further, it did not demonstrate a temporal association between IBK and prior exposure to *M. bovoculi* or *M. bovis*; however, *Moraxella bovoculi* and *bovis* were more frequently recovered from eyes with IBK lesions than unaffected eyes and this provides weak evidence for a causal role of these bacteria to the disease.

*Moraxilla bovoculi* is often associated with ‘winter pinkeye’. Winter pinkeye is present year-round and occurs in stablile cattle. It does not appear to need physical trauma, or summer flies and UV light often associated with traditional IBK. Carrier animals may exist in the herd, with *M. bovoculi* residing in bovine eyes, nasal passages and vaginal tissues.

It is important to distinguish the separate species involved in order to clear up prevalent confusion in the industry and so the disease can be consistently and accurately treated. Currently there is no federally licensed commercially available *Moraxilla bovoculi* vaccine. Outbreaks of IBK due to *M. bovoculi* may occur in herds vaccinated with standard *M. bovis* vaccination. Herds vaccinated with autogenous *M. bovoculi* vaccine have broken with IBK due to *M. bovis*.

Other bacteria isolated from IBK include *Mycoplasma* and other respiratory pathogens and *Listeria monocytogenes* (associated with silage feeding, called ‘silage eye’). Viral infections including IBR, BVD and the herpes virus which causes malignant catarrhal fever may also result in the keratoconjunctivitis.

Abnormal growths involving the eye, such as squamous cell carcinoma, may also lead to keratoconjunctivitis. A veterinary exam is needed to accurately diagnose the cause of clinical symptoms.

### Pinkeye treatment

We should do our best to prevent IBK as it is highly contagious, has an economic impact to our herds, and is an animal welfare issue. But once IBK occurs should we treat it? Treatment outcomes are highly variable and the act of treatment itself can further spread the disease. IBK is reported to have a 98% spontaneous recovery and eye loss occurs in 2 per 100 animals. However, when herds break with IBK there tends to be 20-100% case attack rate with a resulting 44% herd prevalence. The veterinary community agrees that promptly isolating affected animals is paramount for controlling IBK and providing relief from UV light aids in recovery. Stabiling affected cattle, applying eye patches or performing tarsorrhaphy are all beneficial.

![A deep infected ulcer penetrating the stroma. The cornea has diffuse edema with vascularization migrating from the limbus, Alexander](image)

Treatment options have been discussed since the 1940’s. Extra-label drug uses (ELDU) involving subconjunctival (often are sub-palpebral, placed under inner surface of the eyelid) injections of penicillin or penicillin/dexamethasone have abundant antidotal evidence of effectiveness. One trial found these treatments to be ineffective. Penicillin alone resulted in healing by 8.8 days. Healing with penicillin/dexamethasone occurred in 13.6 days (appeared to delay healing) while healing time of the un-treated control group was 7.3 days. Subconjunctival/subpalpebral injections have caused violative residues at slaughter markets.

Topical antibiotic ophthalmic ointments may be helpful (benzathine cloxacinil). Mastitis tubes used as an ointment are ineffective. NZF puffers are now illegal to use (nitrofurazone is an illegal drug for food producing animals).

Two antibiotics are labeled for IBK treatment: Tetracycline (LA200: 9 mg/lb Sub Q, repeat in 72 hours) and Tularomycin (Draxxin: 1.1 cc/100 lb Sub Q, repeat 14 days). ELDU of Florfenicol (Nuflox) and Ceftiofur (Excede) has been reported. Chlorotetracycline pellets (CTC) have been used for calf IBK metaphylaxis; however with new labeling of feed additive drugs for therapeutic use only, CTC will only be available with a veterinary directive. All antibiotics result in slaughter withdrawal times.

*Moraxella bovoculi* appears to be less sensitive to commonly used antibiotics. Often times a mixed infection of *Moraxella bovis* and *bovoculi* fails clinical treatment, and then when tested, a drug resistant *bovoculi* isolated. Generally, clinical symptoms due to *Moraxella* respond to antibiotics when caught early. Cases that fail to respond are often due to *Mycoplasma* or IBR.

Viral IBK causes conjunctivitis. The resulting corneal involvement is located along the outer edge of the eye, not in the center like that of IBK. Calves born with eye infection may be the result of periparturient infection with IBR (or BVD). IBR is not nearly as common as was once thought. Even with careful diagnostics, labs often fail to find IBR; however, if you are having tough cases, test for it. Boost herd IBR immunity when you suspect IBR; but do not vaccinate with modified live respiratory vaccines (MLV) during an IBK outbreak. IBK infected cattle are immunestressed and could develop IBR from MLV use in this instance.

Recovery from IBK is not immediate. Damage to the cornea and conjunctiva may continue after all bacteria are dead. It takes time for the eye to heal. If the cornea is scarred badly enough, it...
may never completely clear. Blindness or reduced eyesight in the affected eye may occur.

Pinkeye vaccinations

Overall results of IBK vaccination are ambiguous. It is debatable how monovalent vaccines can be effective in light of the mixed infections often identified. Statistical differences between vaccinated and unvaccinated calves varies between studies. George and colleagues illustrated some resistance to Moraxella ovis post inoculation with vaccine derived from a hemolytic strain of M. bovis.

Pough & associates found vaccination reduced the carrier status for nine months. They also saw a reduction in the percentage of calves with IBK in three of the four of the selection lines used in the vaccine. Funk et al found three of the four of the selection lines reduced the carrier status for nine months. They also saw a reduction in IBK season as it takes time to develop IBK.

Ten or more IBK vaccines are now available in US and labs are also producing autogenous vaccines, some include Moraxella bovoculi. Autogenous use defined under federal law can only be developed for a farm, using farm specific pathogens and is not to be used on another farm. Pharmaceutical companies have minimum dose requirements for vaccine production; so production can be cost prohibitive for small herds.

Since different strains of Moraxella are found in different vaccines, some vaccines may be more effective in a particular herd than another. Follow label directions! Some products recommend vaccine not be given to calves earlier than 2, 3 or 5 months of age. Some require a booster the first year the vaccine is given, others don’t. Dosage itself varies between products. Some are available in combo with blackleg.

ALL IBK vaccines must be given 3-6 weeks ahead of the traditional summer IBK season as it takes time to develop protective immunity. Work with your veterinarian to determine how often to booster vaccines when dealing with winter pinkeye.

Current whole cell Moraxella bactrins have potential endotoxin concerns, and produce systemic IgG, which may not provide enough local eye immunity. Only piliated strains of Moraxella bovis have been proven to produce IBK in cattle and these appendages have antigenic and immunogenic properties. Moraxella bovis also produces a toxin and a hemolysin. Vaccines created from these antigenic components might create better immunity with fewer side effects (Prieto et al).

On farm IBK agents can vary from year to year; therefore treatments and vaccines used prior may fail. Find out what you are dealing with when your herd’s incidence of IBK is way too high or response to treatment is too poor.

Culturing, speciation and antibiotic sensitivity testing takes the guess work out of treatment and helps to make sure treatments makes sense. Knowing which organism is involved allows evaluation of vaccine choices.

Those Pesky Face Flies!

Face flies have economic and health impacts to cattle. Twelve to fourteen flies per face decreases grazing time one hour per day. 20-200 per face is considered a heavy population and causes a lot of annoyance; cows clustering under shade, not eating. Mechanical transmission of diseases and active fly feeding causes further damage to eye tissue. Normal eye and nasal secretions attract face flies, who feed on secretions. Face flies are not blood feeders like horn flies are.

When talking about IBK (pinkeye), our focus is usually on Musca autumnalis. The Musca fly family includes houseflies and stable flies; but neither house nor stable flies swarm on faces like face flies do. Darker than a house fly, the face fly is 3/8 inch long. It’s a summer fly, with 20-100 clustering on the face and muzzle of cattle feeding on secretions during bright sunny days. Face flies are strong fliers that can travel several miles. Unlike house flies, face flies do not enter darkened barns or stables during the summer months. In the fall, however, they enter buildings and overwinter indoors in a state of diapause, or hibernation.

Face flies are active during hotter days, awake and feeding in bright warm sunlight; resting and not feeding during the night. Removal of decomposing feed, manure, bedding to reduce house and stable fly populations doesn’t help for face flies. Face flies don’t lay eggs there; eggs are laid in freshly deposited manure (less than 15 min old). Control of face flies is achieved by regular application of insecticides to animals’ face and fly breeding sites (fresh manure).

Using organophosphate or permethrin type products in dust, oil applications and sprays can be helpful to repel face flies. When using dust bags or oilers, make sure to hang them low enough so cattle can lift them and rub their head with them. Place them

Practicing biosecurity helps prevent disease introduction into your herd. ‘Biosecurity’ means keeping your animals secure from all biological threats. This begins with maintaining a healthy animal with proper nutrition. Minerals are important to support the immune system as is avoiding stress and minimizing parasite burdens. Parasites steal nutrients and are a source of chronic inflammation.

Isolate newly acquired animals from your herd for at least ten days; for many diseases, isolation is preferred for 30-60 days. Consult your veterinarian to determine isolation time for your situation. Isolation means no nose-to-nose contact, not sharing bunk or water sources or animal handling equipment. Make sure new animals’ vaccination history matches that of your herd. Ask if the herd has had pinkeye or is vaccinating for it.

Diseases are also transferred from one farm to another by rodents, wildlife, birds, pets and vehicles. Humans move disease agents on their hands, clothes and shoes. Work with your veterinarian to maintain a biosecurity plan for your farm.
where cattle are forced to use them: above the waterer, cross-over lanes, doorways, or hung along the feeder wagon or bale feeder.

Insecticidal ear tags are labeled primarily for horn flies. Some products have face fly indications. Read the label to select the correct product. Use fly ear tags as the label directs. Adults usually need one in each ear, the calf usually needs one tag. Tag the calf too, as the calf will receive the flies repelled from the cow’s tags, and the calf is more susceptible to IBK.

Insecticide resistance is developing, so switch tag ingredients between seasons. Check the label’s duration of activity and wait to apply tags so active ingredient is present when you need it. Face flies are a summer fly, especially active during the hotter days of July and August. Applying face fly ear tags in May because it fits your schedule may not interrupt the face fly’s schedule. Timely remove tags. Leaving them in leads to sub-therapeutic dosing which creates resistance.

Feeding fly larvicide may kill emerging face fly larvae in freshly deposited manure. Tetrachlorvinphos (Rabon) is labeled for face flies. To be effective, it must have consistent daily consumption. Remember face flies are summer flies, so think about adding larvicidal products to feed beginning in mid-summer, perhaps when grass is less lush and cattle are more likely to consume supplemental feed.

Some pour-on parasiticides are labeled for horn flies. Horn flies are active blood feeders, obtaining the therapeutic ingredient from poured cattle. No pour-on products are specifically labeled for face flies. Some are labeled for stable and house flies which are in the same fly family as face flies, but passage of the ingredient into fresh manure has not been proven to be an effective face fly larvicide.

According to “Face Fly Biology and Management”, West Virginia Extension Service, face flies are attacked by parasitic nematodes, and immature stages of both horn flies and face flies are attacked by predaceous mites, predaceous beetles, and parasitoids. Manure competitors such as dung beetles also limit fly populations by removing and burying cattle dung before immature flies can complete their development. Adult flies are attacked by predaceous young dung flies, and face flies are occasionally attacked by pathogenic fungi. In spite of the diversity and importance of natural enemies of face flies and horn flies, methods are not known for exploiting these biological control agents in pest management programs. Parasitoid releases for house fly and stable fly control are not effective against pasture face flies.

Face and horn flies can travel for miles, so control is difficult when your neighbor’s flies are not being controlled. You may have more problems with flies when your neighbor is using repellent methods and you are not.

For more information contact
Sandy Stuttgen, DVM
Agriculture Educator
Extension Taylor County
925 Donald St
Medford, WI 54451
715-748-3327 ext 1
sandra.stuttgen@wisc.edu

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