Don't Be Blindsided by Pinkeye

HERD HEALTH

Prevention and treatment of pinkeye can be frustrating tasks due to the disease's multiple causes.

Story & photos by ***Heather Smith Thomas***

Pinkeye, or infectious bovine keratoconjunctivitis (IBK), is costly for cattlemen — due to poor weight gains, cost of medicines and labor used in treating infections, prices docked because of eye damage or blindness, and calves cut back at sale time. Pinkeye scars can lower the value of bulls or replacement females.

Stockmen trying to prevent pinkeye outbreaks are often frustrated.

Richard Randle, Extension veterinary specialist at the University of Missouri College of Veterinary Medicine, says dealing with pinkeye is complicated by the fact that there are several causes of eye lesions in cattle that are lumped together and called *pinkeye*. As a result, the success of treatment or vaccination varies.

Annette O'Connor, assistant professor of bovine production and epidemiology at the Iowa State University College of Veterinary Medicine, says *Moraxella bovis* generally is considered the bacterium most commonly associated with pinkeye, but other organisms can be involved.

"Just having *M. bovis* in the eye isn't enough to cause pinkeye in cattle," she says. "There must be trauma to the eye to enable the bacteria to establish an infection. *M. bovis* tends to be just in the conjunctiva (delicate membrane lining the eyelids and the exposed surface of the white of the eye), in the lubricating fluid. Unless there is trauma to the eye, the bacteria can't bind to the cornea and cause the disease."

Things suspected of causing trauma include high levels of ultraviolet (UV) light, infections by viruses and mycoplasmas, plant pollens, tall grasses that scrape or cut the eye while the animal grazes, dusty feed, dusty or windy conditions, and face flies. Horn flies and stable flies also may be involved, but O'Connor says the connection is not sure.

The incidence of pinkeye usually peaks in the summer, coinciding with an abundance of flies, long grass, dry and dusty conditions, and lots of UV light, O'Connor says. "Conditions are right for trauma to occur to the eye."

She adds that evidence indicates infection with other agents, such as mycoplasmas and infectious bovine rhinotracheitis (IBR, or "red nose"), can affect the eye and make cattle more susceptible to pinkeye.

The adenoviruses (a group of viruses that cause a variety of respiratory diseases in humans) also are associated with severe outbreaks of pinkeye, according to Salmon, Idaho, veterinarian Robert Cope, who adds there is no vaccine available for the viruses.

Randle says that, in most cases, eye lesions result from the spread of contaminated eye material from an infected eye to a noninfected animal, and this can happen in several ways. "Obviously, fly control is a big part of pinkeye control," he adds.

Solid-colored cattle with dark skin around the eyes traditionally have been thought to have less pinkeye, but this isn't always the case. "The color of the skin around the eye and the related irritation from ultraviolet light is a factor, but because of the variety of agents out there that cause these eye lesions, there are a lot of things that make it to where color is not a big factor in whether or not an animal will get pinkeye," he says.

Prevention

Management efforts to prevent pinkeye include eliminating potential situations where trauma could occur. "Reduce the dust, clip the grass, provide shade in some situations, control the flies," O'Connor says. "But these practices are not always effective. It's difficult to control dust, almost impossible to control UV light, and on some properties it's impossible to keep the pastures clipped."

No one thing will be totally effective in eliminating pinkeye, Randle says. "It's really

The disease

Veterinarian Robert Cope, Salmon, Idaho, says pinkeye, or infectious bovine keratoconjunctivitis (IBK), is highly contagious.

"Incidence is variable, but in some herds 45% of calves have been affected over the course of a summer," he says. Symptoms in calves are readily apparent — runny eyes, squinting and avoidance of bright light. These symptoms are usually seen three to five days after infection. At that point, small ulcers may be developing on the surface of the cornea. These ulcers often enlarge to as much as 0.5 inch (in.) in diameter by five to seven days after infection.

"If the ulcer is due to trauma, such as a wound to the eye caused by a stick, the ulcer will generally be off to one side of the cornea," Cope explains. "An ulcer caused by IBK will almost always be in the center."

"Blood vessels grow toward the ulcer, finally reaching the center of it by 14 to 16 days," he says. Rupture of the eyeball is rare but can occur with severe infection or following trauma when a blind animal runs into something.

"Otherwise, the eyes of most infected cattle heal within 60 days but usually leave scar formations on the cornea in the form of a white spot," Cope says.

"The normal cornea can be damaged by light, viruses or *M. bovis,* resulting in neutrophils' gathering to combat the bacteria," he says. Neutrophils are white blood cells that ingest and destroy foreign cells. "The neutrophils release enzymes that increase the size and depth of the ulcer, allowing perforation of the cornea and prolapse of the iris through the defect."

a multifaceted approach — doing a number of things together to try to minimize the effect. Things like fly control, eye-irritation control, as well as feeding tetracycline in cases where potential outbreaks may occur, may help reduce the incidence of pinkeye to some degree."

O'Connor says that producers often don't control face flies adequately. "Unlike horn flies that spend almost all their time on the animal, face flies don't spend much time on cattle. At any one time, there may be only 5% to 10% of the face fly population on the cows; the rest of the flies are out in the pasture. And when they're on cattle, they don't stay there long — just long enough to feed on eye secretions and go back to where they were. So they're really not exposed to the pesticide that much," she explains.

Ranchers will see variable responses to management practices, O'Connor says. "Some of these methods may work on some farms, while others won't. On one farm the problem might be dust and the rancher institutes a fly-control program that's effective, but it's not the main cause of the eye trauma. On one farm it might be dust, and on another it might be long grass."

Vaccination

Another preventive practice is vaccination. The goal of vaccinating is to boost the animals' immune response to the causative organism.

"If everything has happened to cause the disease — *M. bovis* is there, the trauma has occurred, and the pathology is started — you're hoping the animal's immune response will protect it. The results with vaccination tend to be variable, however," O'Connor says.

"It's not entirely clear what antigens we need to put in the vaccine to make it effective. *M. bovis* binds to the eye by means of things called *pili*." Pili are the filamentlike appendages of certain bacteria that contain some of the antigenic properties of the bacteria.

"If a vaccine contains pilus antigens, it's thought to be more effective. But pilus antigens change more rapidly than vaccines can be changed. Most vaccines contain several pilus antigens, but they have to go through tests to show efficacy, etc., before being accepted for use. Then, when they finally get on the market, if they are used on a farm where *M. bovis* has that particular pilus antigen, it will probably work," she says. However, if the pilus antigens change, the vaccine may not work.

"We don't know how this happens. Perhaps the antigens change or another pilus antigen is introduced to the farm from new cattle or flies. There is a little bit of cross protection, but not much. That's the general theory. There's actually very little scientific literature on pinkeye," O'Connor continues. "But this may be why preventative practices tend to fail — they are either impossible to do, or the technology is not up to the job."

Randle says there's varied success with the vaccines available in relation to the organisms actually causing the problem. "Trying to build a good immunity at the eye level is difficult. The thing to understand about vaccine is that, in a lot of instances, it won't prevent an outbreak. But in the face of an outbreak, vaccination can help by reducing the severity of the cases and maybe shortening the time period.

"In herds where we have a severe eye problem that doesn't respond to normal therapy, an option is to take swabs from eyes and try to culture the organism and determine what is actually going on. This can help us redirect the therapy. In herds with severe problems, it may warrant trying to better determine the cause and see what other agents may be responsible," Randle explains.

Herd health

Bolstering immunity to other diseases can help prevent pinkeye. Some veterinarians believe viral diseases can hinder the immune system and lead to higher incidence of other problems. Cope has found that vaccinating calves with modified-live-virus (MLV) vaccine for IBR and bovine viral diarrhea (BVD) dramatically reduces incidence of pinkeye, foot rot, diphtheria and summer pneumonia in calves.

IBR also can be mistaken for pinkeye, Randle warns. "IBR has an eye form and can cause runny eyes and eye lesions that look very similar to infectious pinkeye."

Being a virus, IBR doesn't respond well to antibiotics, he explains. IBR is a herpes virus and can cause ulcers. Once a body is infected with herpes, it's always infected. Situations of stress bring it on again. IBR vaccines are effective at preventing some of the respiratory or reproductive problems associated with IBR, but they're not always effective at preventing the eye lesions.

In his practice, veterinarian Larry Letner of Harris, Mo., focuses on total herd health and principles of management and nutrition before he starts with drugs and vaccines. In order to reduce pinkeye, Letner believes, a rancher needs to understand soil content, grass types, growing seasons and protein levels in forages. Mineral deficiencies can influence the incidence of pinkeye and the success of prevention and treatment strategies.

Treatment

O'Connor says a third type of prevention is treatment. "We don't usually think of treatment as a preventive practice, but … if we intervene and treat early, … we can limit the impact of pinkeye on production parameters like weaning weight," she says. Treatment also may save an eye that would become scarred or permanently damaged otherwise.

"People often think they have failed because they had to treat an animal, but I

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►An ulcer caused by trauma generally will be off to one side of the cornea, while an ulcer due to pinkeye almost always will be in the center, as shown above.

Face flies

In earlier years it was thought that face flies had sponging mouthparts similar to those of the common housefly, but in 1993 Kansas State University researchers discovered (with use of an electron microscope) that the face fly has sharp microscopic teeth.

Located on the end of the fly's tongue, the teeth are used to irritate the eye, making it water. This gives the fly access to the mainstay of its diet — the protein-rich eye secretions. Then the pinkeye bacteria more readily gain access to the eye via the tiny wounds in the cornea caused by the bites of the face fly.

The scrapes reduce some of the eye's protective defenses. Also, if flies scrape an infected eye and move to another animal, they transmit the bacteria to the next animal.

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think that — if they understand the disease — they will realize why they sometimes can't prevent it. If they view aggressive treatment as a way to limit the impact of the disease, that's also successful," she says. By treating early, you minimize spread of pinkeye from animal to animal.

O'Connor has heard producers say the pinkeye outbreak got worse after they treated for it. It certainly could work that way, she says. If you round up the herd, put them in a dusty corral and run all the calves through the chute, you might be making it more possible for them to get pinkeye.

"You create an environment in which all the calves will be more susceptible," she explains. "You may increase transmission of the disease through the herd unless you can bring the affected one in by itself to treat."

After treating an animal with pinkeye, O'Connor says, make sure your hands are clean before you touch the eyes of the next animal. "Or you will be the fly, the spreader!" she warns.

Cases of pinkeye caught in early stages respond well to treatment, but even eyes that are badly ulcerated and blind will recover. Two things are important in treating pinkeye — using an antibiotic to combat the infection and protecting the eye from dust, sunlight, flies and other irritants while it heals.

Cope says *M. bovis* is susceptible to many of the more commonly used antibiotics, and some of them are marketed as topical treatments for pinkeye. "Unfortunately, it is difficult to maintain adequate levels of drugs that are applied topically; they don't stay in the eye long enough. Tears wash the medication out of the eye within a few hours," he says. Ointments, powders, sprays or squirts must be repeated at least twice daily to be effective.

"Normal cattle produce slightly less than an ounce of tears daily. Cattle affected by IBK produce many times more tears than normal, which rapidly wash away antibiotics on the surface of the eye," Cope explains. Antibiotics may be injected under the conjunctiva that line the inside of the eyelid, he says.

An antibiotic mixed with dexamethasone often is used for that injection. It not only lasts longer at the site than topical medication, but it also provides some pain-killing anti-inflammatory relief. Oxytetracycline also has been shown to be beneficial when injected intramuscularly or subcutaneously at a rate of 4.5 cc/100 pounds (lb.) of animal, Cope says.

Eyes generally heal faster (and with fewer complications) if protected with patches or by sewing the eyelids shut. The latter has the advantage of being more dependable for protecting the eye from bright light, dust and flies (eye patches sometimes come loose or rub off) and also keeps the eyelids immobile. There's no blinking to rub the protruding ulcer and to irritate the inflamed eye.

The eye also is constantly bathed in its own tears, which seems to have a healing effect. Keeping the eye stitched shut for a while keeps it from drying out; a lot of seriously affected eyes have a tendency to bulge and to prolapse — and to become dried out, which is a detriment to healing, Randle says.

A twice-daily application of a topical pinkeye antibiotic may work if infection is caught early, but if pinkeye has several days' start and the eye already is turning blue or ulcerating, injecting the eyelid and protecting the eye for a couple of weeks gives much better results. Cases detected and treated early are less likely to develop complications (such as deep ulceration and scarring, "bubble eye," and permanent damage), but it is still important to treat advanced cases of pinkeye.

Not only will treatment help an eye heal faster and with less damage than if you let the disease run its course, but it also will eliminate the bacteria causing the infection and ensure that the animal does not continue to serve as a source of pinkeye for the rest of the herd.

No magic bullet

Randle says there are variations in the effectiveness of treatment in herds with outbreaks that appear to be pinkeye. "We don't know for sure which agent is causing the problem in every case. When dealing with IBK itself (*M. bovis*), early treatment with tetracycline is very successful, given intramuscularly or subcutaneously," he says. "Tetracycline in feed is a help in prevention, but levels in feed are not high enough to be 100% effective."

Some veterinarians take swabs from affected eyes to culture the causative organism and make an autogenous vaccine for that herd since there can be other organisms involved besides *M. bovis*. O'Connor says she never has seen any scientific literature confirming whether or not this works.

"The individual farm would have to attest to whether it worked, and that is incredibly difficult. For instance, one year

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you may have a really bad pinkeye problem, and the next year it might be better, or it might be caused by something else," she points out.

"If the changed conditions happen to coincide with the year you made your autogenous vaccine, you may think the vaccine worked, but in reality it might be you had less pinkeye due to less dust, fewer flies or some other condition that changed so the eyes could stay healthy. The vaccine might only be effective one particular year, and the next year new antigens are involved. Or, in the year you vaccinated, maybe there was not going to be any pinkeye anyway. Then maybe three years later you get an outbreak and wonder why the vaccine doesn't work," she says.

"There are so many potential ways to get the disease, and the pilus antigens are changing. The autogenous vaccine may work, and you see a decrease in pinkeye, but the next year perhaps a face fly or new cattle on the ranch bring in another strain of *M. bovis* with a different pilus antigen, and now your vaccine doesn't work."

Many people are sure that face flies are the cause of pinkeye, but as O'Connor points out, pinkeye existed in the United States before it had face flies. "Pinkeye was first identified in this country in the 1890s, and face flies didn't enter the U.S. until 1952 from Nova Scotia, gradually moving south across the country.

"Incidence of pinkeye has increased with spread of the face fly population. But at the same time, agriculture has intensified. There are many changes in how people handle cattle now. Face flies contribute to the problem, but they are not the only factors."

O'Connor feels veterinarians and cattlemen need to understand why preventive practices sometimes fail. "Then they might be a little less frustrated. There are often reasons why a preventative program does not work. A lot of folks don't really think about how to design an effective preventive program for pinkeye."

Randle says many of the things that might be potentially effective also are costly. "This creates a challenge in determining the most appropriate thing to do, and it must be evaluated for each herd. If an outbreak appears, however, aggressiveness is always better than playing it along and waiting to see if it gets better," he says. "Having a plan of action and moving to it early is what we recommend, and it should be a multifaceted approach, taking into account all the things that play a role."

If you are seeing more than sporadic cases of pinkeye in the herd, ask your veterinarian to help determine the cause so proper measures can be taken to correct the problem.

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Vaccination products

Veterinarian Richard Kent, Green City, Mo., works with many clients to control pinkeye. In one herd of 1,000 cows, he's done trials with various vaccines and treatments.

"The last two years we divided the calves into different groups and used different regimens to try to prevent pinkeye. This herd was having a lot of trouble with pinkeye. The first year, we worked with Grand Laboratories; they made us an autogenous vaccine (from the organism found in those animals), and we also used their commercial Pinkeye Shield XT4.

"I've also used Bayer's 20/20 pinkeye vaccine (in combination with their Vision 7 clostridial vaccine). We used those in different groups of calves to see if we could tell any difference between the groups," Kent says.

"In our experience, vaccines have helped but haven't eliminated our problems. We've reduced incidence of cases, and it seems like severity of cases is less. They have a tendency to heal faster, resulting in less loss of the eye. Some of them we don't have to treat.

"I'm trying a new product this year — a pinkeye vaccine in implant form. It has both a short-acting and a sustained-release implant. We'll see if it helps more than using a single injection. In the past, we've never given anything a booster. We're hoping the sustained-release implant might give a little more booster to these calves and maybe a little better immunity to pinkeye."

The product is administered like a growth implant at the base of the ear or under the skin of the neck. Addison Labs in Fayette, Mo., produces the vaccine, called Solid Bac, which is the same as their Maxiguard and the same product as used in 20/20.

Another Missouri veterinarian, Larry Letner of Harris, Mo., works on pinkeye problems in several herds, including some purebred Angus enterprises. Letner has done a lot of blood testing to see if infectious bovine rhinotracheitis (IBR) and bovine viral diarrhea (BVD) were involved, since these diseases also create eye problems. Then he did cultures on infected eyes in several herds. This gave an indication of geographic focus (in a five-county area), since there were generally several outbreaks in various stages.

Most cultures came back showing the causative agent as *Moraxella Branhamella ovis*, but that bacteria isn't in any commercial vaccines; that's why the vaccines were not working. Letner developed autogenous bacterin for the herds. In one purebred herd, he used a multiple approach that included autogenous bacterin developed specifically for that farm along with Grand Lab's XT4 vaccine. He also looked at nutrition and management — especially protein levels — to try to boost the immune system.

He found that protein content is low in spring, when grass is growing fast. The cattle would start to have a challenge then, and the rancher would see some weepy eyes. Then immunity from the vaccine would kick in, and the outbreak would not continue. That made him feel that the vaccination program probably was working.

Then, about August, there'd be a long, dry hot spell, the grass would quit growing (and ergot toxin level in fescue would be higher since it accumulates in seedheads), the protein content would lower, and the same group would see a challenge again. Late summer is when a herd breaks with pinkeye if it's going to, Letner says.

In this particular purebred herd, the rancher does an excellent job of management — controlling flies, clipping pastures, and deworming and treating for external parasites twice a year. Letner has found that pinkeye resistance or the lack of it has a lot to do with the protein content of the feed. He feels that if a rancher can help boost protein content during the low times, it can help.

To prevent pinkeye, Letner says that initially you must have a good health program in place and also know what problems you are facing, since they can vary so much. In dealing with pinkeye, you can't say, "I vaccinated them, and it should end the problem," because there is no cure-all, Letner says.

He did find, however, with this particular purebred herd, by just doing the autogenous vaccine, they reduced the pinkeye incidence from 75% to 20%. Now he's trying to drop it down to just 1% or 2%. The client sells bulls and bred heifers, so eyes are a major issue. He really needs everything to be perfect, Letner says.