

Mycoplasma 101

Accurate diagnosis and prevention are key to managing this vexing pathogen.

by Heather Smith Thomas

Mycoplasma bovis (*M. bovis*) is a pathogen affecting cattle and bison. In cattle, it can cause many diseases, including mastitis and arthritis in cows and pneumonia in calves. *M. bovis* infections may even cause late-term abortion. Not all infected animals get sick. Some just shed these bacteria without any clinical signs.

Mycoplasma is costly

“This disease manifests in different ways, depending on the production system and age of the animal,” says Dr. Jennifer Davies, University of Calgary pathologist and director of the university’s diagnostic lab. “Mycoplasma bovis can affect all ages, both beef and dairy, but the manifestations are different. Here in Alberta, in beef cattle country, the most typical presentation we see at the lab is from feedlot animals.

“In the feedlot this is an economically devastating disease. It causes chronic disease that responds poorly to antibiotic therapy. As a result, it can have significant animal health and welfare consequences, because we don’t want these animals suffering, and the disease does not respond very well to treatment. About 40% of animals infected with *M. bovis* in the feedlot either die or are in the chronic pen and then euthanized.”

It is not economical, nor humane, to try to keep treating them.

“A percentage may respond to treatment and go back to their home pen after extensive antibiotic therapy but never do as well, with significantly reduced weight gains. There is a lot of investment and loss associated with this disease in the feedlot. It also affects cow-calf herds and plays a role in pneumonia in young calves. If they consume milk from a cow with mastitis caused by *M. bovis*, this can lead to an infection in their middle ear. They may have an ear infection with or without pneumonia,” Davies says.

The ear infection may make the calf dull, and the ear and eyelid on that side may droop. “The calf may tilt its head, and this is a typical manifestation of the ear infection rather than pneumonia, but they can go hand in hand. The calf may have one or the other, or both together,” she explains.

In dairy cattle, *M. bovis* is a significant player in mastitis. Most of the cases Davies sees, however, are the result of *M. bovis* as a factor in respiratory disease.

“It is just one of many agents; there are a number of viruses and bacteria that play a role, leading to pneumonia in the feedlot. This bacterium is quite different from some of the other bacterial agents that cause BRD (bovine respiratory disease). It is the smallest living organism that

“Much of the defense involves keeping calves healthy with strong immune systems. Then, if faced with this organism, they are better able to fight it off. The time when antimicrobials are most likely to work is if we can diagnose the disease very early. By the time it becomes a chronic disease, the damage is done. When I see them in the laboratory, up to 80% of the lung tissue has been destroyed. There is no coming back from that.”

— Jennifer Davies, DVM, University of Calgary pathologist and diagnostic lab director

can replicate. Along with tiny size, these bacteria have lost much of their genetic material as they evolved. They can’t produce the products they need to survive on their own and are very dependent on living in a host that can provide what they need. The good news is that they don’t survive very well out in the environment,” she explains.

Evasive bacteria

These bacteria are mainly spread from one animal to another by direct contact but may live long enough on feed or in water to be transmitted to another animal. In a cow-calf operation, this infection comes into the herd with an infected animal.

“It always comes in with cattle, rather than from the environment. Many cattle have this organism living in their nasal cavity, with no clinical signs of disease. You wouldn’t know they have it, and it’s these asymptomatic carriers that can readily bring it into a herd,” Davies says.

As long as it stays in the nasal cavity, it doesn’t do much harm, though it might be transmitting to other animals. When the pathogens get down into the lungs, that’s when damage is done. The lungs are generally well-protected by several defensive mechanisms because the respiratory system is constantly bombarded by pathogens. Part of the lungs’ defensive system includes the tiny hair-like cilia that

line the airways. Cilia move in wavelike fashion to keep moving foreign material up out of those airways.

“With every breath taken, some of the bacteria from the nasal cavity goes down into the airways. But as long as there isn’t too much bacteria in the nasal cavity, the lung defenses can handle it. If these defenses are decreased for any reason, however, they can’t even handle the normal amount of bacteria that are taken in with each breath,” Davies says.

Stressed cattle often have taxed or overwhelmed immune systems, which can lead to costly disease, especially in the case of *M. bovis*.

“Two things can happen with *M. bovis*. If a calf is very stressed, for whatever reason, this decreases the immune system’s defenses within the nasal cavity. Those bacteria can go wild and proliferate like crazy. Now, the calf has lots of bacteria in the nasal passages that can be inhaled down into the lungs and overwhelm even a normal, healthy lung’s defense mechanisms,” she explains. “Even more significantly, usually that calf has another infection involving the lungs, lowering the defense mechanisms even more. We often see *M. bovis* in the lung along with other damaging pathogens. There are usually a host of pathogens interacting, resulting in pneumonia.”

Once the lung is breached by these pathogens, the body reacts to try to clear them out.

“The immune system mounts a defense to try to clear them, and the defense includes an inflammatory reaction. This inflammation in the lungs is what we call pneumonia,” Davies explains. “The inflammation does more actual damage than the organism does, and the animal starts showing signs of BRD — fever, dull and lethargic, not eating or drinking as much. There may be a cough or nasal discharge; the animal breathes faster and with more difficulty than normal.”

M. bovis is extremely good at evading the immune system’s response.

“As a result, the body can’t clear the infection. Coupled with the fact that this organism is unresponsive to most antibiotics, it goes into a chronic pneumonia,” she notes.

These organisms can even enter the bloodstream from the lungs.

“Once they get into the bloodstream they go to many different places in the body, but one of the places they typically end up is in the large joints, like the stifle. The animal gets arthritis when these bacteria set up shop in the large joints. There is an inflammatory reaction in the joint and resulting inflammation often impacts tendons and tissue around the joints. This results in severe and chronic lameness, which does not respond to treatment,” Davies says.

Prevention and health are key

Prevention is the most effective form of treatment.

“We try to prevent infection in the herd through biosecurity measures, but this is not a viable option in the feedlot. Much of the defense also involves keeping calves healthy with strong immune systems. Then, if faced with this organism, they are better able to fight it off,” she says. “The time when antimicrobials are most likely to work

is if we can diagnose the disease very early. By the time it becomes a chronic disease, the damage is done. When I see them in the laboratory, up to 80% of the lung tissue has been destroyed. There is no coming back from that.

“This is part of the reason antibiotics don’t work; the lungs don’t have the ability to heal that much tissue damage. And since this tiny bacterium has no cell walls, it’s hard to treat because many of our antimicrobials are directed at the cell walls. Early diagnosis and early intervention might improve our chances for successful treatment.”

It is important to work with your veterinarian and a laboratory to get an early diagnosis. Diagnosis in the live animal is challenging, however, because normal-looking animals may have *M. bovis* in the nasal cavity and even in the lung, but do not have the disease. Just finding the organism is not enough for diagnosis.

“That animal could just be a healthy, asymptomatic carrier. Unfortunately, in the feedlot, the diagnosis for the herd problem doesn’t occur until a necropsy after the animal has died or been euthanized,” Davies says.

A pathologist can see those changes in the tissue, such as pneumonia lesions or arthritic lesions.

“The real power of doing a necropsy with lab work is being able to link the presence of the organism to the



Calf lungs permeated by abscesses caused by *M. bovis* pneumonia.

pathology, and then we know there is a cause-and-effect relationship, rather than thinking this organism is just along for the ride. This is why we recommend that if there is an issue within the herd or some animals are being euthanized or dying, it’s important to get them to the lab as quickly as possible for definitive diagnosis,” Davies explains. “This can help you make an appropriate decision for prevention, management and treatment moving forward — with an established diagnosis.”

While there are some vaccines available, the best treatment is vigilance, preparation and prevention. **BA**