

The mycoplasma mastitis risk: what is it costing you?

The number one risk factor for mycoplasma mastitis is bringing new cattle onto the farm. If you have recently purchased new calves, heifers or cows, you may have exposed your dairy to mycoplasma mastitis. Mycoplasma mastitis is becoming an emerging disease as herds continue to expand globally, according to Dr Larry Fox, Professor at Washington State University.

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Mycoplasma mastitis is present in every cattle-producing country of the world, but prevalence varies by region. Due to the fragility of the pathogen and a lack of understanding about how to handle and culture mycoplasma mastitis, detection in diagnostic laboratories around the world has been a problem in the past and, according to experts, mycoplasma may be under-reported.

In a summary of surveys estimating the prevalence of mycoplasma mastitis over the last 13 years, most indicate that mycoplasma mastitis affects less than 5% of herds in the countries studied, with more extreme prevalence in some countries. Prevalence of mycoplasma mastitis also appears to be higher in Utah, a western US state, at 7% than in Canada, Japan, Saudi Arabia or some other European countries.

The US Department of Agriculture National Animal Health Monitoring Service (NAHMS) periodically provides industry with disease occurrence and exposure information. A recent NAHMS survey estimated that during any one year 20% of the 500+ cow dairy herds in the US would have a positive mycoplasma bulk milk tank test result. Thus, mycoplasma mastitis is affecting about one-fifth of all large US dairy herds annually.

“The NAHMS study suggests that prevalence is impacted by herd expansion, and out West, where the herds are expanding and there is a lot of cow movement, mycoplasma mastitis can be as high as 20%. However in the Midwest and

Northeast, it might be closer to 5%,” Dr Fox said. “This is why I think mycoplasma mastitis is becoming more of a worldwide problem. Even now in Europe, there is more herd expansion which means consolidation of herds. The 50-cow Dutch herd is becoming a 500-cow herd. We have already seen this happening in Britain and other parts of Europe.”

Impact of clinical and subclinical infections

Mycoplasma mastitis infections with mild clinical signs or subclinical infections show a few clots in the milk. In a clinical case, typically multiple quarters or sometimes the entire udder is red and swollen and the milk is visibly altered. In both cases, somatic cell counts (SCC) are high, and cows are non-responsive to antibiotics.

“The main problem with mycoplasma is the fragility of the organism, both in transporting a fresh milk sample to the laboratory and then how the laboratory handles the samples to try and get a culture,” said Dr Colin Lindsay, practicing veterinarian and consultant in the UK and Europe with Veterinary Consultancy Ltd.

“Thankfully with the advent of PCR technology, we can run the mastitis multiplex PCR using a fresh, frozen or preserved milk sample. PCR uses a fragment of the DNA, so we do not have to worry about organism viability and you will get

report results usually within a day.” In adult cows, acute mycoplasma mastitis can be accompanied by arthritis, and younger rearing heifers present with the respiratory form, including otitis media or middle ear infections. Occasionally, cows will present purely with swollen joints, and you do not know they have mastitis until conducting a SCC diagnostic analysis.

“In the UK, the problem historically has been that when we submit these samples for diagnostics, specific culture techniques are required to pick up mycoplasma, especially subclinical infections are grossly under-diagnosed,” said Dr Lindsay.

“The largest incidence of infections in the UK tend to be cases with mild clinical symptoms and subclinical cases where we identify high SCC, but I have certainly seen mycoplasma storms or outbreaks of mycoplasma mastitis.”

What makes mycoplasma untreatable?

The key difference in mastitis pathogen categories is their physiology or cell structure. Gram-positive bacteria have a thick cell wall, and the membrane is highly selective about how and what it allows to move in and out. Gram-negative bacteria have a thin cell wall with two membranes that are less selective. The outer membrane is designed to protect the cell wall.

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“Because penicillin antibiotics need to attack the cell wall to be effective, Gram-positive bacteria tend to be more susceptible, and Gram-negatives are more resistant,” explained Dr Fox. “Mycoplasmas do not have a cell wall; they only have a cell membrane. This makes them more fragile, but also makes them much more resistant to some antibiotics because there is no cell wall development to attack. Mycoplasmas have found a way to get around their issue of fragility, which a Gram-positive or Gram-negative would not have been able to do because it has not been necessary.”

Another disadvantage of mycoplasma is that it is very slow growing. Some antibiotics work through the metabolism and reproduction of the cells, and bacteria that are growing, reproducing or metabolising as fast will be more resistant to the antibiotics.

Difficulty diagnosing with culture

Diagnosing mycoplasma through culture method is difficult due to the very characteristics that make it an unusual organism. It is less hardy than most microorganisms and therefore can not grow and survive in just any environment. Given its physiology and its very slow growth, it has fastidious growth requirements and a high demand for particular nutrients, said Dr Fox.

“Mycoplasmas are sensitive to oxygen and require a lower oxygen level,” he noted. “Therefore, an increased CO₂ incubation environment is often used to displace oxygen when growing mycoplasma in a culture situation.”

Mycoplasmas also require a nutrient agar, which is different from the standard culture media that most mastitis pathogens are placed on to grow. The nutrient agar base is modified by adding additional nutrients like sterols. Antibiotics are also added to the agar plate to prevent other bacteria overgrowing the plate and, since mycoplasmas are generally resistant to antibiotics, their addition to the growth media does not inhibit mycoplasma growth.

Because of their slow growth, it can take several days to see colonies. Even after the elapsed time, the agar plates must usually be examined using a microscope because the colonies are so small they are not visible to the naked eye.

“Due to the length of time required to grow the organism, there is a real possibility of a contaminant working its way into the system, either while the organism is plated, or it may already be in the milk in very small numbers, and over time it becomes magnified and inhibits the growth of the mycoplasma,” said Dr Fox.

A recent study led by Dr Fox indicated that sample handling can impact mycoplasma culture growth. Isolates obtained from field milk samples used in the study were frozen for up to 19 months before they were donated for use in the study.



Only 32% of the mycoplasma isolates grew by day seven of incubation and it is suspected that the repeated freeze-thaw effect and prolonged storage may have reduced the viability of the cells. The study also indicated that for all isolates, growth was significantly greater after seven days of incubation compared to three days.

“Patience is important when culturing with mycoplasma because they are so slow growing,” noted Dr Fox.

Economic Impact

Mycoplasma mastitis impacts the health and welfare of the infected cow. It reduces milk production and increases SCC, which results in reduced milk premiums and unnecessary costs if the farmer chooses to treat before receiving a diagnosis. Since no treatment exists for mycoplasma, most farmers ultimately decide to cull infected cows.

New Zealand’s mycoplasma experience is the most recent example of the devastating emotional and economic impact an outbreak can cause. After careful consideration, the New Zealand Ministry for Primary Industries (MPI) has planned a phased eradication of *Mycoplasma bovis*. They projected that their 10-year eradication program of *M. bovis*, the most common mycoplasma mastitis pathogen, will cost NZ\$886 million (US\$586 million). To not act at all is estimated to cost the industry NZ\$1.3 billion (US\$860 million) in lost production over 10 years, with ongoing productivity losses across the farming sector.

“In parts of the UK, about 80-90% of the dairy herds have endemic mycoplasma,” Dr Lindsay noted. “It is a grumbling infection that affects both the young stock and the adult cows, and it can certainly be economically significant. I have been involved with some situations where we have had mycoplasma outbreaks which turned into a culling exercise of clinical cases. Indeed, there have been a few herds which had to be culled out.”

Unlike New Zealand’s current situation, most countries have no compensatory mechanism, so financial losses must be borne by the farmer. Often mycoplasma mastitis starts out as an unseen loss, essentially a chronic subclinical problem.

In rearing systems, instead of a normal mortality rate of 3% or 4%, it can shoot up to closer to 10% or higher. For dairy heifers, rather than 80-85% of live born heifers

reaching first calving, this can drop down to as low as 60%. The dairy will need to breed more heifers and retain more animals. This is further compounded by the problem of heifers calving down older, said Dr Lindsay.

“Each additional day after the target 24-month calving age it costs the farmer £2-3 (US\$2.60-3.90) per animal, so it does not take long for costs to accrue due to higher cull rates and longer growth periods to get to your target weight for calving. These are hidden costs that farmers do not appreciate until they sit down and actually crunch the numbers,” Dr Lindsay explained. “The reality of these numbers can be scary, and they take a real toll on a farmer’s bottom line very quickly. Plus, mycoplasma has a significant impact on the overall herd health, which because it is unseen, is often unappreciated by most farmers.”

An outbreak scenario, where you have the catastrophic situation of having to cull a

group of animals, will have a huge economic impact as well.

“A dairy cow in the UK is currently valued at £2,500 (US\$3,250). A farmer would cull her at about £1,000 (US\$1,300), so you have lost £1,500 (US\$1,950),” said Dr Lindsay. “A farmer could quite easily wind up culling more than 30% of the herd, so it is quite easy to see how devastating mycoplasma mastitis can be to the dairy. And, that is really a best-case scenario. Some of these affected animals are a total write off, then the farmer has to pay £80-100 (US\$105-130) for their disposal.”

Dr Lindsay advises clients to maintain a closed herd. However, if farmers do have a situation arise, whether it is repeat cases of mastitis or arthritis that can not be diagnosed, the only way to get on top of it is through diagnostic analysis.

“That brings me back to culture versus PCR diagnostics, and culture takes at least 10 days, whereas with PCR, I may have results back the same day,” he said. “When we are talking about a disease spreading to other cows that may need to be culled during the 10 or more days while we are waiting for results with culture versus one day, that is significant economically to a herd and another reason PCR is my go-to for diagnostics.” ■

References are available
from the author on request
