Mycoplasma bovis: facts, risks, and approach

Mycoplasma bovis is a bacterium that is familiar to many livestock farmers, often because of their own (negative) experiences. It is a pathogen that causes problems worldwide, and concern is also growing in Flanders. Mycoplasma bovis is therefore one of the biggest challenges facing the sector. Ghent University, Animal Health Care Flanders, Inagro, and Hooibeekhoeve have joined forces for the MycoSTOP project. MycoSTOP aims to develop better testing protocols for the purchase and disposal of animals, as well as to support calf health monitoring using quick thoracic ultrasound, an innovation that was put into practice through the VLAIO PneumoNEE project. Much has been written and said about Mycoplasma, and there appears to be a great deal of confusion. As part of the MycoSTOP project, we have therefore listed a few facts for you based on the most recent research.

What is Mycoplasma bovis?

Mycoplasma bovis (hereinafter referred to as M. bovis) is a small bacterium that can cause disease and even death in both dairy and beef cattle. The infection mainly manifests itself as pneumonia, arthritis, and otitis in calves and as arthritis and incurable mastitis in adult cattle. In addition, the chronic nature of the disease leads to increased antibiotic use and an increased risk of culling infected animals. Several studies have shown that chronic, non-healing pneumonia in calves can have very harmful long-term effects, such as reduced daily growth and reduced milk production in dairy cattle.

Is Mycoplasma becoming more common?

The aforementioned clinical symptoms are just the tip of the iceberg. In Belgium, we have seen an upward trend in the incidence of Mycoplasma in recent years. For example, an earlier study from 2019 showed that *M. bovis* is involved in no less than 33.3% of respiratory tract infection outbreaks in Belgium. When we test bulk tank milk using antibody tests or PCR, 31.8% of dairy farms again test positive for *M. bovis*. On average, roughly one in three Flemish farms tests positive for *M. bovis*, even without clinical problems. Figures from ARSIA (the Walloon counterpart of DGZ) show similar results. These high figures can be explained in part by the fact that we are probably dealing with a high infection rate, but also by the fact that we are testing a lot. This upward trend is not only occurring in Belgium, but also in our neighboring countries such as France and the Netherlands and in Scandinavian countries such as Finland and Denmark. In 2017, New Zealand, which had previously been labeled free of the disease, was also affected.

How does Mycoplasma get into my herd and how does it spread?

The most well-known risk factor for introducing *M. bovis* into the herd is the purchase of recently infected animals or long-term shedders. Once inside the farm, this bacterium can spread rapidly. Among cows, this usually occurs through nose-to-nose contact or the milking equipment. Furthermore, the use of a breeding bull and the absence of a separate calving pen are risk factors for infection with *M. bovis*. Calves are mainly infected through mutual contact or by ingesting infected milk. The risk of infection via the cow's own colostrum is limited, but certainly not non-existent. Indirect transmission via materials or people is also possible. What makes *M. bovis* so insidious is that it can creep into the host's cells without making the animals sick. A cow can be a carrier for months without showing any visible signs of illness, allowing the pathogen to spread unnoticed throughout the herd.

What keeps the infection going at the herd level?

We have noticed that more and more dairy farms are testing their bulk tank milk for the presence of *M. bovis* or antibodies. This can give a false sense of security, because it is the calves that are the driving force behind the infection. In other words, it is often the calves that perpetuate the infection on the farm. It is likely that a small proportion of these calves become carriers of the bacterium. The exact size of this proportion is currently unclear, but previous studies suggest that it is a very low percentage.

Which treatment of calves results in the best healing?

Visibly sick calves are just the tip of the iceberg: for every sick animal, there are three subclinically affected ones. This means that these animals show hardly any symptoms of disease, but can spread the pathogen unnoticed throughout the farm. A reliable way to detect these hidden cases is quick thoracic ultrasound (qTUS). Using this technique, a veterinarian can determine in just one to two minutes whether pneumonia is present and distinguish it from inflammation of the upper respiratory tract. Given that pneumonia is often bacterial in origin, treating animals with pneumonia with antibiotics is a logical next step. However, this is often less straightforward than expected. For example, *M. bovis* is naturally resistant to penicillin-like antibiotics and trimethoprim-sulfonamides. First-line products such as florfenicol and oxytetracycline appear to be better alternatives, especially in cases of early detection. This is also evident from a study in which lung ultrasound was used to guide treatment during an outbreak of *M. bovis* on a closed beef cattle farm. It was demonstrated that thanks to lung echography and targeted treatment, >95% recovery was achieved after 7 days, with a 50% reduction in antibiotic use. Moreover, individual treatment resulted in almost half the amount of antibiotics being used compared to standard 7-day group treatment. Lung echography thus enables early diagnosis, leading to a higher chance of cure and lower antibiotic use. Within the project, this technique, in combination

with diagnostics, is therefore used to gain more insight into the course of treatments and to verify whether cured animals also effectively stop excreting the pathogen.

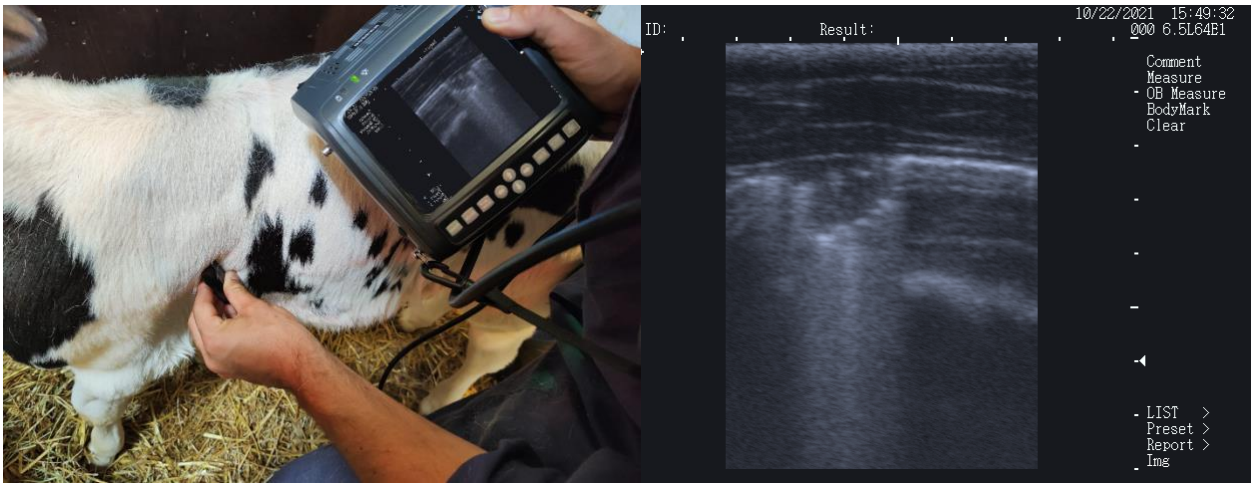

Figure 1: Left: the use of quick thoracic ultrasound in calves. Right: image of a consolidation or lesion indicating pneumonia. (Image: Ghent University)

Unfortunately, treatment is not always straightforward. The cure rate can vary greatly depending on the calf's immunity and the occurrence of mixed infections with other viruses or bacteria. These mixed infections not only exacerbate the disease process, but also often render the prescribed treatment insufficiently effective. In addition to natural resistance, acquired resistance (e.g. to macrolides) also occurs. However, due to the lack of a clear frame of reference, it is often difficult for veterinarians to immediately start using the most effective antibiotic. Our advice in this regard is to systematically monitor calves with lung ultrasound and to perform lung lavage in case of treatment failure. This makes it easier to determine whether resistance is a factor and/or whether additional infections have taken over.

How can I test an individual animal upon purchase?

The most sustainable solution remains effectively combating the infection. New Zealand takes this very far: as soon as an animal tests positive for antibodies, it must be culled immediately. This approach is very radical and unrealistic for the current situation in Belgium. As mentioned earlier, the purchase of animals poses the greatest danger. Currently, only antibodies can be tested, which only provide information about past infections. Whether animals are still actively infected and therefore still contagious is not clear with the current antibody test. This causes a lot of confusion and uncertainty among both livestock farmers and veterinarians. MycoSTOP is therefore working on a reliable purchase protocol to detect individual (carrier) animals with an infection. Specific protocols are being developed for both calves and adult dairy and beef cattle. The pathogen can be detected via samples such as nasal swabs, lung lavages, vaginal swabs, and milk. In addition, a whole arsenal of tests is already available in Flanders (including culture, PCR, and

nanosequencing) to detect active infections. Unfortunately, intermittent shedding—where animals shed the pathogen intermittently rather than continuously—and carrier animals can lead to false negative results, meaning that these animals may be missed. The aim of the project is therefore to find the most economically viable and reliable combination of tests.

Figure 2: Taking a nasal swab from an adult animal. Note that the swab must be long enough to reach the lymphoid tissue in the nose. (Image: Ghent University)

How can I test my herd for Mycoplasma?

Identifying individual (carrier) animals is a first step, but it doesn't give enough insight into the risk at the herd level—a major gap in the sector. That is why the second objective of the project focuses on developing a test method that determines the *M. bovis* farm status. This risk screening helps livestock farmers assess the impact of *M. bovis* on their farm and supports them in preventing its introduction onto their farm. Recent research has shown that testing bulk tank milk can be an important first step, although threshold values and interpretation remain unclear. The key message is therefore that calves must always be included in the investigation.

In summary

The high prevalence of *M. bovis* on Flemish dairy and beef cattle farms causes many problems and discussions. Although quick thoracic ultrasound and advanced laboratory techniques improve diagnosis, treatment failure remains a persistent problem and there is a lack of reliable

tests to identify carriers. MycoSTOP is working on a reliable purchasing protocol and strategies for determining and monitoring herd status.

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