

Mycoplasma

Mycoplasma is a bacterium and is the smallest self-multiplying organism on earth. There are about 100 different types of Mycoplasma spp known for different animal species. The most common Mycoplasma spp in cattle is Mycoplasma bovis and this bacterium can cause a variety of complaints. The severity of clinical signs may differ per farm from mild to moderate to very severe. In addition, a Mycoplasma infection may appear to be present without symptoms, but may lead to a severe outbreak in a period of reduced resistance.

Clinical signs

The most common clinical signs are pneumonia, joint inflammation and / or mastitis in one or more cattle groups (lactating animals, non-lactating animals and / or young animals). To a lesser degree, eye infection, rejection and / or middle ear infection are also observed in young animals.

Mastitis is usually characterized by untreated mild to moderately severe clinical mastitis for several quarters in a cow that is not ill (no fever), having sometimes typical rice-grained-like deposits in milk and often poorly respond to therapy. Sometimes infection with mycoplasma only results in an increased cell number, but an infection may also occur completely without symptoms.

Especially in calves, a mycoplasma infection can lead to pneumonia. The calves have a dry cough, fever and / or wet eyes. Clinically, this type of pneumonia is indistinguishable from pneumonia caused by other pathogens. Clinical signs can be chronic and the response to treatment is often disappointing. Mycoplasma can give primary lung problems, but also in combination with other bacterial pathogens (especially *Pasteurella multocida*, *Mannheimia haemolytica* and *Histophilus somnus*). In calves, pneumonia can be accompanied by a middle ear infection (in that case, the animal keeps its head skewed). In some cases, adult animals can also develop pneumonia due to mycoplasma.

Mycoplasma bovis can also be found in the throat cavity in animals without complaints. Characteristic of joint inflammation is severe pain, and therefore it does not or barely use the leg, redness and / or swelling. In the case of infected dairy cattle, it is often noted that the front legs are affected.

In calves, inflammation of (multiple) joints is noted, associated or not associated with pneumonia due to Mycoplasma bovis. The treatment results of joint inflammations are often disappointing.

Diagnosis

An important action to control Mycoplasma bovis on dairy farms is to identify infected animals and isolate them so that uninfected animals are not exposed. There is still a lot of uncertainty about the spread of M. bovis between farms, but the infectiousness and spreading of the infection within farms has not yet been fully clarified. This makes it difficult to control the infection.

A structured approach is needed for each affected farm. In case the infection is recognized in an early stage with the correct diagnosis, additional damage can be prevented.

Research in (tank) bulk milk

When there is untreatable clinical mastitis, affecting several quarters, showing sand-like milk and a negative routine bacteriological examination, the suspicion of a Mycoplasma bovis

infection is more likely. Due to specific dietary requirements and very slow growth characteristics of mycoplasma in the laboratory, it is not detected by routine bacteriological examinations of milk. In the laboratory, a specific mycoplasma culture must be applied for fresh (tank) milk, but it is preferred to detect genetic material of *Mycoplasma bovis* by PCR on (tank) bulk milk.

The milk samples for mycoplasma culture (incubation time of at least 12 days) should be fresh (after chilled transport!). It is important that milk samples for mycoplasma culture have not been frozen prior to culture. Since these bacteria do not have a cell wall, they often do not survive freezing conditions. It is advised to use the faster PCR test on (dead) genetic material of *Mycoplasma bovis* in tank bulk milk.

Research of tank milk can be used to screen (animal groups) the farms for the presence of cows with mycoplasma mastitis. Keep in mind that cows with (severe) clinical mastitis are not milked in the tank. Tank milk research is not suitable for screening for mycoplasma problems in other organs. Discuss the possibilities and your choice of diagnostics before submitting (tank) milk samples; in this way we can exchange thoughts on the optimal sampling methodology and the sample submission process.

Research in joint fluid (PCR or culture)

When you perform a joint puncture, it is important to fix the cow and the leg properly. For sterility, the injection site should be washed, shaved and disinfected. The radiocarpal joint can be injected laterally and medially of the *M. extensor carpi radialis*, the intercarpal joint laterally and medial of the *M. extensor digitorum communis* and the carpometacarpal joint medial of the lateral *M. extensor digitalis*.

For the diagnosis of mycoplasma, the veterinarian can choose between culture and/or PCR. The PCR test on *Mycoplasma bovis* has a running time of a maximum of four working days. A mycoplasma culture takes up to twelve working days, but may be positive sooner if the sample is highly positive (showing visible growth). In addition to *Mycoplasma bovis*, the bacterial culture method can detect some other types of mycoplasma too, and it also offers the ability to perform a sensitivity test. This may be an advantage of the culture method compared to PCR.

Examination of lung fluids

For the diagnosis of mycoplasma in respiratory diseases, a lung fluid collection is suitable. Per herd, a lung fluid sample of three calves is sufficient (preferably from acute diseased animals not yet treated with antibiotics). After the positive demonstration of *Mycoplasma* spp. by cultivation, you can also perform a sensitivity testing. Lung fluids may occasionally also be positive for other mycoplasma types than *Mycoplasma bovis*. These are unlikely to be found in serological examinations.

Examination blood of individual cows

Another possibility to confirm the diagnosis of mycoplasma is by serological examination of five animals with typical clinical signs (since more than two to three weeks). Antibodies to *Mycoplasma bovis* are determined in the blood using an ELISA. This test indicates whether the animal has been exposed to mycoplasma in the past. The results may vary from 0 to +++++. In case of +++ or more; "antibodies" are detected.

Serology is primarily used for herd or farm screening and less for the diagnosis of individual animals. By single serology testing, you have to take into account the presence of maternal

antibodies in young calves. In that case, paired serology is a good tool to confirm the diagnosis.

Post-mortem examinations

Also by post-mortem examinations, it is possible to diagnose mycoplasma infections. If mycoplasma has been demonstrated by post-mortem examinations, you can apply a sensitivity testing within a maximum of five days after the positive outcome of the bacteriological examination.

Sensitivity determination mycoplasma

It is possible to request a sensitivity testing of mycoplasma. This can be done after cultivation of e.g. lung fluids or joint fluids.

Risk factors

Little is known about the risk factors for mycoplasma. Based on current literature, the following risk factors are defined;

-Risk factors for introducing *Mycoplasma bovis* to the farms:

- Purchase of animals
- Animal contacts (young bulls, joint breeding, cohabiting or over-the-wire contacts)
- Large (re) dairy farms (based on research in the USA)

-Risk factors for spreading *Mycoplasma bovis* within farms:

- Transfer during milking
- Nose contacts
- Transfer from cow to calf during birth
- Transfer from cow to calf by bite or by cow's milk
- Transfer between calves by using the same drinking machine
- Transfer by infected needles

Outbreaks of mycoplasma occur more often in e.g. the United States in larger farms. *Mycoplasma* spp. (mainly *Mycoplasma bovis*) spread easily within farms with a lot of cattle traffic (transport); the purchase and mixing of cattle within a herd can lead to clinical manifestations but also suppression of immunity can play a role.

Approach to treat *Mycoplasma* infections

Not everything about the treatment of mycoplasma is known yet. The recommended approach is often based on current literature knowledge and practical experience. The approach to treat mycoplasma should be structured and strongly depends on the affected organs (udder, joints, lungs, etc.).

In general

- Closed operation:

- Hygiene improvements: hygiene sluice with clothes and boots, hygienic working procedures, cleaning environment.

- Optimize the resistance of animals:

- Good health status of the herd (free of BVD and salmonella);
- Good nutrition (including good mineral supply, tailored to the specific animal groups);
- Optimize housing conditions, avoid overcrowding;
- Prevent stress as much as possible;
- Good colostrum supply of calves;
- Optimize the approach to prevent other respiratory tract diseases (climate improvement, heifer vaccination).
- Prevent contact with and between infected animals:
 - Transfer via cow's milk (after passing the colostrum period change to artificial milk);
 - Individually housing of calves;
 - Individually supplying of milk;
 - Identification and isolation of diseased animals, see below;
 - Young animals preferably housed separately from dairy cattle;
 - Extremely hygienic working procedures in the milking parlor (including teat disinfection with iodine-containing dippers after milking).

Mastitis

An important part of the strategy to control udder inflammation, caused by mycoplasma, is the identification of infected animals and the isolation of infected animals, so that exposure to uninfected animals is reduced.

A sensitivity testing in mastitis cases is not useful because treatment of mastitis due to mycoplasma is mostly not successful. The cows that seem to be cured often become asymptomatic (invisible) carriers later on. Culling of the affected mastitis cows seems to be the only option.

After culling of animals with mycoplasma mastitis, the results of the tank bulk milk testing may become negative (no mycoplasma detected), but the advice is also to sample the individual animals that become milk producers (pregnant heifers, dry cows) in the interim period to detect new cases as soon as possible. Frequent sampling and monitoring of the tank milk is recommended to follow the status of the company over time, and to detect rapidly any further spread of the mycoplasma in the dairy herd.

Joint inflammation

When *Mycoplasma bovis* is detected in joint fluid, the prognosis is rather poor due to the difficult accessibility of antibiotics to the mycoplasma. Only at a very early stage of infection, an antibiotic treatment, combined with an NSAID, can be effective. In the formularium of the medicine, there is no specific treatment described for joint inflammation in dairy cattle. So in case the veterinarian will choose to start a treatment, a sensitivity testing is important for the optimal chance of success and to support the choice of the used antibiotic. Whether or not to use any therapy should be carefully considered and discussed, also because of the possible risk of spreading.

In case of arthritis, it is still unclear to what extent transmission occurs and what the outcome is.

Respiratory problems

If the cause of the pneumonia is found to be mycoplasma, a sensitivity testing may help to choose the right antibiotic. Resistance against all antibiotics, registered for pulmonary

diseases, has been demonstrated to a greater or lesser degree. A sensitivity testing is therefore important to make a good choice of treatment for each particular farm. If other pathogens than mycoplasma also play a role in the cause of pneumonia, a vaccination against PI-3 may be of added value. A vaccine against mycoplasma is not available and does not appear to be available for the time being.

If there are any problems with calves, it is good to check cows on mycoplasma; to exclude that the infection has already been introduced to the young animals via colostrum, for example from asymptomatic carriers. If there is no reason to think of mycoplasma problems, based on the absence of any clinical signs in dairy cattle, the examination of tank bulk milk samples is a good control check (three times with a two weeks interval). If there are clinical signs of dairy cattle that fit to a mycoplasma infection, an animal-level (individual) screening is recommended.

The extent to which calves can become free of mycoplasma, or maintain a symptomless carrier, is still insufficiently known.

Mycoplasma can be present in the environment and survives well under cool and humid conditions. The bacterium can suffer from drought, and due to the absence of a cell wall the bacterium is well sensitive to disinfectants.

Prevention of Mycoplasma

- Closed housing system:
 - Hygienic rules: hygiene sluices with clothing and boots, hygienic working procedures (especially in the milking parlor, wearing gloves, one cloth per cow in the pre-treatment phase of milking, iodine dip (550 ppm)),
 - Cleaning of the environment.
- Optimize Resistance:
 - Good health status of the herd (free from BVD and salmonella)
 - Good nutrition (including good mineral supply, tailored to the specific animal groups)
 - Optimize housing conditions, avoid overcrowding
 - Avoid stress as much as possible
 - Good colostrum supply of calves
 - Optimize prevention of other respiratory diseases (climate, possible PI-3 vaccination)