



The prevalence of *Mycoplasma bovis* on Irish cattle farms

Aurelie Moralis DVM Cert DHH MRCVS, national veterinary manager, Zoetis Ireland, assesses the prevalence of *Mycoplasma bovis* on Irish farms when controlling respiratory disease in youngstock

Bovine respiratory disease (BRD) is a major problem of young stock, causing significant loss and compromising animal welfare. Exposure to *Mycoplasma bovis* increases the risk of calves being treated for respiratory disease.¹ *Mycoplasma bovis* is not uncommonly isolated from the lungs of pneumonic calves² so it's important when controlling respiratory disease in youngstock, that we understand its role.

EPIDEMIOLOGY

Mycoplasma bovis is well adapted to causing chronic, asymptomatic infections and, therefore, the role of 'carrier' animals is an important part of the *Mycoplasma bovis* story. Animals may remain infected for many years, shedding bacteria intermittently. The main sources of infection are respiratory secretions and infected milk. In infected herds, calves become infected when they are very young, either in the calving pen, from ingesting infected colostrum or milk, or from close contact with individuals shedding *Mycoplasma bovis* in respiratory secretions. Calves then go on to shed *Mycoplasma bovis* in large numbers particularly during the first two months of life, playing an important role in onward spread of infection.

In many infected herds, the role of contaminated milk is crucial. Small numbers of infected cows can potentially contaminate large volumes of milk. Calves fed contaminated milk are much more likely to be colonised by *Mycoplasma bovis*.

Large numbers of *Mycoplasma bovis* can be isolated from the air of sheds housing infected animals. Poor air circulation will significantly increase the bacterial load of the environment,

and therefore the rate of transmission of the mycoplasma. The role of fomite needs to be considered as well.

Transmission of bacteria from calf to calf via infected feeding equipment, pen divisions and bedding could all play a role in spreading the bacteria and subsequent clinical disease.

In diseased herds, the prevalence of colonisation of the upper respiratory tract can be very high, with reports of 100% of animals being infected. Given the routes of transmission of the bacteria, it is not surprising that herds which experience high rates of *Mycoplasma bovis*-associated disease tend to have a higher prevalence of infection, and that once a herd is infected, eradication of *Mycoplasma bovis* is extremely hard due to the continual cycle of infection, shedding and transmission.

In one study³ the proportion of calves shedding *Mycoplasma bovis* increased from 49% to 91% of the group in just three weeks (Figure 1). Where calves are sourced from multiple farms, it's clear to see that getting on top of *Mycoplasma bovis* can be challenging.

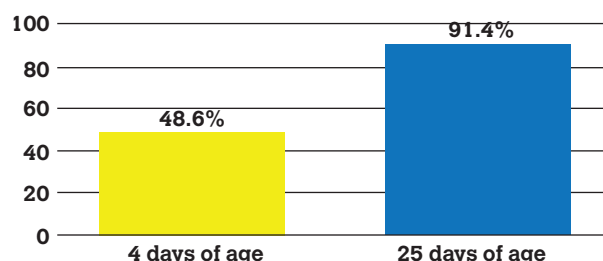


Figure 1: *Mycoplasma bovis* spreads rapidly within a group of calves.

CLINICAL SIGNS

Clinical signs are typical of calves with respiratory disease and include: elevated temperature; increased respiratory rate; breathlessness; decreased appetite with or without nasal discharge; and coughing.³ The only potential distinguishing clinical picture of *Mycoplasma bovis* may be the tendency for chronic cases to respond poorly to many antimicrobial treatments.

Affected calves may also suffer from otitis media/interna, arthritis, or both.⁴ Middle ear infections can occur as single cases or as outbreaks. Calves are seen with head shaking as a result of ear ache, ear droop progressing to a head tilt, nystagmus, circling and recumbency as infection penetrates the inner ear. Some will also have problems swallowing and others may go on to develop meningitis. If signs of these disorders appear in conjunction with BRD, it significantly increases the likelihood of *Mycoplasma bovis* involvement. *Mycoplasma bovis* is a recognised cause of mastitis and has, on occasions, been linked with cases of infertility, abortion and keratoconjunctivitis.

PREVALENCE

Prevalence varies across regions and between production systems, but it is well established that across Europe, *Mycoplasma bovis* is a highly prevalent bacterium. Exposure increases in systems which rely on mixing of animals from multiple sources, and with high stress husbandry systems. A study⁵ on Belgian veal units found *Mycoplasma bovis* in 87.5% of respiratory disease outbreaks. In an Italian study⁶, 100% of the six-month-old veal calves at slaughter had been exposed to *Mycoplasma bovis*. In the UK, 2015 data from a subsidised serology scheme run by Zoetis showed 50 per cent of 2,460 calves with a history of respiratory disease, had been exposed to *Mycoplasma bovis*. This figure had increased from 45% in 2014 and 41% in 2013. In Northern Ireland, 59 out of 77 (76.6%) farms investigated by Zoetis in the course of 2015-2016 showed evidence of exposure to *Mycoplasma bovis* and, on average, 64% of calves (238 out of 372) had positive titres. In 2016, *Mycoplasma bovis* was the most frequently detected respiratory pathogen in calves aged one to five months, occurring in 29% of cases in Northern Ireland, while it was detected in 13.3% in Republic of Ireland. In weanlings aged five to 12 months', *Mycoplasma bovis* was diagnosed as the cause of mortality associated with respiratory disease in 23% of cases at Agri-Food and Biosciences Institute (AFBI) and 6% of cases at the Department of Agriculture, Food and the Marine (DAFM).⁷

DIAGNOSIS

BRD with poor response to treatment, accompanied by arthritis and/or otitis media/interna, would strongly support a diagnosis of *Mycoplasma bovis*. Serological testing by enzyme-linked immunosorbent assay (ELISA) will demonstrate previous exposure of the animal to infection. Diagnosis of pathogens in lung tissue through laboratory testing has generally resulted in an underestimation of the prevalence of *Mycoplasma bovis* for a number of reasons. Culture of *Mycoplasma bovis* is not straightforward and

requires specialist expertise and equipment and may take a prolonged period of incubation before a negative result can be established with confidence. The culture and identification of other BRD pathogens is easier, so the presence of *Mycoplasma bovis* may be missed.

Confirmation of current *Mycoplasma bovis* involvement can only conclusively be determined through the identification of *Mycoplasma bovis* antigen in lung lesions, using molecular methods such as PCR, qPCR or immunohistochemistry (IHC) staining of lung sections. These tests range in their sensitivity and cost, and there is not a standardised approach within the laboratory network of the EU. Care must be taken when interpreting a negative result and the whole clinical picture should always be considered.

On gross post mortem the affected lungs are deep red colour, with degrees of consolidation. The distribution of the lesions is mainly focused on, but not restricted to, the cranioventral portions of the lung. In many chronic cases (not uncommon in animals affected by *Mycoplasma bovis*), caseo-necrotic lesions can vary from a few millimetres to several centimetres in diameter and are distinct from typical lung abscesses as they are not surrounded by a well-defined fibrous capsule. These changes are considered by many to be pathognomonic for *Mycoplasma bovis* infection. Additional signs include a diffuse fibrinous or chronic fibrosing pleuritis and the observation of linear yellow necrotic lesions with oedema fluid in the interlobular septae. Occasionally, lung sequestration, fibrinosuppurative tracheitis and caseous necrosis of regional lymph nodes have also been observed.

CONTROL

There are currently no commercially available vaccines for protection against *Mycoplasma bovis*, so control needs to focus on minimising the exposure of naive animals. The main sources of *Mycoplasma bovis* are contaminated milk and respiratory secretions from infected (but not necessarily clinically affected) animals.

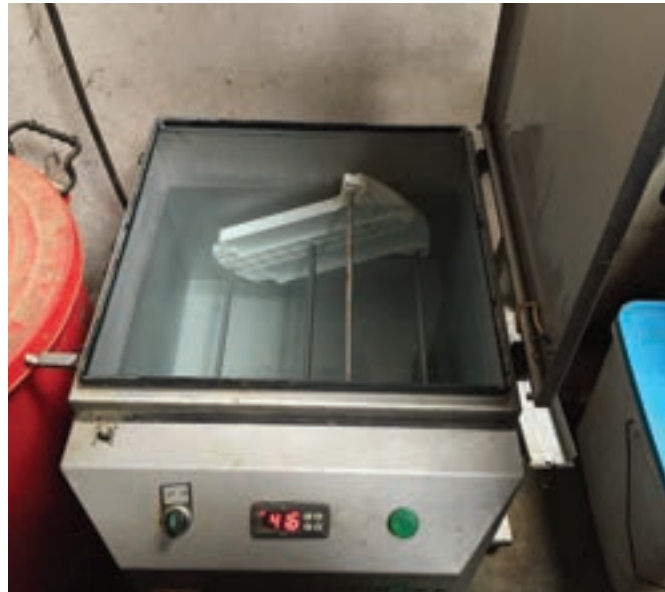
Four areas to consider

1. Minimising the risk of spread from dam to new-born calf

Removing new-born dairy calves from the cow and calving box as soon as possible after birth reduces the risk, of spread of infection.

2. Minimising the risk from contaminated milk

This is achieved relatively simply by feeding artificial milk replacer, but of course it is essential that calves receive adequate colostrum as soon as possible after birth, and *Mycoplasma bovis* can be passed in the colostrum as well. Risk can be minimised by screening cows and then, if necessary, careful selection of cows eligible to contribute to a colostrum pool (bearing in mind other disease risks such as Johne's disease). Pasteurisation of colostrum on a low-temperature, long-duration setting (60°C for 60 mins) minimises the risk of transmission of infection without destroying the vital antibodies.



3. Minimising risk from purchased cattle

Ideally, screening, quarantine and, if applicable, a treatment policy could be used to minimise the risk from incoming animals. Less effective, but a more viable option on many units, is the separation of animals on arrival when they are stressed and likely to be shedding more *Mycoplasma bovis*.

4. Minimising the risk of animal-to-animal spread

Mycoplasma bovis will spread from animal to animal primarily in respiratory secretions, so sick calves with increased shedding should be separated. Ensuring excellent air circulation will reduce the bacterial load in cattle buildings. *Mycoplasma bovis* is susceptible to common on-farm disinfectants. So, all-in, all-out policies for cattle sheds, coupled with effective disinfection of the housing between batches, is a practical solution for many.

TREATMENT

Care must be taken when selecting an appropriate antimicrobial, either for the treatment of undifferentiated BRD (where *Mycoplasma bovis* may be involved) or for outbreaks and individual cases where the involvement of *Mycoplasma bovis* has already been determined.⁸

The fact that *Mycoplasma* species lack a cell wall has important implications for treatment, as it means the beta-lactam antibiotics – cephalosporins and penicillins – are ineffective. *Mycoplasma* species are also naturally resistant to sulfonamides.

In vitro sensitivity profiles can be an unreliable indicator of clinical efficacy, particularly for certain classes of antimicrobial. Where possible, practitioners should utilise studies that demonstrate efficacy in the face of either a confirmed natural or experimental challenge with *Mycoplasma bovis*. The two most important factors in the treatment of mycoplasma pneumonia have been described as early recognition and prolonged therapy with continuous therapeutic levels of effective antibiotics for 10 to 14 days. Without this, 30-70% of the calves would relapse, causing more lung damage, and requiring further treatment.⁹

CONCLUSION

Mycoplasma bovis alone or in combination with other respiratory pathogens, can cause significant disease. Control relies on improving overall calf health, minimising the exposure of naive cattle and when required implementing effective treatment regimes.

Appropriate vaccination and control programs should be in place for the respiratory viruses such as BRSV, PI3v, IBR and BVDv, since controlling other pathogens will help decrease the risk of *Mycoplasma bovis* co-infections. Until alternative options (such as vaccines) for *Mycoplasma bovis* control are commercially available to protect against infections, antibiotics remain the only available treatment option. Where *Mycoplasma bovis* infection is suspected or confirmed, prudent and targeted use of antibiotics that are effective against this pathogen is required.

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