

Mycoplasma: Calf to Cow

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Introduction

Mycoplasma has, in the past few years, gone from what seemed to be relatively rare occurrence to an issue that any dairy regardless of size or location needs to consider. In addition, there is an increasing awareness that Mycoplasma is not just an udder health problem but often has more widespread clinical manifestations. A more complete perspective on what Mycoplasma is, where it hides out, and how it potentially gets to be a problem of clinical significance allows for the development of much more effective prevention and control measures.

Mycoplasma: What are They?

Mycoplasma are small organisms that are related to bacteria but also have some fundamental differences. The major difference is that they do not have a cell wall, as do bacteria. This has good and bad consequences. Many of the antibiotics we use work by attacking the cell wall of the bacteria we are trying to control. In the case of Mycoplasma these antibiotics are not effective. On the other hand, not having a cell wall makes them much more sensitive to their surrounding environment such that they do not survive well outside animal hosts. This also makes them fairly easy to kill with heat or disinfectants. Finally, not having a cell wall makes them somewhat more of a problem for an animal's immune system to recognize such that we generally do not see a very effective immediate response or good long-term immunity develop with exposure. In fact, some of the clinical signs we see with infection seem to result because the organism confuses the immune system into reacting against the host itself.

Mycoplasma is actually quite widespread both in the environment as well as being associated with essentially all warm-blooded animals. Many types do not seem to cause disease and most that are associated with animals seem to be specific to the species of animal they associate with.

In cattle, there have been somewhere around 11 different species of Mycoplasma that have been reported. Of these, only three really seem to cause much in the way of disease, these are M. bovis, M. bovis genitalia, and M. californicum. Of these, M. bovis appears to be the most common as a cause of clinical problems. Another, name you might see associated with Mycoplasma would be Acholeplasma. This organism can be confused with Mycoplasma when cultured in milk samples. It is generally considered to be a contaminant and not able to cause disease. This means that, particularly in bulk tank samples, growth alone without typing the organism may result in a wrong diagnosis.

What Kinds of Problems do They Cause?

Generally, we have been pretty focused as an industry on the mastitis problems that Mycoplasma causes. While this seems to be the most frequent way the disease shows up there are a number of other conditions that effect both cows and calves. In fact, when mastitis shows up on a dairy we can frequently find evidence of these other disease processes going on at the same time. Recognizing some of these related conditions may also be the "early warning" sign that alerts you to the possibility of developing more serious problems.

The following gives a short description of some of the more common related conditions one might see.

Eye infections (pinkeye) can be caused by Mycoplasma. The signs may involve anything from simple weeping and reddening to more serious swelling and erosion of the cornea. Poor response to antibiotic

treatment should make one suspicious that you are not dealing with typical “pinkeye”. While it is more common to see in calves, cows can sometimes be affected as well.

Occasionally, Mycoplasma can cause brain infections (meningitis) in calves. These can sometimes be difficult to recognize, as calves may just appear to have fevers and be depressed. Signs of apparent neck pain and abnormal eye movements may also be evident. Signs are usually severe and response to treatment poor. It is not uncommon to see ear infections in young calves associated with Mycoplasma. Calves with head tilts, droopy ears, fevers, and eye signs should be suspect.

Mycoplasma has been implicated as a cause of respiratory problems in feedlot cattle, dairy calves, and cows. When Mycoplasma alone is involved the signs are usually mild enough that they are not noticed. In fact, it is commonly thought that for Mycoplasma to cause significant respiratory problems there has to be other pre-disposing factors involved. These could include other respiratory pathogens, poor ventilation and air quality, and immune suppression.

Arthritis is another common sign of Mycoplasma infection. This can be a problem in both young and adult cattle. In young calves one might be suspicious that Mycoplasma is involved when you see joint problems occurring without infected navels. Adult cows tend to be extremely lame and multiple joints may be involved. Often other signs of Mycoplasma are present in addition to the lameness if one looks closely.

Mycoplasma has been implicated in breeding and abortion problems as well as fertility problems in bulls. The significance of Mycoplasma in these types of problems, however, is thought to be low.

Where do They Come From?

While it may be somewhat of an over-statement it is probably safe to say that one can find Mycoplasma on most dairies if one looks hard enough. Mycoplasma is isolated from the upper respiratory tract and the reproductive tract of apparently normal animals. This is true both for cows and calves.

Certainly we also see some level of animals in the population (probably low) that have chronic unapparent infections. This is true for both respiratory and udder infections and these animals are a potential reservoir for exposure of other animals within a herd.

Finally, in some situations, Mycoplasma is capable of surviving in the environment for fairly extended periods of time. It has been found to survive well in the environment in wet bedding or wet corral conditions particularly during warm or mild weather. In addition, it survives quite nicely in environments that are contaminated with milk and uterine fluids. It will also survive well in contaminated medications, etc.

How Does a Clinical Mycoplasma Problem get Started?

Understanding the basic relationships that predispose to clinical disease problems in a herd is extremely helpful when thinking about how to prevent, control, and/or eradicate a specific problem such as Mycoplasma. Basically if we know something about the potential source of the organism, how that source gets started and spreads through the herd, and something about the ability of the animals to resist a challenge we can be pretty effective at addressing the problem. Multiple factors are important in most disease outbreaks and more commonly than not there are multiple factors that have come together to create a problem. Unless we have a systematic way to identify, determine the significance, and address all factors involved we run the risk of investing significant money and time for a mediocre result.

The source of Mycoplasma as was stated earlier tends to be other animals although there does appear to be some ability to survive in the environment. When thinking about source it is important to not only think about location but also about level of challenge. For example, we know that some percentage of an apparently normal group of calves will have Mycoplasma in their upper respiratory tract. In herds where we do not have Mycoplasma problems in the cows and we are careful about feeding potentially contaminated milk to calves the level of these healthy carriers is very low. The level of carrier calves is much higher in a population where they are being exposed to the organism through the milk they drink. This does not necessarily mean that these calves will get clinical Mycoplasma. What it does mean is that if other predisposing factors develop that enhance spread or lower resistance (such as poor air quality or marginal nutrition) the organism is much more likely to be present and able to take advantage.

In the case of Mycoplasma mastitis the same relationship exists. The initial source could be another animal with mastitis, an animal that develops the respiratory form that spreads through the blood to the udder, or the environment. The ability for significant spread to occur through the herd usually depends, however, on the addition of other factors that enhance challenge levels, enhance number of animals exposed, or lowers a herd's resistance.

Animals with clinical Mycoplasma will generally go through stages where they shed extremely high numbers of organisms so in addition to thinking about the levels of carrier animals in a herd it is important to think about the levels of challenge created by any one infected animal. The levels of cleanliness associated with hospital, fresh cow, milking time, and calf feeding practices is critical to increasing the chances that an infected carrier animal does not have the opportunity to expose significant numbers of other animals. This relationship is so key to good control that it cannot be stressed strongly enough. Many herds experience episodes of clinical Mycoplasma but herds that have breaks in basic hygiene in these areas tend to have much worse problems when they occur.

The resistance of a population of animals to infection with Mycoplasma also seems to play a role in the initiation and spread of a problem. Vaccination specifically for Mycoplasma does not seem to fundamentally change the course of the disease in a population and, in fact, there have been some reports of increased severity of clinical signs with vaccination. Suffice it to say that vaccination certainly will not replace the need for good screening and control practices.

There does appear to be some potential relationship between other diseases that tend to cause immune suppression and the ability of Mycoplasma to become clinical within a herd. Specifically, there has been some work done in feedlot animals that seems to indicate that BVD may play a role in some Mycoplasma outbreaks through its immune suppressive effects. Good control strategies for BVD could be a factor in preventing Mycoplasma outbreaks.

Another area that is often overlooked is the nutritional status of young calves. Many calf-hood infectious problems have a nutritional component to them and Mycoplasma would be no exception.

Managing Mycoplasma on the Dairy

From the above discussion it is evident that virtually any dairy has some risk of experiencing Mycoplasma problems and therefore should include this as a consideration in the development of farm-level bio-security protocols.

There are four basic questions, which need to be addressed in this regard.

First: What are we doing to minimize the introduction of Mycoplasma carriers into the herd?

Second: What control measures are critical to controlling spread if it is introduced?

Third: How would we know if we begin developing a Mycoplasma problem?

Fourth: If we had a problem what steps can we take to address the problem?

To address these questions there needs to be some ongoing screening strategy in place. Since there is no one perfect test, it is extremely important that one is able to recognize clinical signs that make one suspicious that Mycoplasma could be involved. Groups of calves that show ear, eye, or joint problems should be highly suspect. In addition, respiratory infections, which occur around 3-6 weeks of age, often have a Mycoplasma component.

In adult cattle we tend to recognize mastitis as a predominate clinical sign. Groups of animals that have clinical mastitis that does not respond to treatment and seems to jump aggressively from quarter to quarter should be suspect. Milk from effected quarter tends to be slightly discolored and contain garget that may be “sandy” or gritty in consistency. In addition to mastitis, if a herd seems to experience animals with joint problems or periodic outbreaks of pneumonia there is likelihood that Mycoplasma is involved.

Mycoplasma types, which are most commonly involved in clinical mastitis problems, tend to show fairly obvious clinical signs, particularly with newly acquired infections. This is not necessarily the case with other species or with chronically infected animals. Because of the high likelihood that some infections will be sub-clinical or inapparent, a good screening program will not rely on clinical signs alone. Animals with Mycoplasma mastitis tend to run significantly elevated SCC's so individual SCC can be helpful in determining whether a cow is truly infected or not.

Some level of milk culturing is probably necessary as part of a sound preventative screening program. At the least, one should be screening the bulk tank on a regular basis. In addition, clinical cows probably should be cultured. It is also probably worth culturing all new additions to the herd (including first calf heifers) either as they freshen or as lactating animals are added to the herd.

Use of milk culturing for Mycoplasma as part of an effective screening and control program is dependant on a number of considerations. First, there needs to be a clear plan of what to do with the information generated. Second, samples need to be collected and handled properly. One of the characteristics of clinical Mycoplasma is that enormous levels of the organism are shed. This not only increases the risk of spread but also significantly increases the chances that samples can be contaminated during collection causing false positive results. On the other had, some types of Mycoplasma seem to be very sensitive to freezing and thawing so it is possible to have samples from positive cows that show up as no growth. A certain portion of chronically infected animals seem to vary significantly in the levels of Mycoplasma they shed at any one time so this can further confuse the issue. Growing Mycoplasma in the lab is not particularly difficult, however not all labs are created equal. If there is reason to be suspicious of Mycoplasma, it is really important to work with a lab that has experience with the organism. Finally, simply growing Mycoplasma, particularly from the bulk tank, without further typing of the organism is probably not acceptable.

There are other tests available to screen for Mycoplasma. One that is relatively new is termed PCR. PCR has the advantage of being very sensitive as well as specific for a particular Mycoplasma species such as Mycoplasma bovis. It also is much faster to yield a result. Currently, PCR is fairly expensive. The sensitivity of the test potentially makes it much more susceptible to contamination and the fact that is specific, means other types of Mycoplasma would not be picked up.

Managing for Control

Despite best efforts at screening the reality is that there is still the risk of exposure from carrier animals as well as the environment. This means that understanding and addressing the critical modes of spread is important not just when you know it is present. Sound basic control measures can be the difference between culling the odd positive cow or having it rapidly spread to a group of other animals in the herd.

Control for calves needs to be focused on excellent hygiene practices around feeding as well as feeding Mycoplasma free milk. Pasteurization of milk is effective, but as with any other management process it needs to be done correctly and it also needs to be monitored to make sure we are consistently getting a desirable product.

Air quality is also a factor in how easily spread can occur through a group of animals. This is probably true for susceptible adult populations as well as for calves.

Control for cows tends to focus on mastitis. The initial challenge that starts a mastitis outbreak may be another animal with mastitis. It may be an animal with respiratory disease that ends up with a septicemia and resulting mastitis. It may even be contaminated bedding or environment.

While it is important to be aware of these potential sources and address them effectively, it is also important to remember that most if not all serious outbreaks have some component that really facilitated spread beyond the initial infected animal.

Poor or inconsistent milking, hospital, and fresh cow practices are critical in creating potential for an actively shedding animal to challenge other cows. As an example, housing fresh and hospital cows in the same pen will increase the probability for spread.

Finally, the quality of these practices is critical to control during an outbreak. No amount of culture and culling or segregation will help if new cases are being created faster than we can find them.

While mastitis is by far the most common clinical problem associated with Mycoplasma, there does appear to be an apparent increase in herds that experience the respiratory/joint syndrome in adult cows. Environmental stresses, air quality, and possibly other types of infections, particularly those associated with immune suppression, probably play a role in how aggressively infections spread through a herd.

Managing a Mycoplasma Outbreak

Finding out you have Mycoplasma mastitis in your herd is serious. How extensive the actual impact is, however, is strongly dependent on good screening and basic control strategies as outlined above. This means that the first step in dealing with news of Mycoplasma in the herd is to ensure that basic critical control measures are in place and being effectively practiced. It is also probably a good idea to step back and look for related signs of Mycoplasma on the dairy.

Given that we have our basic control measures in place, the next step is to identify and manage the existing Mycoplasma positive animals. This can be approached with differing levels of intensity. There

is obviously a strong correlation between level of intensity, efficacy, and cost. These need to be considered in each particular situation.

The least intensive approach would be to do nothing except ensure that basic control measures are in place. Basic screening of bulk tank and hospital samples as well as aggressive culling of non-responsive clinical case might be added as additional strategies. Culturing clinical, fresh, and incoming cows as well as bulk tanks would add to effectiveness. One might consider string sampling and culture to focus individual cow sampling efforts to certain sub-populations within the herd. Finally, an aggressive program of whole herd culture with culling and/or segregation of positive cows may be desirable based on herd status and management goals.

While it is fair to say that both cost and probability of quick resolution increase with more aggressive control programs it is also important to remember that without consistent basic control measures (particularly in the parlor, hospital and fresh pen) no program has much likelihood for success.

Summary

No herd is completely risk free when it comes to the possibility of clinical Mycoplasma problems and in fact, there seems to be an increase in the frequency with which Mycoplasma problems are being reported. While we tend to think of Mycoplasma as mainly a mastitis problem it is associated with other disease processes on the dairy. These other types of Mycoplasma infections not only cause problems in their own right but may be significant as the source of eventual mastitis problems as well.

Basic screening procedures as well as good basic control procedures in the parlor, fresh and hospital pens are the basis for preventing Mycoplasma from becoming a serious issue. In fact, these same screening and hygiene procedures are equally important to the success of any attempt to control or eradicate an existing Mycoplasma problem.