Treating Subclinical Mastitis Based on Milk Culture Results

Very little of the attention paid to the culture and treatment of clinical mastitis cases has dealt with treating subclinical infections. This article demonstrates the usefulness of culturing subclinical mastitis to develop treatment protocols. Many of the common questions asked about culture results and treatment and management protocols are answered. Previous studies have shown that treatment based on SCC alone is not economical or even successful. However, identifying subclinical infections based on culture results will help target cows for treatment and improve treatment success.

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A number of articles have been written on the culture and treatment of clinical mastitis cases, but little has been written about treating subclinical infections. Perhaps this is because there’s little economic evidence to support treatment of subclinical mastitis except for the control and eradication of Streptococcus agalactiae. Years ago, when electronic somatic cell count (SCC) testing was first adopted to monitor dairy herds for subclinical mastitis, research was conducted that included SCC in treatment decisions. However, like clinical mastitis, many infections that caused subclinical mastitis are eliminated by the time that high SCC is detected in monthly testing. When these studies were evaluated, the reduction in SCC following treatment was not much better than the untreated controls. Therefore, when milk loss and treatment cost were factored into these studies, treatment based on high SCC did not show an economic benefit. However, we should take another look at subclinical treatment to understand some of the factors that affect their results.

Treatment Difficulties

Some of these factors are similar to those affecting clinical mastitis since subclinical mastitis is caused by the same organisms. Treating all cases of subclinical mastitis the same is no different than treating all cases of clinical mastitis the same. In a clinical mastitis study (1), milk cultures were used to help identify the bacteria causing clinical mastitis and antibiotic treatment was selected that was effective and appropriate. We should consider the same rationale when making treatment decisions for subclinical mastitis. As with clinical mastitis, by the time the elevated SCC is detected, the cow’s immune/defense system may have eliminated the pathogen. This is true for many bacterial infections, most commonly when Gram-negative coliform bacteria are responsible. Not
all coliform bacteria cause clinical mastitis and bacteria are often eliminated before serious damage to the gland occurs. Yet, the presence of the organism and its toxins can elicit a high SCC that can remain high for days or even months before the gland recovers. An infection can cause enough damage to increase the SCC identified on the monthly DHIA-SCC records, but that SCC will drop to normal levels by the next DHIA sampling. This is common with environmental infections and we often use this observation as a way of monitoring records to see if environmental bacteria are responsible for the increase in herd SCC. If we use SCC to select cases for treatment, antibiotic treatment would be of little value because the bacteria have already been eliminated. Antibiotic treatment is only effective against bacteria and has little effect in improving tissue healing.

Selecting Drugs for Treatment

As with clinical mastitis, treating subclinical cases with antibiotics when the cultures are negative for bacteria will accomplish very little except add treatment cost and increase milk loss as more milk will be discarded. Therefore, antibiotic treatment should be reserved for subclinical infections that are culture positive for bacteria that are susceptible to antibiotics. Milk culturing can help select the most appropriate antibiotic that will eliminate the bacteria. This requires culturing high SCC cows before initiating treatment. As noted in a previous article (2) the use of the correct drug, in the correct dosage, for an effective treatment period may very well determine if a treatment is going to be successful or fail. Drugs differ in their efficacy towards various bacteria, the time they stay in the gland and how well they get to the infections. For example, Streptococcus agalactiae is very susceptible to many antibiotics and can be eliminated from the gland by treatment during lactation or the dry period. Other streptococci are less sensitive to some drugs and less likely to be eliminated. In a recent study looking at new subclinical infections at calving, we identified streptococci-like bacteria (enterococci) that had the same resistance patterns as Gram-negative bacteria. Antibiotics generally found in our lactation mastitis tubes would be of little use against these infections. Similarly, Staphylococcal organisms (especially Staphylococcus aureus) are not as accessible and it is difficult to get the drugs to the bacteria at a high enough concentration to eliminate the infection. Drug sensitivity testing and treatment protocols should be discussed with a professional who understands the pharmacology of both the drug and bacteria identified from subclinical mastitis cases.

Profitable Treatment

We can profitably culture subclinical mastitis and use the results to develop treatment protocols. As we look at culture results and discuss treatment and management protocols, the questions below are commonly asked.

1. When should we culture? Selecting cows for culture based on subclinical mastitis is a moving target and differs for each farm. A herd with a large number of high SCC cows may need to limit the number of cows for culture by identifying problem cows to bring the herd back down to an acceptable range, while other herds with low SCC can lower the threshold to select all infected cows. If cultures are negative, the increase in herd SCC may very well determine if a treatment is going to be successful or fail. Drugs differ in their efficacy towards various bacteria, the time they stay in the gland and how well they get to the infections. For example, Streptococcus agalactiae is very susceptible to many antibiotics and can be eliminated from the gland by treatment during lactation or the dry period. Other streptococci are less sensitive to some drugs and less likely to be eliminated. In a recent study looking at new subclinical infections at calving, we identified streptococci-like bacteria (enterococci) that had the same resistance patterns as Gram-negative bacteria. Antibiotics generally found in our lactation mastitis tubes would be of little use against these infections. Similarly, Staphylococcal organisms (especially Staphylococcus aureus) are not as accessible and it is difficult to get the drugs to the bacteria at a high enough concentration to eliminate the infection. Drug sensitivity testing and treatment protocols should be discussed with a professional who understands the pharmacology of both the drug and bacteria identified from subclinical mastitis cases.

2. When should a farm consider culturing subclinical mastitis? Most dairy farms can benefit by culturing high SCC (or high CMT) cows to identify pathogens (or lack of) that are responsible for elevated cell counts. Small dairies may find that on-farm culture programs are not practical, but they can select a veterinary clinic or laboratory that meets their needs.

3. What are we looking for when culturing subclinical mastitis? Identifying the pathogens that cause an elevated SCC in a herd is the first step in identifying practices that influence the spread of new infections and help identify management practices that can help prevent this spread. Contagious pathogens have a different control strategy than environmentally acquired infections. Some pathogens can be eliminated from the lactating cow by antibiotic treatment while others are less responsive to therapy. If cultures are negative, subclinical mastitis is probably caused by environmental pathogens. Many of these bacteria damage gland tissue and it is a matter of time before the mammary gland heals and the SCC returns to normal. This may occur before the next test date or it may take the entire lactation and dry period to heal. In these cases, antibiotic treatment is of very little value.

4. Who should be cultured? High SCC (or high CMT) cows are good candidates and cows in early lactation with high CMT scores are often the best candidates. The ability to collect samples at appropriate periods and develop management protocols will determine the cows selected on any farm. A culturing program without a plan of action is of very little use and only adds a significant investment of time and resources. Therefore, a dairy herd manager needs to make a commitment and be willing to invest time and resources before tackling a subclinical mastitis problem. Target specific areas. Screening cows by culturing at calving (3-6 milkings post-calving) with the CMT is an excellent way to monitor calving areas, heifers, and dry cow management. Monitoring monthly DHIA records for cows with high SCC is useful in monitoring lactating cow management that includes housing and milking practices.
5 What infections can be identified by milk cultures? When we are culturing milk samples we are first trying to identify no growth (eliminated infections). Secondly, we try to identify Gram-positive pathogens that can be managed with the help of antibiotic therapy. Gram-negative bacteria are not as responsive to antibiotic therapy and are often self-limiting. An easy on-farm culture protocol can readily identify the bacterial pathogens.

6 What happens if mastitis cultures are negative? Culture-negative mastitis samples indicate the cow is not shedding bacteria in very high numbers or the infection has been eliminated. This is true of most environmental infections caused by coliform bacteria. Affected cows aren’t a big risk to infect other cows and should be managed as an individual cow problem. Often times the damage has happened already and little can be done to speed up the healing process. Preventing new environmental infections becomes the challenge. In the herd with a contagious problem (Staphylococcus aureus and Mycoplasma), a single culture may not identify the infected cow and additional cultures are required if the cow’s milk or the SCC does not return to normal.

7 Treatment Protocols? Clinical mastitis treatment protocols have been published in previous articles (1, 3) and articles with treatment protocols are available on MDR and CVM dairy websites. Gram-positive pathogens are more responsive to antibiotic therapy, while Gram-negative pathogens are not. However in severe clinical mastitis, supportive fluid therapy may be necessary whereas this would not be the case for subclinical infections. Deciding on a treatment strategy for subclinical infections is different than clinical infections because the health of the animal is not in jeopardy, and economics and milk quality are the primary goals. Having good culture results makes targeted treatment more effective while using the most appropriate antibiotics when antibiotic therapy is selected. Incorporating antibiotic therapy to reduce Gram-positive pathogens has been successful in herds while limiting milk loss. These protocols should be designed with the help of the herd veterinarian and monitored (culture and SCC) for treatment success.

8 What are the costs? If a farm has an employee or manager who has adequate training or is willing to go through the training process, on-farm culture is very affordable and can be easily implemented within a treatment protocol. However, many veterinary clinic laboratories have rapid response times and are affordable. Either decision will require an investment of time and resources to initiate culturing protocols on the dairy farm. It has been very beneficial for many farms. If on-farm culture is selected, the farm personnel should work closely with the herd veterinarian to monitor culture accuracy and quality. Having the herd veterinarian monitor the culture quality also helps in identifying the appropriate treatment and management protocols for mastitis on the farm.

9 Can we culture for Mycoplasma mastitis? Most farm culturing protocols are not useful in identifying and monitoring mycoplasma mastitis. Mycoplasma requires special media and a specialized environment to grow this organism. When mycoplasma is identified on a farm, the farm should select an appropriate laboratory for culturing this pathogen. Starting by culturing bulk tanks for the presence of mycoplasma pathogens is a good monitoring tool. Mycoplasma bovis is a contagious pathogen. When found in the bulk tank, it indicates the presence of mycoplasma infections in the herd. Management practices can be developed to eliminate mycoplasma similar to eliminating other contagious pathogens (4).

10 What are the benefits of on-farm culture? There are two major benefits. Firstly, culture results are obtained in a timely manner that can help in making treatment decisions. Secondly, if the person responsible for culturing is also responsible for treatment, they become more aware of the pathogens causing infections. This awareness of the type of bacteria and its sources can improve prevention and make mastitis treatment more effective. All farms have mastitis cases, but until someone on the farm takes the responsibility for managing mastitis, few farms achieve a significant reduction in mastitis. In this respect, I do not separate clinical from subclinical mastitis because the cause and management is often the same.

11 Motivation. The person responsible for culturing milk samples should be the same person working with the veterinarian to routinely review the cultures and culture results at regular herd visits. The employee should be involved in the mastitis treatment and management decisions. This routine feedback will engage the employee and/or owner/manager in the herd’s mastitis control. Seeing a reduction in antibiotic use and a positive response to proper antibiotic treatment can be a very motivating factor. However, someone of authority must monitor the progress. This may be someone on the farm (owner, manager or supervisor) or the veterinarian working with the farm.

12 Where can I find these culturing procedures? There are a number of websites that promote on-farm culture. The Bi-plate culture method can be found on the MSU College of Veterinary Medicine Dairy website at <http://user.cvm.msu.edu/~sears/>. The CVM Dairy Website also includes a training presentation under “Dairy Health Solution – Slide lecture presentation” or under the Training link – “Clinical Mastitis Treatment Decisions”.

13 Where do I get the supplies to start on-farm culturing? Talk with your veterinarian or check our
website under laboratory and laboratory supplies. There are other laboratory resources suppliers that can help you equip an on-farm culture lab.

Conclusion

Culturing subclinical mastitis can be an important aspect of monitoring subclinical problems on herds. If contagious pathogens are the major cause of clinical mastitis, then contagious mastitis also will be identified in subclinical mastitis. Treatment and management should focus on reducing the presence of these pathogens. However, if environmental pathogens are a major cause of clinical mastitis, culturing both clinical and high SCC cows is needed before ruling out contagious pathogens as a significant cause. In most herds the isolation of pathogens in a herd will be similar for both clinical and subclinical mastitis. It is almost always the same pathogens causing both forms of mastitis, but the severity of the symptoms are usually the result of the amount of tissue damage caused by the pathogen.

Summary

In the past, most of our emphasis has been on culturing and treating clinical mastitis. Until now we have not addressed the use of these same tools to treat subclinical mastitis. Although SCC data are an excellent tool to evaluate herds, monitor progress and select cows for culture, it is not a good tool to select cows for treatment. Previous studies have shown that treatment based on SCC alone is not economical or even successful. However, selecting subclinical infections based on culture results will help target cows for treatment and improve treatment success. On-farm culturing is an opportunity for many Michigan herds.

References