HOW TO POSITION MILK CULTURES IN A CLINICAL
MASTITIS TREATMENT PROGRAM

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TAKE HOME MESSAGES

- Milk cultures are the only mechanism dairy producers have to determine the mastitis pathogen profile of the organisms infecting their cows.

- Several approaches to milk cultures are available including bulk tank monitoring, herd surveys, and strategic sampling of specific cows (dry off, fresh cows, and clinical cases).

- Milk cultures can be performed on-farm to help guide more efficacious treatment decisions.

When dairy producers have a record of the mastitis pathogen profile for their herds, control measures and treatment decisions are improved. While elevations in bulk tank somatic cell count (SCC) can be an indication of herd mastitis problems, the personnel milking the cows are typically the initial component in the decision making process for clinical mastitis treatment. Strategic milk culture programs are the only mechanisms to determine which microbial agents are causing mastitis problems.

KNOWLEDGE IS POWER

Submitting aseptically collected milk samples to a diagnostic laboratory has been the traditional approach to determine mastitis causing pathogens. Unfortunately, this method has been criticized for slow turn around time and displacement of the results from the point of action, the milking parlor, and cattle housing. Additionally, many producers are only interested in finding an appropriate antibiotic with which to treat the offending mastitis infection. With a limited number of antibiotics legally available to treat clinical mastitis, understanding the class of pathogen becomes more useful. Therapy varies greatly depending on the bacterial organism suspected to be involved in each particular case. Culture of an aseptically collected milk sample is the only way to know which pathogen is causing a clinical case. Culture programs need to be systematic to be successful.

MILK CULTURE APPROACHES

Potential culture programs for identifying bacterial pathogens causing clinical mastitis may include, bulk tank cultures, herd survey culturing, periodic culture of cows with high somatic cell counts from DHIA tests, or strategic sampling and culture of cows at dry off time, fresh cows, cows post therapy and/or new cases of clinical mastitis. For any of these approaches, there are several procedures that are essential to obtain accurate, quality results. Excellent quality milk samples are a must! The goal is to determine if bacterial pathogens are infecting the milk secretory tissue. Teat ends must be scrubbed with alcohol pads prior to milk collection.
Roughened teat ends can harbor a significant number of environmental bacteria and can contaminate carefully collected milk samples. If filth, hair, and other debris from the udder falls into the milk sample during collection, one is simply culturing the environment not the milk from within the gland. Holding the sample collection vial at an angle will help reduce contamination. Once collected, milk samples must be cooled rapidly. They can be placed in a refrigerator if plating will occur soon or should be placed in a freezer if plating will occur at a later date. Milk samples should be representative of the offending milk. Using a CMT paddle to determine the quarters with elevated SCC and sampling only elevated quarters is appropriate.

The level of laboratory diagnosis will be determined by the intended use of the results. Herd outbreaks may require more sophisticated professional laboratory diagnoses, while clinical mastitis treatment decisions may only need a determination of gram reaction (gram negative indicative of coliforms and gram positive indicative of staphs and streps). In any case, results must be recorded, readable, and relevant to the conditions of the program. These results must be able to be summarized and allow for trend analysis.

Bulk tank culturing has been covered in previous papers (Wallace, 2002 Illinois Dairy Report). In summary, bulk tank culturing may not offer much utility in making clinical mastitis treatment decisions. This approach is most useful in determining if contagious pathogens are present in milk from lactating cows. Should a bulk tank culture show that *Staph aureus*, *Strep agalactia*, or *Mycoplasma bovis* is present, further milk samples are indicated. Herd survey culturing can incorporate individual milk samples from the entire lactating herd or perhaps one pen or group at a time. Therapeutic decisions again are limited. This approach may best be used to determine which cows not to treat! Cows infected with *Mycoplasma bovis* or *Staph aureus* have poor treatment prognosis, while cows infected with *Strep agalactia* would benefit from antibiotic therapy. This approach is not recommended in low SCC herds unless a bulk tank culture revealed one or more contagious pathogens.

Periodic sampling of cows with high SCC from DHIA tests can be problematic as well. This approach may be useful in high SCC herds because intramammary infections in these herds tend to be of longer duration. Otherwise this approach will yield too many negative or no growth cultures. This approach is also unlikely to lead to good therapeutic decisions because the SCC sample date is usually out of sync with the milk culture date. Cows with pathogens that create long duration infections and thereby chronically elevated SCC may have the same pathogen within the gland at the time of DHIA test when compared to the pathogen isolated at milk culture. Cows with pathogens that create short duration of infections may no longer be having bacteria in their milk at the time of culture. Additionally, cows typically only have one quarter infected. When from the infected quarter is commingled with milk from three SCC “normal” quarters (as in a DHIA milk sample), it may take an infected quarter SCC in excess of 700,000 to cause a composite SCC sample to exceed 250,000.

Strategic sampling of specific cows may provide the most useful information for mastitis control decision making. Obtaining aseptic milk samples and culturing the milk from all cows going dry will help determine the pathogen load in the cows that will be expected to remain in the herd. Culturing all fresh cows can provide a wealth of information. This approach will help assess the organisms most frequently challenging the cows in the dry cow and calving pens. This may also
help determine if dry cow therapy has been successful (in particular if dry off milk cultures are obtained). Fresh cow cultures focuses on the most valuable cows and most costly cases of clinical mastitis. This can also help predict the cause of future clinical cases and can guide therapeutic decisions. Finally, fresh cow cultures can help assess the applicability of metaphylaxis, or pre-calving antibiotic treatment of cows and heifers.

The decision to treat a cow for clinical mastitis should ideally be based on the pathogen inducing the abnormal milk. While we may not know the causative agent at initial treatment, obtaining an aseptic milk sample, pretreatment, is essential to assessing the success of control programs and the efficacy of therapeutic regimes. Waiting for results from a diagnostic laboratory remote from the farm severely reduces the utility of this approach. On-farm milk culturing can be extremely useful in developing more successful clinical mastitis treatment protocols. Equipment required include an incubator capable of maintaining a regulated temperature of 37C, milk culture plates, sterile swabs and collection vials. Within 12-18 hours, the use of bi-plates or tri-plates will help determine if the offending pathogen is gram negative or gram positive. With additional training and a color atlas of typical pathogens, further pathogen diagnosis can be made. Coupling severity coding of clinical mastitis cases with on-farm milk cultures improves the efficiency of therapy. Treatment decisions modified after gram reaction is determined can be more successful. One approach is presented at the end of this paper.

Should therapy be unsuccessful, the on-farm culture plates along with a frozen sample from the initial infection can be submitted to a professional diagnostic laboratory for a more detailed analysis. Lactational therapy for cows with incurable pathogens, such as Arcanobacterium pyogenes, yeasts, or Mycoplasma bovis should not be treated further. Treatment success for Staphylococcus aureus will depend on pathogen and cow factors. For example, treatment failure is higher than when Staph aureus is detected in older cows or after cows have had elevated somatic cell counts for several months. Since milkers do not initially possess knowledge of the pathogen involved, assessing the stage of infection (acute versus chronic) and assigning a severity code to each clinical case will assist milkers in determining the appropriate on-farm treatment protocol.

**EXAMPLE PROTOCOL FOR TREATING CLINICAL MASTITIS USING ON-FARM MILK CULTURES**

**Severity Code 1.** The milk is abnormal, but the rest of the udder is normal (not swollen or painful) and the cow does not have a fever and/or production level is not reduced.

1. Collect an aseptic milk sample from the affected quarter(s), label appropriately
2. Record information on treatment sheet in parlor
3. Place yellow leg band on cow’s rear leg
4. Infuse quarter(s) with SpectraMast (both gram negative and positive spectrum)
5. Move cow to treated pen.
6. Streak milk sample on tri-plate ASAP after milking, freeze remaining sample.
7. If milk sample results indicate gram negative infection
   a. Continue SpectraMast once a day for up to four more days
   b. Begin treatment with Excenel or another systemic antibiotic
   c. Consider ancillary therapies such as oral fluids depending on clinical signs
8. If milk sample results indicate gram positive infection  
   a. Continue SpectraMast or switch to CefaLak or Pirsue depending on previous therapeutic success  
   b. Consider Polyflex or Oxytet depending on clinical signs

Severity Code 2. The milk and quarter(s) are affected (swelling and/or pain in the udder), but the cow does not have a fever. Production level may be decreased.

1. Follow steps 1 through 6 above.  
7. Begin treating with Excenel (assuming gram negative infection)  
8. If milk sample results indicate gram negative infection  
   a. Continue SpectraMast once a day for up to four more days  
   b. Continue Excenel for two more days  
   c. Consider ancillary therapies such as oral fluids depending on clinical signs
9. If milk sample results indicate gram positive infection  
   a. Continue SpectraMast or switch to CefaLak or Pirsue depending on previous therapeutic success  
   b. Consider Polyflex or Oxytet depending on clinical signs
10. If the cow does not respond, contact the attending veterinarian.

Severity Code 3. The milk, quarter(s), and cow are affected. The cow shows signs of systemic involvement: dramatic reduction in milk production, fever, off-feed, depressed, or dehydrated.

1. Follow steps 1 through 9 above.  
10. Treat cow in parlor and contact attending veterinarian for more aggressive therapy  
   a. Attending veterinarian will administer intravenous treatment including Banamine, hypertonic saline, and/or calcium gluconate.  
   b. Attending veterinarian will reassess the cow the following day.