

Uses of the MASTiK[®] Antibiotic Susceptibility Test

as part of the

ImmuCell Intelligent Mastitis Management[™] Program

The MASTiK Test is an integral part of the ImmuCell Intelligent Mastitis Management Program. We are pleased to offer you this guide to help you apply this innovative technology.

Other tools in the Intelligent Mastitis Management Program can be found at www.immucell.com or by calling 1-800-466-8235

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Intelligent Mastitis Therapy Background:

The basic premise behind this program is that if you are going to use antibiotics to treat mastitis, then make sure you choose the appropriate one with the greatest chance of success. Even though this makes sense, the problem is it's hard to determine which antibiotic is going to be most effective.

Traditionally, a producer would send a milk sample to a lab and have it cultured, followed by a test called the Kirby-Bauer Disk Diffusion (KBDD) for antibiotic sensitivities. **Culturing to determine which bacteria are causing the infection is still a valuable tool in mastitis therapy.** However, the KBDD antibiotic sensitivity method was originally designed for human diagnosis and it has many drawbacks in that it takes too long, it is hard to set up and run correctly and its accuracy is suspect. "Many of the zones of inhibition of older classes of drugs were based upon serum levels in human patients and veterinary clinicians sometimes question the clinical relevancy of this data...Significant source of error in this test is the failure to standardize the bacterial inoculum."¹

In addition, the choice of an antibiotic treatment on the farm is based on many reasons, such as:

1. It has worked in the past or it is just on the shelf, close at hand.
2. It is readily available at a farm store or route truck.
3. Veterinarian recommendation.
4. Drug company sales representatives visit.
5. Antibiotic with the shortest withdrawal time

The results of antibiotic therapy can be unsatisfactory and frustrating. Treatment failures occur up to 25% to 40% of the time and money is wasted on extended treatment/withdrawal times, inappropriate mastitis tubes, not to mention the potential of culling the cow.

With so many influences and variables, a method such as the **MASTiK Antibiotic Susceptibility Test** can help improve mastitis management by giving the producer an accurate indication of which antibiotic has the best chance of curing intramammary infections. It will clearly show you which antibiotics will not work as well.

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The Lactating Cow Intelligent Therapy[™]- Treat Early, Treat Right

Not all mastitis cases should be treated with antibiotics. **MASTiK should be used in conjunction with bacterial cultures to determine what are the causative mastitis pathogens.** According to the AABP Guidelines for Therapy of Clinical Mastitis in Lactating Dairy Cows, “antibiotics are unlikely to be of benefit in clinical mastitis caused by gram-negative organisms. Thorough milkout with supportive therapy, possibly including anti-inflammatory drugs, should be the basis of treatment.”⁵ *Mycoplasma* is another bacterium that does not respond to antibiotic therapy. Similarly, chronic *Staph. aureus*, is also next to impossible to cure with antibiotics. It is helpful to know this prior to treating.

On the other hand, new cases of *Staph. aureus* and other gram-positive organisms can be successfully treated with antibiotics.

Using MASTiK at the Lab- Giving better service to producers.

The MASTiK Test is better than the KB Method when used at the lab:

<u>MASTiK Feature</u>	<u>MASTiK Benefit</u>
Milk Based Medium	Same environment as what you'll be treating in
Faster	At least 24 hours faster
Easier to run	No media to prepare or to go out of date
Specific MIC Levels	Indicates amount of antibiotic that can be administered

Using MASTiK on the Farm

If the choice has been made to treat with antibiotics, it is well documented that treating early increases the chances for successful cure rates. The MASTiK Test can be used on clinical and sub clinical cases of mastitis, whether it is at the vet lab, independent lab or tested on the farm. If used on the farm under the direction of the vet as part of the client/patient relationship, the MASTiK test could **dramatically decrease the time to results for antibiotic susceptibilities by at least two to five days and allow correct therapy sooner.**

Using the usual indicators of mastitis such as visual observance, DHIA records of elevated SCCs, the ImmuCell CMT test or other tools, a producer can isolate cows that are in need of therapy. MASTiK can then be run to determine an appropriate treatment while the milk sample is being cultured.

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Intelligent Mastitis Therapy- Culturing and MASTiK on the Farm

Some innovative producers are using the Bi or Tri Plates (available from The Laboratory of Udder Health, MN Vet. Diagnostic Lab, College of Vet Med., U. of MN, St. Paul 1-800-605-8787). The Bi Plate can help determine if the pathogen is a gram positive or gram negative organism. The Tri Plate has media on it for gram negative growth, gram positive growth and *Streptococcus* species. Using these plates and the manual provided by U. of MN is intended to be a relatively simple microbiological analysis to give better and faster information. It is not intended to replace a high quality diagnostic lab or identify all organisms that may be present. Proper aseptic sampling must be followed.

The MASTiK test can be used alongside the Bi or Tri plates. MASTiK is either started at the same time or a colony from the gram pos. portion of the plate is picked off and added to the MASTiK reagent and then run according to the directions.

This protocol allows even better mastitis management because if the pathogen is a gram negative, it is generally recognized that supportive therapy, rather than intramammary antibiotics, may be the best option. However, if the pathogen is a gram positive, then the MASTiK can give an indication of which antibiotics will have the best chance of success. Once again, it is intelligent mastitis management.

Intelligent Dry Cow Therapy

The Intelligent Dry Cow Therapy program addresses how the MASTiK and the CMT can be used to improve dry cow treatment and prevention programs. It is often noted that there are usually several different treatments on the shelf at a farm for lactating cows but only one treatment for dry cow therapy. In many cases, a cow going into her drying off period may have a sub clinical case of mastitis or may be recovering from a clinical case that may have required a specific treatment.

In addition, it is widely recognized that there is a huge advantage to having a cow cleared up from sub clinical or even clinical mastitis prior to calving. For example, once a cow carries a *Staph.* species infection through the dry period and into calving, the infection will rarely clear.

Why, then, would you use a “one size fits all” approach to dry cow treatment when this is obviously not the best way to go for all cows?

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Intelligent Dry Cow Therapy-How it works

Under this program, both the CMT and MASTiK tests can be used with a specific, rational and scientifically sound program. Here's how it works:

1. The herdsmen or veterinarian identifies certain mastitic cows either through DHIA reports or their own records. These animals may be subclinical cases or she may have had a bout of mastitis in her last lactation.
2. A CMT is then run on that cow to determine which quarter is mastitic.
3. Once the quarter is determined, a MASTiK is run to determine what is the preferred treatment.

This is only done on a small % of the entire herd. To run MASTiK on all cows would be prohibitive in terms of time and money. However, to do it on the cows you know need some help makes perfect sense. Its intelligent dry cow therapy.

References:

Dr. Ynte Schukken is the Program Director of the Quality Milk Promotion Services at Cornell University. QMPS is a program of the Department of Population Medicine and Diagnostic Services within the College of Veterinary Medicine at Cornell University, and is supported by New York State. As the largest organized program of its type in the world, QMPS extends an array of services to clients within New York State as well as to other states and other countries worldwide.

Dr. Ynte Schukken made a presentation to the National Mastitis Council Meeting in Feb 2001, entitled "Factors Affecting the Success of Antibiotic Treatment at Dry Off". In it, he stated that "Because antibiotic treatment in farm animals is currently under greater scrutiny than ever before, and essentially dry cow treatment is the only blanket use of antibiotics in the dairy industry, it is of value to consider the opportunities for a somewhat selective and more rational use of a dry cow antibiotic treatment."

Dr. Schukken goes on to state that a number of cow, bacteria and herd factors are associated with the likelihood of cure during the dry off period. Specific to susceptibility testing and support for a test like MASTiK, he further states that "There is some value in matching the in vitro antibiotic susceptibility to the choice of antibiotics for in vivo treatment. This is especially the case for *S. aureus* isolates that produce B-Lactamase." He concludes "it may be possible to more precisely allocate treatment to cows that are expected to cure" by using tools such as antibiotic susceptibility testing at dry off.⁵

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Summary:

Choosing the right mastitis therapy has always been difficult. Now there are more tools to assist the dairy veterinarian and producer that can significantly improve the chances of successful mastitis treatment. The MASTiK and CMT tests from ImmuCell are being used successfully to identify and treat mastitis, drive down bulk tank SCC levels and improve productivity. Used in conjunction with your vet and supportive care, these tools can be profitable additions to any dairy operation, large or small.

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5. American Association of Bovine Practitioners, Guidelines for Therapy of Clinical Mastitis in Lactating Dairy Cows, from Web site, May 10,2002
6. Ynte Schukken, Linda Titovsky, David Wilson, and Olav Osteras, "Factors Affecting the Success of Antibiotic Treatment at Dry Off", Cornell University, Ithaca, NY, TINE Dairies Association, As, Norway, National Mastitis Council Annual Meeting Proceedings, Feb, 11-14, 2001, P.80
7. Minnesota Easy Culture System II, Laboratory for Udder Health, Minnesota Veterinary Diagnostic laboratory, College of Veterinary Medicine, University of Minnesota, St. Paul, MN 55108, 1-800-605-8787 or 612-625-8787, e-mail: mastlab@tc.umn.edu

MASTiK Antibiotic Susceptibility Test

Treat Early, Treat Right

Uses of the MASTiK[®] Antibiotic Susceptibility Test

At the Lab

- Simple set up and pre incubation allows samples to be started in the afternoon and then pipetted into the MASTiK plate for 2nd incubation overnight for reading in the morning.
- Simpler, faster and more accurate than Kirby Bauer method

At the Lab or On the Farm

Clinical Mastitis

1. Cows with 1st case of clinical mastitis

- When you don't know what pathogen is the infection.
- Take an aseptic sample, split and freeze half.
- Run other half of the split sample on MASTiK and treatment can start the next morning while waiting for culture results to come back from the lab.

2. Chronic mastitic cows or treatment failures

- Run a MASTiK test on a cow that had treatment administered without a susceptibility test. MASTiK can help determine which alternative treatment should be given, if necessary. Sample should also be sent to the lab for culturing.

Sub Clinical Mastitis Cases

3. High SCC Cows or cows with clinical infection

- High SCC, determined through DHIA or CMT.
- Decreased production or increased conductivity.

→ Run MASTiK, send sample for culture and treat accordingly.

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4. First Calf Heifers

- Studies indicate that a high % of first calf heifers freshen with mastitis
- Run a CMT (Post colostrum) and then isolate relatively high quarters
- Aseptically collect a milk sample from that quarter.
- Run MASTiK and determine course of treatment. Send split sample out to be cultured.
- Get heifers off to a good start by treating early and treating right.

5. Drying off cows

- Cows that are determined to have a case of mastitis in the last lactation or
- High SCC cows as determined through CMT.
- Use MASTiK to determine what dry treatment to administer.

6. Purchasing cows or a whole herd

- Send all lactating cow samples for culture and biosecurity testing.
- Have SCC testing done either at lab or with CMT
- All high SCC cows that have gram-positive bacteria can have a MASTiK performed to see which treatment, if any, is appropriate.

Other Innovative ways to use MASTiK:

7. Using MASTiK in conjunction with Bi Or Tri-plates on Farm

- Veterinarian involvement recommended.
- Run Bi or Tri Plate to determine gram negative or gram positive pathogen
 - If Gram Positive, run MASTiK to get indication of antibiotic treatment that has best chance of working
 - If Gram negative, consider focussing on supportive therapy and consider avoiding intramammary treatment.
- Above protocol should be reviewed by your veterinarian.

