Mastitis continues to be a problem for dairymen across the US. Clinical mastitis causes economic loss due to treatment costs, lost quarters, perhaps dying cows and most importantly, discarded milk. Subclinical mastitis on the other hand, silently reduces milk production and quality until detected with a somatic cell count. It is easy to forget the basics in our attempts to solve a mastitis problem. The purpose of this article is to recap the basics as a reminder for mastitis prevention and problem solving.

The Infectious Agents

The infectious agents can be divided into two main groups – contagious and environmental. The contagious agents spread from cow to cow primarily during milking while the environmentals infect cows mostly from their growth locations in the bedding.

<table>
<thead>
<tr>
<th>Contagious Agents</th>
<th>Environmental Agents</th>
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</thead>
<tbody>
<tr>
<td>Strep ag</td>
<td>Strep uberis</td>
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<tr>
<td>Staph aureus</td>
<td>Strep dysgalactiae</td>
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<tr>
<td>Mycoplasmas</td>
<td>Coagulase-neg Staphs</td>
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<tr>
<td></td>
<td>Coliforms–E coli, Klebsiella</td>
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</table>

This grouping is very important as it directs our preventive efforts once the infectious agent is known.
through culture of the milk from clinical cases or high somatic cell count cows.

**Controlling the Amount of Mastitis in the Herd**

The amount of mastitis in the herd at any one time depends on the new infection rate and the duration of each infection. The new infection rate is the number of new cases of mastitis occurring over a particular time period. The new infection rate determines how fast the infected group of cows is increasing. The duration of infection is how long do the cases of mastitis last. The duration of infection determines the rate at which the infected group of cows is getting smaller.

Prevention of new infections or decreasing the new infection rate is always the most economical approach to mastitis. By controlling the new infection rate, the speed at which the infected group of cows grows is reduced. Once the cows are infected, the duration of infection is reduced by treatment with its associated costs or culling (new term – marketing).

**The Mammary Gland**

It is well worth remembering that the mammary gland or udder is made up of four independent glands that are only interconnected by the blood supply. Milk does not pass from one gland to the next. The entrance for bacteria into each gland is through the teat sphincter.

A layer of keratin inside the sphincter guards the udder from new infections. The keratin is sticky and bacteria that enter the sphincter are caught on the keratin. At each milking, part of the keratin with any bacteria stuck to it, is removed from the gland as the milk passes out. Teat injuries, teat surgery and infusions all remove the protective keratin and increase the risk of mastitis. Adequate levels of
vitamins A and E as well as selenium are needed to insure that the mammary gland immune system is functioning at its maximum capacity.

**Milking Technique**

In order to prevent new infections, bacteria must be kept away from the teat sphincter. The milking machine should be attached to clean, dry teats. Clean to reduce the number of bacteria at the teat end and dry to prevent movement of water and bacteria down toward the teat end during milking. It does not matter how the teats get clean and dry…sprinkler pen and drip-dry or spray hose and individual paper towels…it just needs to get done. The cleaning and drying of the teats plus entering the milking parlor should provide adequate stimulation for milk letdown via oxytocin release to insure that teats are full of milk when the milking machine is attached. Proper machine placement and adjustment will insure that there is no twisting of the teats during milking.

**Predipping**

Dipping or spraying clean teats prior to attachment of the milking machine will assist in preventing new infections particularly from environmental bacteria. The key is to apply the predip to clean teats, as it will not be effective when applied over manure. Once applied the predip requires about 30 seconds to interact with any bacteria that might be present. After this period of time, the predip should be wiped off the teats using single use towels.

**Postdipping**

Thoroughly covering the teats with a teat dip after milking is one of the most important steps in controlling new infections from contagious bacteria. The entire teat up to the base of the udder should be covered for maximum protection. Dipping or spraying can be effective. The key is routine coverage.

**Sphincter Closure**

During milking, the teat end sphincter is opening and closing about 60 times per minute. At the end of milking, the muscles in the sphincter are fatigued leaving the sphincter open for a period of time. Until the sphincter recovers and closes tightly (30-45 minutes), the mammary gland is at high risk for new infections if the teat end is placed on bedding or in manure. By providing fresh feed after milking, the cows will remain standing to eat while the sphincter closes thus reducing the risk of infection.

**Environmental Infections in the Housing Areas**

Clean, dry and comfortable. Wouldn’t you like to have a quarter for every time you have heard these three words in relationship to preventing new environmental infections. The non-ag Streps, non-aureus Staphs and the coliforms live in the bedding whether it is in a free stall or a corral. When the
bedding become heavily contaminated with manure and urine, the environmental new infection rate increases. When the free stalls are uncomfortable and the cows lay in the alleys, the environmental new infection rate increases. When the corrals become muddy and filled with runoff water, the environmental new infection rate increases. Clean, dry and comfortable.

**High Risk Times for Environmental Infections**

The risk for new environmental infections is highest just after dryoff and just before freshening due to changes within the mammary gland and reduced immune function. When increased numbers of environmental infections are occurring, check the housing areas for dry cows and close-up cows.

**Controlling Duration of Infection**

Dry cow antibiotic treatment is the most effective therapeutic means of controlling the duration of mastitis infections. All cows should be treated in all quarters at the end of each lactation with a commercially available, sterile, single-use tube of antibiotic. Even in herds that routinely have very low bulk tank somatic cell count, it is economically beneficial to continue total cow treatment. Dry cow antibiotic therapy cures a high percentage of existing infections and prevents new infections for about 2 weeks. Partial insertion is recommended. Marketing chronically infected cows also affects duration.

**Vaccinations**

Vaccines exist for Staph and coliform (gram-negative) bacteria. Manufactures’ recommendations should be carefully followed to gain maximum effect. It is well to remember that these vaccines do not prevent new infections. However, they will reduce the severity of infections. These vaccines are additions to a mastitis control program and should not substitute for other basic control measures.

**Treatment Protocols**

Each dairy should have written, standardized treatment protocols for mastitis and other diseases. Your veterinarian can help you develop protocols. Only a few people on each dairy should be allowed to administer antibiotic treatments and they should carefully follow the treatment protocols.
The treatment protocols should describe the conditions to be treated, the drug to use, its dosage and route of administration, and the milk and meat withdrawal periods. Only commercially available, single-use infusion tubes should be used. A written record should be kept for each cow treated to avoid violative residues and to allow for evaluation of treatment outcomes. All treated cows should be clearly identified. Consult your veterinarian if you are using antibiotics in any manner than that written on the label.

Monitoring

Monitoring is necessary in order to know the mastitis status of the dairy herd. Monitoring of the bulk tank somatic cell count and culture of clinical cases of mastitis allowing early detection of potential herd problems. Days in milk at the initial time of somatic cell count elevation may pinpoint the location for corrective action. Individual cow somatic cell counts or on-farm, electrical conductive readings permit identification of infected cows. Milk culture of fresh cows, clinical cases and high somatic cell count cows will identify the infectious agents involved. Identification of the infectious agents provides a focal point for preventive actions. This is the primary use of milk cultures.

**Monitoring:**

- Somatic cell counts–cow and bulk tank
- Milk culture–fresh cows, clinicals, high SCC cows
- Bulk tank culture
- Treatments

Treatments outcomes for various types of mastitis (abnormal milk alone; abnormal milk with sick animal) should also be monitored to assess the efficacy of each antibiotic. Shifts in antibiotic sensitivity patterns may suggest the need to change antibiotics.

When less common mastitis pathogens such as Serratia, Pseudomonas, Prototheca and Nocardia are detected, the herd veterinarian should be consulted for specific advise on treatment and control.

**Biosecurity**

All newly arrived heifers and cows entering the milking herd can be source of new infectious agents.
particularly the contagious ones – Strep ag, Staph aureus and Mycoplasma. In a recent farm study, we found over 10% of the purchased heifers were positive for Staph aureus. New animals should be cultured as soon as possible after they enter the milking herd. When possible they should be milk last or with separate equipment until their mastitis status is known.

Summary

While mastitis remains a complex disease, applying the basics of mastitis prevention and control will minimize its deleterious effects on a dairy herd. Herds with bulk tank somatic cell counts above 300,000 cells/ml or new infection rates above 1-2%/month should re-evaluate their mastitis prevention programs. Straying too far away from the basics will often result in a herd mastitis problem.