



Western Dairy News

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Staphylococcus aureus Treatment Options

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Staphylococcus bacteria can cause both clinical and non-clinical mastitis. The most significant mastitis pathogen in this group is Staph aureus. While these bacteria can be found on various body sites, the most common source is the infected mammary gland. From this site, these bacteria spread primarily by transmission from the infected cow to susceptible cows during the milk process. The route of entry into the mammary gland is the teat duct. Bacteria may be carried from cow to cow by the milking machine, the milkers' hand, and rags or sponges and survive from one milking to the next on these locations. Relief milkers have been known to carry the infection from one dairy to another. Because bacteria are secreted in the colostrum and milk, they can also be passed from infected cows to milk-fed calves. Staph aureus can be found on the teat skin and enters the mammary gland following injury to the teats. Flies have also been shown to mechanically transmit the bacteria onto the teats particularly in pre-partum heifers. However, the main source of Staph aureus remains infected cows. Thus, good milking techniques and post-milking teat dipping coupled with an effective biosecurity plan remain the primary preventive strategies.

Of all the antibiotic sensitive bacteria, Staph aureus may be the most difficult to clear from the mammary gland. The success of Staph aureus treatment depends on the following factors:

1. Choice of antibiotic drug
2. Susceptibility of the bacteria to the drug
3. Duration of treatment and number of treatments
4. Time of treatment during the lactation cycle
5. Duration of the infection
6. The number of quarters infected
7. Immune status of the cow being treated

The choice of drug to use for treatment can be tailored to the specific Staph aureus on the dairy by using milk culture and antibiotic sensitivity/resistance testing. This should be done in a milk quality laboratory that routinely works with bovine milk samples rather than a laboratory that commonly tests human samples. Bacterial isolates can be obtained from bulk tank milk or cow samples both from clinical cases or high SCC cows. Once isolated in pure culture, the isolates can be tested for sensitivity to the commonly used mastitis drugs. Milk samples for culture can be frozen prior to delivery to the laboratory without significant negative results. It is usually recommended that at least 10 samples be tested to select the most appropriate antibiotic. Routinely saving milk samples from all treated cows is an excellent means of obtaining sufficient samples to test for antibiotic sensitivity/resistance.

The ideal time for treatment of Staph aureus in milking cows is at dry off. The cure rate at this time for most of the available intramammary drugs is between 40-70%. As recommended by the NMC, all quarters in all cows should be treated at dry off using partial insertion of the treatment cannula. Only commercially available, single use, sterile products should be used. The cure rate for dairies will be satisfactory in most herds. Good hygiene should be practiced when treating quarters to be dried off in order to avoid infusion of other pathogens like mycoplasma.

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Milking Procedures on U.S. Dairy Operations

NAHMS Dairy 2002 Study

The National Animal Health Monitoring System's (NAHMS) Dairy 2002 study surveyed dairy operations in 21 States*. These States represented 82.8 percent of U.S. dairy operations and 85.5 percent of U.S. dairy cows. Results of the Dairy 2002 study suggest that continued education regarding how to improve milking procedures could help reduce the incidence of mastitis on U.S. dairies. The complete report of this study may be found on the web at http://www.aphis.usda.gov/vs/ceah/cahm/Dairy_Cattle/dairy.htm.

Mastitis Pathogens and Their Control

Contagious mastitis pathogens such as *Staphylococcus aureus*, *Streptococcus agalactiae* and *Mycoplasma* spp. can be transferred from cow to cow during milking. Milking procedures known to reduce the spread of contagious pathogens include the use of gloves by milkers, predipping and postdipping with a proven germicidal teat dip, drying teats with single-service paper towels or cloths, and disinfection of milking units after each cow with a backflush system. Environmental pathogens that cause mastitis, such as coliforms and environmental streptococci, can be transferred during and immediately after milking while the teat canal is still open and, therefore, susceptible to bacterial invasion. These environmental pathogens also are commonly acquired during the dry period. The use of gloves, premilking disinfection of teats with teat dips, and the use of single-service paper towels or cloths are recommended milking procedures to reduce new environmental infections

Use of Gloves by Milkers

Milkers can transfer mastitis-causing pathogens from their hands to the teats of non-infected cows. To help prevent pathogen transfer, it is recommended that milkers wear latex or nitrile gloves during milking. These gloves should be cleaned regularly. Only 32.9 percent of operations represented by the Dairy 2002 study reported that milkers wore gloves to milk all cows.

Forestripping

Removing a small amount of milk from the udder prior to milking (forestripping) helps identify new intramammary infections and improve milk quality. By forestripping, abnormal milk can be identified before a cow is milked and before the milk is put into the bulk tank. Ideally, forestripping should be done on clean teats prior to predip removal. Overall, 86.9 percent of operations forestripped all or some cows prior to milking, while 13.1 percent did not forestrip any cows before milking.

Waterless Teat Preparation

Proper teat preparation prior to milking is crucial for preventing new intramammary infections. Pre-milking teat preparation not only reduces environmental bacteria on the teat surface but also reduces bacteria counts in milk. Established protocols recommend covering most of the teat surface with an approved and proven disinfectant (predip). This method of teat preparation decreases intramammary infections and is more effective in reducing bacterial counts in milk when compared to either water and/or wet towels or no teat preparation at all. Overall, 65.0 percent of dairy operations used a waterless teat preparation method (WTPM) in both summer and winter. Operations in this category include those that predipped teats prior to milking and those that performed no premilking teat preparation. The percentage of operations that used a WTPM did not vary significantly between summer (66.4 percent of operations) and winter (66.6 percent of operations). Small (less than 100 head) and medium (100 to 499 head) operations were more likely to use a WTPM (64.2 and 71.9 percent, respectively) than large (500 or more head) operations (39.6 percent).

There are many groups of teat disinfectant compounds approved for use on U.S. dairies. The National Mastitis Council publishes annually a table that lists all peer reviewed studies on teat disinfectants, by compound and by the study results. This information helps establish recommendations for specific products proven effective on dairy operations. Of all operations that reported using a WTPM, 64.5 percent used a predip containing iodophor as a premilking teat disinfectant in both summer and winter. Compounds containing chlorhexidine were used as a predip on 9.5 percent of operations. Overall, 8.2 percent of operations using a WTPM did not use a predip, suggesting that no premilking teat preparation was performed on these operations prior to milking.

****States/Regions***

West: California, Colorado, Idaho, New Mexico, Texas, Washington

Midwest: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin

Northeast: New York, Pennsylvania, Vermont

Southeast: Florida, Kentucky, Tennessee, Virginia

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(Treatment, continued from page 1)

Using current label dose schedules for lactating cows will result in lower cure rates for Staph aureus than are achieved by dry cow therapy. These label dose schedules usually recommend treatments for 2-3 days and often result in cure rates of less than 40%. Extended treatment periods (6-8 days) beyond the recommend dose schedules may be required to achieve satisfactory cure rates of greater than 40-50%. These extended treatments will be extra-label and results in significant milk discard. However, in some extended treatment studies the cure rate has been double that following the recommended treatment schedules. With repeated entry through the teat duct, it is absolutely necessary to practice exceptional care to prevent entry of unwanted additional pathogens into the udder.

The use of systemic antibiotic therapy along with intramammary treatment may also help to increase the cure rates in lactating cows. In some studies, the combined use has increased the cure rates from 20-25% to about 50%. Similar results have been shown but to a less degree of success when injectable antibiotics have been used at dry off with intramammary therapy. The choice of antibiotics to use should be based on sensitivity testing.

The immune status of the cow is also an important factor. Some recent studies have shown that boosting the cow's immunity by adding vaccination along with antibiotic therapy can result in higher cure rates than with therapy alone. These studies used a trivalent capsular vaccine that was not commercially available. In one of these studies, two doses of vaccine were given prior to an extended course of antibiotic therapy for 6 daily antibiotic treatments. In this study, over 75% of the quarters were cured in vaccinated cows compared to those receiving antibiotics alone. In another study giving the vaccine and therapy at the same time was equally as successful. Keep in contact with your herd veterinarian about the availability of these vaccines.

Other studies have reported on pre-partum treatment of heifers with both dry cow and lactating cow intramammary therapy. This may be an option for dairies that are striving to be free of Staph aureus but purchasing bred heifers from herds of unknown mastitis status. In small field trials on several dairies, we have seen very high cure rates of heifers (>75%) using lactating intramammary antibiotics at about 14 days prior to anticipated freshening. With this strategy, it is important to withhold the milk from these treated heifers for 3-5 days after calving. This strategy may also be beneficial in areas where heifers suffer from excessive numbers of fly strikes. Great care must be taken when using pre-partum intramammary therapy to prevent the introduction of other mastitis pathogens into the mammary gland. The heifers must be completely restrained, teat ends cleaned and sanitized and partial insertion should be used.

Chronic Staph aureus infections that have become established deep within the mammary gland and reside in locations sheltered by blocked secretory ducts are almost impossible to cure. Cows with multiple quarter infections are also very difficult to cure on a cow basis and should be given strong consideration for culling. For this reason, early detection and treatment of Staph aureus infections is imperative. The use of CMT early in lactation may aid in the detection of infected quarters and more effective treatments. This is particularly true for first lactation heifers.

In cows of exceptional value with chronic, non-responsive Staph aureus infections, permanently drying off the affected quarter is a final option. This obviously should not be the first choice for infected quarters; however, it is an option. Infected quarters can be infused with iodine solutions to completely stop lactation. The use of chlorhexidine for this purpose is currently prohibited.

The keys to successful treatment of Staph aureus mastitis are to detect cases early in lactation and treat aggressively. With the assistance of your herd veterinarian, extra label treatments combined with systemic therapy and vaccination may be a viable option for your herd. On some dairies, pre-partum treatment of heifers in the close-up pens may also be used. Cows with multiple quarter infections, cows with consistently elevated SCC or those that have had several episodes of clinical mastitis should be marketed without additional attempts at therapy.

Staph aureus mastitis infections reduce milk quality; decrease milk production; require prolonged and repeated treatment; increase discard milk following therapy and result in excessive culling. Treatment of Staph aureus infection always seems to be less satisfactory than desired. Therefore, prevention of these difficult infections should be the primary aim of a control program. The backbone of the control program should be biosecurity to prevent entry of infected heifers and cows into the herd; good milking hygiene with attention to adequate post-milking teat dipping to prevent milking time spread, and complete dry cow antibiotic therapy at the end of lactation. Therapy is often necessary, but should not be the primary strategy for control of Staph aureus infections. Consult with your dairy veterinarian to develop a prevention and control program supported by prudent antibiotic therapy.

Ref: Sears PM and McCarthy KK. Management and treatment of staphylococcus mastitis. *Vet Clin Food Anim* 19:171-185, 2003.

(*Milking Procedures, continued from page 2*)

Teat Wash Method

Overall, 31.8 percent of operations used a teat wash method with water in both summer and winter to clean cow udders and teats prior to milking. Large operations (58.1 percent) were more likely to use a teat wash method than small operations (32.8 percent) and medium operations (24.2 percent). The West region had the highest percentage (54.2 percent) of operations using a teat wash method with water in both summer and winter. The Northeast region had the lowest percentage (16.6 percent) of operations using a teat wash method with water.

Teat wash methods of teat preparation include wash pens, hose in the parlor, and single- or multiple-use wet cloth or paper towel. For large operations that used a teat wash method, wash pen was the most common teat wash method (91.5 percent of operations). On medium operations, hose in the parlor or single-use wet paper towel or cloth were the most common teat washing methods used. Single-use wet cloth or paper towel were the most common teat wash methods on small operations. Single-use wet cloth or paper towel was the most common wash method used in all regions, except the West, where wash pens were used most commonly (74.2 percent of operations). Use of a hose in the parlor was more common in the West and Southeast regions (48.1 and 41.0 percent of operations, respectively) compared to the other regions.

Drying Method

To decrease the spread of bacteria from one cow to another, single-use cloths or paper towels are recommended for drying teats of individual cows. In both seasons, single-use paper towel was the drying method reported most frequently (47.3 percent of operations) on operations that used a teat wash method.

Air drying was the next most common drying method (26.6 percent of operations) followed by single-use cloths or multiple-use cloths (Figure 3). The method of teat drying did not vary significantly between summer and winter. The Dairy 2002 study questionnaire did not address how operations routinely removed predrips.

Removal of Milking Machines

Removing milking machines from teats is done either manually or mechanically. Manual removal can lead to over milking, which can cause teat-end damage and decreased resistance to pathogen invasion. Although automatic takeoffs, or automatic cluster removers (ACRs), can also lead to over milking if not properly set and maintained, the probability of over milking is reduced. More than 9 out of 10 (93.3 percent) large operations used automatic takeoffs, compared to 71.0 percent of medium operations and 21.3 percent of small operations. This coincides with results showing that large farms more commonly have parlor facilities equipped with automatic takeoffs compared to smaller stanchion operations. The West region had the highest percentage of operations (78.7 percent) that used automatic takeoffs compared to 36.0 percent of all operations.

Postmilking Teat Disinfection

Postmilking teat disinfection kills bacteria transferred to the teat by milkers or milking equipment. Postmilking teat disinfection is targeted at decreasing transfer of contagious mastitis pathogens. Compounds containing iodophor, followed by compounds with chlorhexidine, were the most common postmilking teat disinfectants used. The percentage of operations using postdip compounds did not vary by season. Only 5.5 percent of operations did not use any postmilking teat disinfectant in both seasons.

Backflush Systems

Milking units that incorporate backflush systems are designed to remove pathogens from milking units immediately after each cow is milked. Backflush systems are used to prevent contagious pathogens from spreading from cow to cow via milking equipment. Backflush systems were used on 6.7 percent of all operations. Nearly 1 in 5 (20.7 percent) of large operations used the system, while smaller operations used it less frequently (9.8 percent of medium operations and 4.9 percent of small operations). The West region had the highest percentage of operations (22.3 percent) using a backflush system.

Milking Frequency

Milking frequency affects milk production and udder health. Increasing milking frequency from twice daily to three times daily improves production by 10 to 18 percent. Increasing frequency from three to four times daily boosts milk production another 8 to 12 percent.

Udder health, as measured by somatic cell counts, improves as the milking frequency is increased to four times daily. This is most likely because the streak canals, where mastitis pathogens first colonize the udder, are flushed-out more frequently. Overall, 93.6 percent of operations (representing 78.6 percent of cows) milked twice daily, while 5.8 percent of operations (representing 21.2 percent of cows) milked three times a day. Milking frequency increased as herd size increased. Only a small percentage of operations milked less than twice daily or more than three times daily.

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