

An Update on *Staphylococcus aureus* Mastitis

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Staphylococcus aureus (*S. aureus*) is often considered the most common cause of contagious mastitis in US dairy herds. There are estimates that 80-100% of all herds have at least some *S. aureus* mastitis, with from 5 to 10% of cows infected. *Staphylococcus aureus* is also an important cause of mastitis in heifers, with wide variability in levels of infection among herds. Herds with excellent milking hygiene practices and management have lower levels of *S. aureus* intramammary infections (IMIs), as compared to those herds with poor hygiene or management.

S. aureus IMIs are usually diagnosed by specific techniques in a microbiology laboratory. They are gram-positive cocci, which are catalase and coagulase positive. The numbers of *S. aureus* bacteria found in the milk of an infected cow often shows cyclic variation. Bacterial numbers in milk may be high for a while, followed by an intervening period with much lower to non-detectable numbers of bacteria. A negative result or very low numbers of *S. aureus* might be found in an infected cow when milk samples are collected during the period when the numbers of bacteria are at their lowest (or nondetectable) levels. A single negative result is not proof that a cow is uninfected with *S. aureus*. A more accurate determination of a cow's infection status could be obtained by testing 2 or 3 milk samples collected on different days. Because of the cyclic numbers of *S. aureus* in milk of individual cows, the accuracy of bulk tank milk sample cultures can vary considerably.

Staphylococcus aureus IMIs are difficult to eliminate. Average cure rates have been reported to be only about 50% (17-95% range) for subclinical cases, approximately 55% (26-92% range) for clinical cases, and around 60% (14-100% range) for dry-cow therapy. Several different strategies have been introduced to improve the therapy success rate. They include 1) using extended antibiotic therapy protocols, 2) vaccinating animals, and 3) combining extended antibiotic therapy with vaccination. Pirlimycin is the antibiotic most often advocated for use in these strategies. Use of antibiotics in the US must be according to Food & Drug Administration regulations, and appropriate withholding times for meat and milk must be observed.

Extended therapy protocols that have been investigated have involved multiple infusions of pirlimycin per quarter. The extended therapy approach appears to work because of the extended period of effective antibiotic levels in the mammary gland. In one study, the product was used according to label (2 treatments at 24 hour intervals, followed by a 36-hour milk withholding period) for 3 consecutive series of treatments. Cure rates from extended therapy with pirlimycin reportedly exceeded 60%, compared to 49% with the label use of 2 infusions at 24 hour intervals. In studies in the European Union, extended therapy trials have been conducted with as many as 8 infusions of

pirlimycin on consecutive days (this would be extra-label use in the US). In those studies, treatment success improved with increasing number of infusions.

Another strategy to increase treatment success in *S. aureus* mastitis is to combine systemic with intramammary therapy. In one study, the cure rate was only 25% when udder infusions of amoxicillin were administered for 6 milkings. Cows in another group that received both the udder infusions plus systemic procaine penicillin G for 3 days had a cure rate of 51%. This cure rate, however, is still lower than desired.

Vaccination has been employed as an adjunct to therapy as well as a preventative measure for *S. aureus* mastitis. Several vaccine products have been evaluated for protection against *S. aureus* mastitis. Results are variable, but some studies have demonstrated decreased new infections or increased cure rates in both cows and heifers. One study with heifers vaccinated at 6 months of age, 14 days later and then at 6 month intervals showed a 43% decrease in quarters exhibiting chronic IMI during pregnancy, a 45% decrease in new IMIs during pregnancy, and a 45% decrease in new IMIs at freshening. In other studies with cows, extended therapy with pirlimycin has been compared with vaccination alone or in combination with extended therapy. The studies have shown that extended therapy plus vaccination generally produce results that are better than either extended therapy or vaccination alone. Additional research is continuing to increase the success rate with *S. aureus* vaccines.

Principles of control of *S. aureus* should be focused on three areas: 1) preventing new infections; 2) elimination of existing infections; and 3) monitoring progress after implementation. The single most important step in preventing new infections is to dip every quarter of every cow after every milking with an effective teat dip. Dry cow treatment is an essential step in eliminating existing infections, and is also a step which can reduce new infections by 50-75%. Guidelines for monitoring quality milk goals for contagious and subclinical mastitis are available from veterinarians and milk quality specialists.

The level of mastitis caused by *S. aureus* can be minimized in dairy herds when producers follow practices shown to be effective. Consultation with your herd veterinarian, extension specialist, and/or milk handler/plant fieldman about this topic can result in less mastitis in your herd and more profit from your dairy business.

(Discussion of a particular protocol does not constitute recommendation of use. Consult with appropriate individuals prior to initiating any treatment or prevention change. All appropriate regulations of the US Food & Drug Administration for proper drug use in dairy cattle must be observed.)