



River Valley Veterinary Clinic

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Dry Cow Mastitis Prevention

At a price of \$200 per cow per year, mastitis is the most costly infectious disease among dairy herds. Control strategies, good case identification and treatment protocols like those discussed last month have greatly reduced the prevalence of contagious pathogens during lactation. But it is easy to forget how critical the dry period is in treating chronic infections and preventing new ones. Depending on the herd, up to 26% of cow quarters develop an intramammary infection during the dry period. The dry period is the origin of over 50% of clinical coliform mastitis cases in the first 100 days in milk.

A dry quarter has three main defenses against infection, and they provide excellent resistance to infection under the correct circumstances. The first defense is the protein lactoferrin, which is secreted by the mammary cells and is part of the cow's immune system. With less milk secreted during the dry period, there is a higher concentration of lactoferrin present in the milk. Lactoferrin inhibits bacterial growth by attaching to iron molecules and keeping them away from bacteria, which require them to survive. The second defense is the immune cells circulating in the mammary tissue and milk. As with lactoferrin, the cells are also at a higher concentration due to less milk in the gland. They also work better because there are less milk fat and casein proteins to get in their way as happens with more milk present. Finally, the keratin plug that forms in the teat canal provides a physical defense against new bacteria working their way into the gland. Also, the fatty acid molecules that make up the keratin plug inhibit bacterial growth.

Despite these great defenses, the mammary gland is still at risk, especially at the beginning and end of the dry period. If half of all new environmental mastitis cases happen during the dry period, the majority of the infections will be acquired at the beginning or end. At the start of the dry period, the mammary tissue undergoes involution, where the milk producing cells in the udder stop producing milk and die, returning the gland to a non-lactating state. This makes way for new milk producing cells to grow and prepare for the next lactation.

During the involution period, bacteria that work their way into the gland are not being flushed out with regular milkings and fore-stripping. The leftover milk dilutes immune cells and lactoferrin, making it easier for pathogens to overwhelm them and instigate an infection. Also, the teat isn't being dipped regularly, so any gross contamination of the teat end remains and increases the likelihood of infection. The keratin plug does form during this time, but it isn't immediate, which gives bacteria plenty of time to enter through the teat canal.

Colostrogenesis, when colostrum is made at the end of the dry period, is the other high risk period for infection. As milk collects in the gland, immune cells and lactoferrin are once again diluted and inhibited by the new milk, milk fat and casein. Also, the keratin plug may break down early, allowing bacteria entry. When a cow is this close to calving, her whole immune system is under an enormous amount of stress, making her much more susceptible to infection.

While a cow is most likely to become infected during these two high risk periods, there are also risk factors at the herd, cow and quarter levels that increase her chances of an intramammary infection.

Risk factors for infection at the herd level are much the same as those during lactation, including the bulk tank SCC and the prevalence of intramammary infections. Management practices such as sanitation, bedding management, heat stress, crowding and other herd-wide stressors have a deep impact on the cows' abilities to fight infections. Often dry cows are housed in older facilities where good management is more difficult to maintain.

For the individual cow, those with a higher risk of dry period intramammary infections are the higher lactation cows and those with high milk production at dry off. The method of drying off cows can also impact their chances of a dry period infection, but there is so little good research into the best method of drying off cows that each farm must decide what works best for them.

Focusing on the quarter, the keratin plug needs to form correctly in order to block pathogens. But it forms very slowly! Formation is especially delayed with high milk production at dry off. After being dry for 7 days, 50% of teats are still open with no plug, and by 42 days dry 23% of teats don't have a plug. That's one teat on every cow or one out of four cows with every teat wide open and inviting bacteria in halfway through the dry period! Which brings up dirty teats: bacteria growing on a wet and dirty teat end, especially if the keratin plug didn't form, can easily overwhelm the immune system in the udder.

Teat end cleanliness can be monitored with the simple Udder Hygiene Scoring System. Udders are scored on a scale from 1 to 4 with clean udders being a 1 or 2 and dirty udders a 3 or 4. Scoring can be easily done by management during milking in the parlor where udders are on display or by quickly walking up and down the aisle of a tie-stall or stanchion barn. Research on the system found that cows with a score of 3 or 4 are associated with a higher SCC and risk of intramammary

infections. The benchmark for udder cleanliness is to have <15% of cows with a score of 3 or 4.

With the risk periods and factors of dry cow intramammary infections identified, how can they be prevented? While good management is critical in preventing most infections by reducing the amount of pathogens in the environment with clean and dry bedding, the focus of the remainder of this article will be on maximizing the cow's defense against infection. The first line of defense when a cow enters the dry period comes from Dry Cow Therapy (DCT), which eliminates 80% of all existing infections and prevents up to 80% of new infections in the dry period.

There are two strategies for using DCT, the first being Blanket DCT, where all quarters of all cows are treated at dry off, regardless of infection or not. In Wisconsin, 92% of producers use this method. All available DCT products were compared in a few research studies and were found to be better than no treatment at all. There was also no difference in efficacy between the products in udder health at calving through 100 days in milk. So the product of your choice can be based on cost, availability or your favorite color!

The other method of DCT is Selective DCT, where only the quarters or cows with active infections at dry off are treated. Selective DCT is often used on farms with a low rate of contagious mastitis infections in the herd. Currently, the biggest challenge with this method is determining what easy or cow-side test can be used to determine who needs treatment. Culturing every quarter would be wonderful, but isn't practical for most herds. Stay tuned, maybe research will find an answer soon! The benefit of selective therapy is that when used with an internal teat sealant, it results in the same udder health as blanket treatments, but with 21% less use of antibiotics. The one exception to any of the DCT products or methods is with *Staph aureus* infections. Even with DCT, the rate of curing chronic infections over the dry period remains frustratingly low, even when combined with systemic antibiotics. But we'll save that topic for another day.

The second line of defense during the dry period is through a teat sealant. The sealant creates a physical barrier to prevent bacterial invasion, like the keratin plug. External sealants aren't

reliable and fall off the teat after about five days even with good teat preparation and sealant application. In order to maintain the seal, it needs to be reapplied, often a few times during the dry period. The better option is an internal sealant, such as Orbeseal, which is the only available option in the US. The sealant is an inert paste that is infused into the teat at dry-off and creates an artificial keratin plug that prevents any bacteria from entering. When inserted correctly, the sealant should only go into the teat and not be squirted all the way into the mammary tissue like a DCT tube. Prior to the first milking post-calving, it is stripped out easily with no risk of residues since there is no antibiotic in the sealant. If the calf suckles first, it is safe to be ingested. Internal teat sealants prevent new infections much better than no sealant or DCT alone. A DCT and sealant combined reduce the risk of new infections by 30% and reduce the clinical mastitis rate during the first 60 days in milk by 33%. If a selective DCT program is being used, a teat sealant is absolutely necessary for success.

Boosting a cow's immunity going into the dry period is her third main defense against infection. A good transition cow diet will provide the immune system everything it needs to fight infection as well as reducing transition and fresh cow metabolic diseases. Reducing stress in a cow's environment goes a long way for her immune system; she is on a two month vacation after all! Low stress environments focus on cow comfort, good ventilation, reducing overcrowding and good heat abatement. All of which benefit the cow regardless of where she is in her lactation. Finally, if a farm has a problem with coliform mastitis infections, a specific vaccine against gram negative core antigens might be useful. While it won't prevent coliform mastitis, it will reduce the severity of infection and death loss. However, vaccination won't correct for poor nutrition or management so a conversation with your veterinarian will determine what is best for the farm.

While a cow is enjoying her well-deserved vacation, her immune system and human caretakers must work diligently to ensure her udder is healthy and ready to go when she begins her next lactation.