

VENTION AND TREATMENT OF MASTITIS
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Mastitis is defined as inflammation of the mammary gland. In dairy sheep this inflammation is most commonly caused by a bacterial infection that has entered the mammary gland through the teat canal. This paper will primarily focus on practical ways to prevent mastitis that is caused by bacteria because if it can be prevented, it does not need to be treated.

Why should you worry about mastitis?

Each farm will have to answer this based on their own goals but one obvious reason is that a farm does not want to have a valuable sheep die or be culled because of clinical mastitis. On many dairies, though, this is a very small percentage of the mastitis problem. The larger concern is subclinical mastitis and the decrease in production and quality of milk components that it causes. One study showed that comparing a healthy half-udder to an infected half-udder the milk production was 1.7 versus 0.79 pounds, the SCC was 311,000 versus 4,999,000 cells/mL and the amount of casein was 45.9 versus 40.5 mg/mL (Leitner et al., 2004). There are not good estimates on how common subclinical mastitis is for dairy sheep in the USA but worldwide the prevalence it is estimated to be between 5-30% (Contreras et al., 2007).

What signs will you see?

Although it seems obvious that you would be able to tell if a sheep has a bacterial infection in the udder the most common cause of mastitis in sheep is subclinical mastitis (Menzies et al., 2001). Subclinical mastitis means that there is nothing visually different about the milk and the only way that you will know there is a problem would be to obtain the somatic cell count (SCC) of the milk or estimate the SCC using an on farm technique such as a California Mastitis Test (CMT). Clinical mastitis does happen on sheep dairies but it is far less common on most dairies. The signs of clinical mastitis that you would see include abnormal appearance of the milk (clots, flakes, or discoloration), the udder (swelling, red or blue, or a change in temperature) or the sheep (fever, not eating, decreased milk production, or depressed).

What are the most common types of bacteria that cause mastitis?

Based on worldwide data (Bergonier et al., 2003) the most common bacteria isolated from sheep mastitis cases are *Staphylococci*. These *Staphylococci* are further divided into *Staph aureus* and coagulase negative *Staphylococcus* (CNS). *Staph aureus* can be a cause of both clinical mastitis as well as subclinical mastitis whereas CNS mainly present as subclinical mastitis (Gelasakis et al., 2015).

When do these bacteria enter the udder?

Although it seems obvious, these bacteria enter the udder at time points when the teat canal is open. During the lactating period the teat canal is open just prior to milking and for some period after milking as it closes. During the dry period, the teat canal is potentially open for a little while after the ewe is dried off and then may re-open just prior to lambing if the ewe leaks milk. Targeting these time points helps to focus your prevention efforts.

Where do these bacteria that cause mastitis come from?

To help simplify this, it may be helpful to think of three primary sources for the mastitis causing organisms: 1) Organisms living inside the udder of an infected sheep; 2) Organisms living on the skin of the teat, udder, or legs; 3) Organisms living in the environment of the sheep (Bergonier et al., 2003).

What are the most common pathogens for clinical and subclinical mastitis on your farm?

In order to determine if the worldwide data on common mastitis pathogens is applicable to your herd, you will need to perform individual milk cultures on infected ewes. Dr. Pamela Ruegg in the 2015 DSANA symposium proceedings outlines an excellent technique for obtaining samples to perform cultures on that I would refer you to (Ruegg, 2015). I would recommend that you take a sample of all clinical cases prior to any treatment. For subclinical cases you will need to first identify the sheep to culture. If you are doing monthly SCC testing then you can easily create a list of the high SCC sheep. There are various cut points of SCC levels to use to determine possible infection status in sheep but in the literature it has been suggested to consider ewes above the range of 200,000 to 400,000 cells/mL as infected (Ruegg, 2011). To further target your culture, you could perform a CMT on each half-udder of the high SCC sheep and only culture the half-udder that is positive on the CMT. This culture information will then give you an indication of the most common organisms causing clinical and subclinical mastitis on your dairy. Having this information will allow you to more specifically focus your mastitis control procedures.

How do I prevent contagious mastitis from spreading in my flock?

Perform post-milking teat disinfection on every teat at every milking. Since the source of the contagious mastitis is from the milk from an infected half-udder of another sheep the highest risk period is during milking. By applying a disinfection product to the teat after the milking event, you are attempting to destroy any potential pathogens that may have spread to an uninfected half-udder. These contagious organisms may have been transferred by the teat cup liners, milker's hands or some other fomite such as a towel that was used to wipe off teats.

Reduce the number of infected half udders that are putting uninfected sheep at risk. This can be accomplished in multiple ways. One recommendation is that in herds where contagious mastitis is a known problem then all ewes (or possibly selected high risk ewes) should be treated with an antibiotic at dry off (Petridis and Fthenakis, 2013). See the treatment section below for caution concerning antibiotic residues. It is also possible to identify ewes with contagious mastitis during lactation such as by culture and then cull or segregate these ewes so they do not put the rest of the flock at risk. I am not aware if there are flocks routinely doing this but it is commonly done with other species such as cows and goats. If the flock is doing monthly SCC testing it also may be possible to identify high risk ewes and potentially culture these ewes or just segregate them so there is less risk to uninfected ewes. Culling of these high risk ewes at the end of lactation should also be considered especially if there are other risk factors present such as poor udder conformation.

Reduce the risk of spread by fomites. All milkers should wear gloves during milking and these gloves should be rinsed and sanitized often throughout the milking. Towels (cloth or paper) that are used to wipe off teats should only be used on a single ewe prior to being laundered or disposed. Teat cup liners should be changed as recommended by the manufacturer to prevent excessive wear leading to cracks that could harbor organisms.

Reduce the risk of bringing in ewes with infected half-udders. Any purchased ewes should be cultured prior to being introduced to the milking flock to reduce the risk of bringing in contagious mastitis.

Consider the milking order of a flock. The early lactation younger ewes should ideally be milked first as they are the least likely to be infected on most dairies. If monthly SCC testing is being done then any ewe that has a repeated high SCC (greater than 200,000 to 400,000 cells/ml) should be milked toward the end of milking. It is also possible that the CMT could be performed on a monthly basis and any ewes that are repeated high on the CMT could be moved to a pen that is milked last.

Promote healthy teat skin. Some of these contagious mastitis pathogens can first colonize the teat skin so keeping this skin healthy will allow it to naturally resist colonization. Controlling the environmental conditions to minimize the amount of extreme cold, excessive moisture, and wind that teats are exposed to should help. Using a post-dip with a good emollient package and making sure that the entire teat is covered should also promote healthy teat skin.

How do I reduce the risk of mastitis causing pathogens found in the environment from gaining access to the teat canal?

I am using the word, “environment,” in this context to include mastitis causing bacteria that are found on the teat, skin, legs, wool, bedding, etc.

Reduce the amount of mastitis causing organisms at the teat end during milking. Since the teat canal is opened during milking it is critical that the teat end is clean prior to the teat cup liner being attached. Depending on the cleanliness of the teats prior to milking there may be a benefit to applying a pre-dip disinfection as part of the milking routine. This pre-dip should have at least 30 seconds of contact time and then be completely wiped off with an individual towel prior to unit attachment. Milkers should be trained to specifically focus on wiping the teat end as well as the barrel of the teat to ensure that both are completely cleaned before the teat cups are attached. If cloth towels are used they should be washed with detergent and dried prior to being re-used.

Reduce the amount of mastitis causing organisms that teats are exposed to outside the milking center. Keeping the housing area of the ewes as clean and dry as possible at all times will reduce the pathogen load that the teats are exposed to. This also helps to reduce the work load of the milkers that have to clean the teats at the next milking. Controlling the stocking density of each pen will also help to maintain a clean and dry environment.

Reduce the risk of teat damage caused by the milking equipment. Setting the milking system up with the appropriate vacuum levels and pulsation parameters is essential to properly milk the ewes. These settings along with proper teat cup liner alignment will reduce the risk of liner slips during milking which can potentially create teat end impacts depending on the specific milking equipment used. Having a properly timed and consistent milking routine and removing units as soon as milking is finished will also help reduce the risk of teat damage caused by excessive overmilking.

Keep the milking center and milking units clean. If the milking units and milking floor are excessively dirty it can increase the risk that teats will be exposed to a larger pathogen load. The mouthpiece lip of the liner is one critical area to keep clean as this can expose the teat end and barrel of the teat to pathogens as the unit is attached or removed.

Keep the environment that dry ewes are kept in as clean and dry as possible. It is important for ewes just after dry off and just prior to lambing that the environment they are housed in be as clean and dry as possible. Monitor the stocking density in these pens as well to help control the exposure to environmental pathogens.

Treatment of Mastitis

Since there are no approved drugs for the treatment of ovine mastitis in the USA and there has been limited work done on the withdrawal periods for antibiotics in lactating sheep it makes this topic very difficult to address in any detail. Each farm should have an established relationship with a veterinarian as it is possible for them to legally prescribe antibiotics for mastitis treatment under strict guidelines outlined for the extra-label use of drugs. These guidelines specify that the prescribing veterinarian must provide a meat and milk withdrawal time for the drugs being used. It would also be prudent for the farm to have their veterinarian develop a written standard treatment protocol for severe clinical mastitis that farm personnel could carry out to at least provide supportive treatment in the event that a veterinarian was not immediately available.

If the veterinarian and the farm do decide to use intramammary treatments either during lactation or the dry period then it is critical that the herd veterinarian review the proper administration technique with all personnel who are authorized to perform this task. It is also imperative that the farm have a fail-safe way to ensure that no treated ewes are milked into the tank as it is likely that a residue could occur.

Conclusion

Mastitis in dairy sheep can be a challenging disease because the most common presentation is subclinical mastitis. Even though there are not visible signs, the effect of subclinical mastitis on milk production and milk components of infected ewes make it worthwhile to focus management time in order to prevent this disease in your flock.

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