

DAIRY MANAGEMENT

COLOPHON:

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PREVENT MASTITIS WITH GOOD MILKING PRACTICES

Properly functioning milking machine is important

Every dairyman worries about mastitis and wants to keep udder infections off his farm. Preventing mastitis is very important, and one way dairymen can prevent infection from spreading is by implementing proper milking techniques and maintaining their milking equipment. There are many different sources of mastitis and milking practices can be a very important one. This article examines the role of the milking equipment and milking practices in the spread of mastitis. When a large part of the herd is affected by mastitis, it is not an individual cow problem, and one should look for the cause in the milking equipment or milking techniques. Whether a cow contracts an udder infection or not depends on two aspects: the degree of infection with pathogens and the resistance level of the cow.

Sources of mastitis

The sources of mastitis can be classified as follows.

a) Udder and cow related bacteria.

These bacteria can only survive and multiply in or on the udder. These are bacteria whose survival rates are low outside of the udder or when they are not on the cow. Examples include *Staphylococcus aureus*, *Streptococcus agalactiae*, and *Streptococcus dysgalactiae*. The latter frequently appears in teat wounds. Contamination often takes place during milking or via milking equipment.

b) Environmental bacteria

These bacteria do not depend on the cow in order to exist, as they can also multiply themselves when they are not in the vicinity of a cow, for example in manure or in cow bedding. Examples of these kinds of bacteria are *Strepto-*

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coccus uberis, *Escherichia coli*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*. Contamination with these bacteria can also occur during milking or via milking equipment.

c) Conditional pathogenic bacteria

These kinds of bacteria are only pathogenic/infection causing in specific circumstances. Examples include the remaining *Staphylococci*, the *Coagulatic Negative Staphylococci*. Contamination can also occur during milking or via milking equipment.

d) Other causes of mastitis

These include the milkfever bacteria (*Leptospira Hardjo*) and "summer mastitis" (*actinomyces pyogenes*). Contamination does not take place via milking equipment.

MILKING TECHNIQUE HIGHLY IMPORTANT

When it comes to transmitting bacteria that are directly dependent on the udder and the cow, milking equipment and the milker play a very important role. Working hygienically is of crucial importance.

Several tips:

- Do not use udder towels for extended periods of time;
- Prevent milk from spilling onto the udder towel during prepping. These milk drops can infect the udder of the next cow to be milked.
- Preferably use a disposable paper towel for every cow.
- Constantly ensure that the milker's hands remain free of milk during prepping.
- Wash away any milk remnants from the cow stands before the next row of cows enter the milking parlor. This prevents milk remnants from splashing up against the teats of the next row of cows.



Do not use udder towels for extended periods of time.

Teat liners

Special attention should be paid to the teat liners, as they are being used from cow to cow. Care should be taken that milk does

not touch the teats of the next cow as this milk could be contaminated. Moreover, it is important that the liners are attached to the teats without air suction. Due to air

suction, milk drops can often hit the teats at high speeds and penetrate the teat channel, a process referred to as milk drop impacts. These milk drops can contain

bacteria of previously milked cows. Cross contamination with other quarters of the udder may also occur. If you know certain cows to be carriers of certain pathogens, it is best to milk these cows last.

A number of dairymen use air wash or back flushing of the milk clusters in between cows to prevent infections, but often these measures are not sufficient.

Housing and hygiene

Infection as a result of environmental pathogens and conditional pathogenic bacteria can also take place during milking, but there are a number of other ways contamination can take place. If cows are wet prepped such as with udder showers for instance, the environmental bacteria *Streptococcus uberis* can enter the teat end along with the water.

In order to prevent contamination due to environmental bacteria it is especially important that the housing and hygiene of the bedding in the barn are as desired.

Working hygienically is of crucial importance



MILKING EQUIPMENT CAN DAMAGE TEATS

Milking equipment can also cause mastitis in yet another way. Wrong milking techniques can damage teats allowing bacteria to enter the udder.

Several points to watch for:

1. Vacuum level: Ensure the right vacuum level in the teat liner right below the teat. Aim for 36-40 kPa just below the teat (in the short milk tube) during milk flow. This will ensure that the cow milks out quickly, while at the same time it prevents the forces exerted on the teat from becoming too high. If the vacuum level is too high though, frayed callus may form and the teat ends will be damaged. As a result, bacteria will be able to enter the udder more easily, while too much vacuum will cause cows to not milk out well either. N.B.: During milk flow the overall pressure is lowered, so you will have to increase the pressure on the entire milking system. The following overview can be used as a guideline for the vacuum meter count on your milking equipment:

- Overhead pipeline milking system 48-50 kPa
- Milking parlor system with weigh jars 44-46 kPa
- Low line milking parlor system 40-44 kPa
- Bucket milking system 40-44 kPa

2. Stable vacuum: A stable vacuum level plays an important role when it comes to udder health. The fluctuation in the overall pressure should not be larger than 1 kPa, whether only one cow is being milked at the time or whether the entire milking parlor is used to capacity. An effective vacuum regulator is vital to achieve this. In addition, make sure that the dust filter is cleaned on a regular basis and that the vacuum pump has enough capacity to provide all the milking units with sufficient vacuum. To this end, it is necessary to have sufficient "reserve capacity" to compensate for the unexpected pressure swings, for instance when a milking unit is kicked off or during other forms of air suction. Too little reserve capacity can be caused by an undersized vacuum pump but also by excessive leaks in the pipelines and other equipment. Milking parlors without milk measuring devices require a pipeline with a sufficiently large diameter.

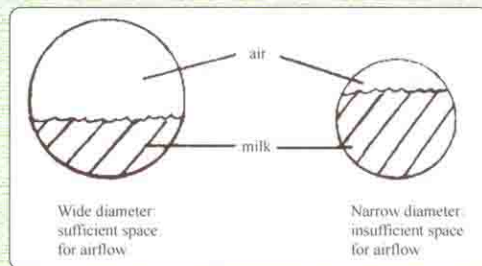


Figure - Distribution of milk and airflow fill in the pipeline.

3. Milk flow: The teats of the cow should be nearly dry after the clusters have been taken off. If the teats are clearly wet this means the milk flow is insufficient. Milk surrounds the teats and bacteria get the chance to penetrate the teat channel in a fashion similar to milk drop impacts. Make sure that the tubes and other parts of the milking equipment are not too small. As a case in point, the short milk tube and the cluster liner diameter should be at least 10 mm wide. The cluster itself, as well as milk flow from the cluster and the long milk tube should also be sufficiently large with a minimum diameter of 12.5 mm. Over time, milk tubes tend to flatten out, which prevents milk flow. Replace flat milk tubes with new ones. There is a small air hole in the cluster that allows entry of up to 12 liters of air per minute. If this air hole is blocked it will also negatively impact milk flow. Cleaning the air hole can prevent this from happening. Moreover, a sagging milk pipeline may lead to the formation of columns in the pipeline that can lead

to a drop in vacuum pressure and of milk flow. These milk pipelines should also be replaced.

4. Take-off timing. After the milk flow has stopped, the cluster will have to be taken off in a timely manner to prevent unnecessary strain on the teats. Especially in the case of an overhead pipeline system with an overall pressure of 48-50 kPa, not taking off the cluster in time can have a considerable negative impact on the teats. Automatic take-off often takes place at a milk flow rate lower than 0.2 to 0.3 kg per minute. After reaching this value a short lapse is maintained, known as the delay time. This prevents the cluster from being taken off prematurely during a short dip in the milk flow.

Taking off the cluster prematurely as well as incomplete milk out are other possible sources of mastitis. It is important to take care of the right take-off moment for both manual and automatic take-offs.

5. Pressure alternators: During the mechanical milking cycle, the teat goes through two phases: the suction phase and the rest phase. During the suction phase the machine sucks the milk from the teat. During the rest phase the teat liner in fact massages the teat, and thereby restores blood circulation in the teat. Combined with the transition phase in between the suction and the resting phase, this leads to an ideal suction phase - rest phase ratio. This ratio



Measure the pressure

can vary from 50:50 to 70:30. Without special measuring equipment it is impossible to measure this ratio though. The manufacturers of milking machines will provide the number of pulsations for each type of milking machine. One pulsation is one cycle consisting of a suction beat and a rest beat: the opening and subsequent closing of the teat liner. This number will often lie between 55 and 65 pulsations per minute. You can check for this by counting the number of pulsations. The best way to do this is to feel the motion in the teat liner while the pressure alternator is working. Listening is not an easy method because all the other pressure alternators will probably confuse you while you count.

Pulsators can work simultaneously with all four teat liners of a cluster maintaining the same suction to rest ratio. The result is that with every pulsation, milk flows into the cluster from four quarters simultaneously. Newer milking systems often have an alternative pulsation system where two teat liners have an alternating suck and rest phase, which results in a more regular milk flow. The swings in vacuum below the teat are less profound in this case. It is important that both halves of the pulsator operate with equal strength. However, also this is difficult to check without specific testing apparatus. Regular maintenance and cleaning of the pulsator is beneficial to its functioning. In particular, leaking (short) pulsation tubes have a negative impact on the suction force. The result is that one set of quarters is milked slower and not as thoroughly, while the other set of quarters spend too much time under pressure.

6. Teat liners: You can select teat liners with a large or a small head. Both have their advantages and drawbacks. Teat liners with a large head do not creep up

Regularly check the teat conditions in your herd



Teat disorders and their causes

This table lists the most important teat disorders and summarizes the possible causes.

PROBLEM	POSSIBLE CAUSE
Red teats	- vacuum is too high - too much over milking
Bleeding at the teat end	- too much vacuum underneath the teat end
Excessive or frayed callus	- too much pressure on the teat during the rest phase because of a resting phase that lasts too long or because of inflexible teat liners (too much teat-pressure is more likely at a high udder floor vacuum) - too much vacuum - too lengthy b-phase
Teat concussion, blue teats, edema, swollen teats.	- malfunctioning pressure - too much over milking - too much vacuum - lengthy machine milking time - inflexible teat liners - too short teat liners
Udder floor concussion	- too high udder floor vacuum - too wide teat liners - wet prepping
Flattened teats	- too much pressure on the teat during the resting phase because of a resting phase that lasts too long; especially with inflexible and/or short teat liners. - worn teat liners Flattened teats are more likely with high udder floor vacuum.

when a cow has nearly finished milking, and as a result the cow is generally milked out better. However, this type of liner will more easily lead to air suction. The opposite applies for the liners with smaller heads. There are dairymen in the field who use smaller heads for the front teats and larger heads for the rear teats, in order to make optimal use of the advantages and to minimize the drawbacks. However, this kind of mixed use of large and small heads is seen less and less nowadays. The applied level of vacuum also plays a role in this respect.

Should one select **soft or hard teat liners**? In order to limit teat and tissue damage due to milking, the flexible teat liners probably hold more advantages. However, their drawback is that rapid milk(out) time could be prevented.

The diameter of the shaft in the teat liner is also important. If the teat liner is too wide, the vacuum between the teat and the lining can creep upwards, and it can thereby create too much vacuum at the top of the teat near the udder floor (creating a concussion ring at the udder floor).

On the other hand, teat liners that are too narrow will not milk out a cow clean enough. The selected type of teat liners will therefore need to be suitable for use on the entire herd. On top of this, it is important to note that each herd should have a certain degree of uniformity in teat size. For teat liners to function well it is imperative that they are replaced on time. Old teat liners weaken and will therefore not milk out the udder as well. They will also increase the rate of so-called flat teats after take-off. In general, rubber teat liners have to be replaced after approximately 2,500 milkings.

TEAT CONDITION

Regularly check the teat conditions in your herd. When something is wrong, this can either be caused by the cows or by the milking equipment. Milking equipment that does not work properly can lead to teat problems within a large part of the herd. Problems can include excessive frayed callus, bleedings at the teat end, flat teats after milking, or swellings on the base of the teats (floor udder concussion rings).

If these problems are limited to several cows only, then the problems can often be identified at the cow level.

Fresh heifers often have lots of udder edema. The appearance of a concussion ring at the udder floor and swollen teats are common problems in this group of animals, and it is clearly a problem at the cow level, not an equipment defect.