Teat Ends as a Measure of Milking Performance
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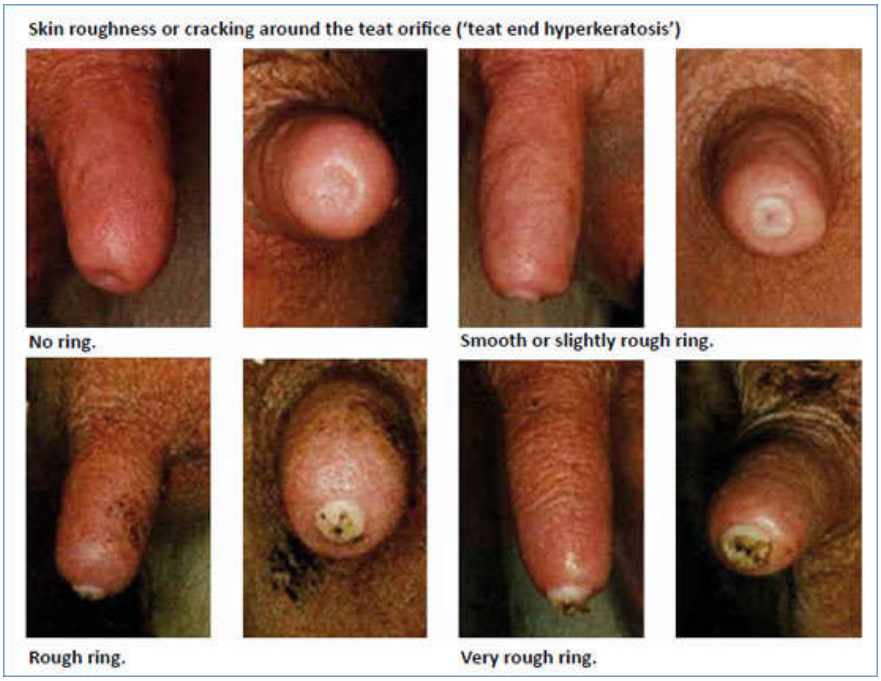
Teat ends are contacted multiple times a day during milking, but how often are they really examined? Teat ends are the cow's last exterior defense against mastitis causing pathogens, so it is important to keep them healthy and clean.
Cleanliness is a concept we are all familiar with: clean and dry stalls, clean alleys and crossovers, no puddles or splashing; but what is meant by healthy teat ends? Lots of elements affect teat end health with some being environmental, such as cold weather and chapping, or infectious, like herpes and warts, or injuries. But the most common sign of an unhealthy teat is a callous that forms at the opening on the end called hyperkeratosis.

As a normal response to milking the teat end forms a certain amount of callous, similar to hard working hands (Fig 1- smooth or slightly rough ring). This callous is thicker in pointed teats and high production animals, but an abnormal amount of callous is a sign of milking management problems.

Rough callouses (Fig 1 rough and very rough ring) are caused by overmilking at the start or at the end of milking, and by improper equipment settings and by liner slips/squawks. Low milk flow <1kg/min (ie. overmilking) is the number one factor correlated with this condition. Damage is caused when the teat end experiences relatively high vacuum during low milk flow. Over time, these rough callouses form and become embedded with bacteria that cannot be removed during milk prep, and serve as a reservoir of bacteria right at the teat end.

Fig. 1 Teat End Hyperkeratosis



http://www.farmfile.ie/cc_warts

Does your herd have a problem? There is a teat end scoring system where cows are given a score of N (No ring or normal), S (smooth ring), R (rough ring), VR (very rough ring), as seen in the Fig 2 below. The following is a link that has this scoring system plus a chart to record results in: http://milkquality.wisc.edu/wp-content/uploads/2011/09/teat-end-condition-scoring-chart.pdf

To score teats, assess all teat ends on a cow after prepping and right before unit attachment in animals >7 DIM. Her score will be that of the worst teat end because that's the problem that needs to be addressed. Evaluate at least 20 random cows, or 20% of the herd if you milk more than 100 cows. Note the pen or management group each cow is from (ie, fresh group, high production group, etc). It's time to look at milking management if over 20% of the cows score rough/very rough or >10% very rough. This system allows for 20% of the herd to score high because teat shape and production level have such an influence on the teat end condition.

The bad news is that bringing rough/very rough teat ends back to normal is difficult. The best way to reverse damage is a combination of chemical and physical exfoliants: choose a predip that helps soften the callous and wipe aggressively with a cloth towel by running the thumb over the end of the teat and pinching off loose tissue. This will only help if you prevent further damage by addressing milking routine and milking equipment settings. Otherwise you are not fixing the problem and will continue to see poor teat ends.

The good news is that prevention will help your entire milking routine. Adjustments may be needed in your prep, your take-offs, your vacuum, or your pulsators.

Overmilking at the start or the end of milking is the main problem. At the start of milking you must have the timing right on your prep. That means minimum 60-90 sec between forestrip/wipe and attachment. Dipping does not count as the start of contact time. The timing is important because contact starts the oxytocin response but milk letdown happens 60-90 seconds after first contact. If you attach too soon, you get a cisternal dump and a lag time before real milk flow, known as bimodal letdown. The lag time exposes teats to high vacuum and low flow, causing overmilking and teat end damage. The flip side of this is that you want to attach units within 2.5 minutes. Waiting longer causes low flow at the end of milking.

Overmilking at the end of milking is common and is impacted by automatic takeoff (ATO) settings and manual reattaches. Factory settings of ATOs are typically at settings which overmilk the cow. The settings should be at 1kg/min flow with a 0-3 second delay. If you think these settings are too wet, think again; there is no effect on milk yield, SCC, or clinical mastitis at wetter settings. In fact, you'll get faster milking times and better teat ends. The goal here is to minimize unit on time. If changes are made to the ATO they need to be done very slowly over several weeks to let the cows get used to it. You can check how wet your settings are now by seeing how much milk is left in the udder when the unit comes off. In ~10 cows, hand strip into a liquid measuring cup immediately after the unit comes off. The goal is 400mL divided evenly between the quarters. Less than that and you're overmilking. An even faster test of overmilking is if you can't get to 400mL because the cows are kicking. This exercise may also show you if the units are aligned properly on the cow.

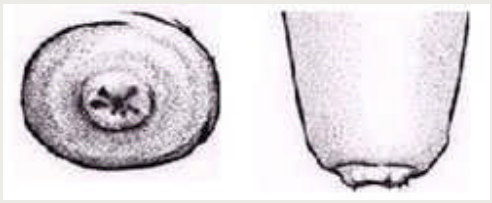
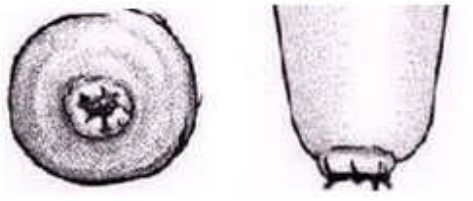
As far as manual milking goes, never ever machine strip a quarter or hang anything on the claw. You are wasting time, damaging teat ends, and not increasing yield. Also, never reattach a unit if it was on for

>2 minutes or she gave >4.5kg milk. Just leave it off; she will adjust and the milk in her udder does not cause mastitis.

The equipment settings should be checked regularly for vacuum at peak flow and D-phase pulsation time. Vacuum should be 11.7-12.5mmHg at peak flow and D-phase >200ms. A common intuitive reaction to bad teat ends is to lower the vacuum. The problem with this is that the vacuum will then be too low at peak flow, which prolongs milking time and causes overmilking. These measurements must to be taken during milking to be accurate. Again, any changes need to be done slowly so the cows can adjust. Equipment dealers are often very willing to work with you on making changes and there are a number of veterinarians in Ontario trained in assessing milking routines and equipment settings. Please don't hesitate to ask for advice.

Making appropriate changes to milking procedures and equipment will not only improve teat ends, but will also result in faster milking times leaving more time for cows to do what they do best: eat, lay down, and most importantly, make milk!

Figure 2 Teat End Scoring Chart

Score	Description	Illustration
Score 1 (N)	**No Ring.** The teat-end is smooth with a small, even orifice. This is a typical status for many teats soon after the start of lactation.	
Score 2 (S)	**Smooth or Slightly Rough Ring.** A raised ring encircles the teat orifice. The surface of the ring is smooth or it may feel slightly rough but no fragments of old keratin are evident.	
Score 3 (R)	**Rough Ring.** A raised, roughened ring with isolated fragments of old keratin extending a short distance from the teat orifice.	
Score 4 (VR)	**Very Rough Ring.** A raised ring with rough fragments of old keratin extending out from the teat orifice. The rim of the ring is rough and may be cracked, often giving the test-end a "flowered" appearance.	

http://www.extension.umn.edu/agriculture/dairy/milk-quality-and-mastitis/teat-end-condition-matters/