

Proper Milking Practices

G. M. Jones, Extension Dairy Scientist, Management
Virginia Tech

Development of mastitis infections is related to conditions which expose the teat end to bacteria and to situations which make it easier for these bacteria to penetrate the teat canal. To minimize mastitis problems and to milk cows more effectively, attention must be paid to cow preparation, stimulation of milk let-down, and procedures used to apply or remove teat cups. Many dairymen pay too little attention to the importance of proper milking practices and routine.

Milk is produced throughout the day by alveoli located deep within the udder (Figure 1). This milk is stored within the alveoli until milking. For complete, fast milk-out, the cow must be stimulated to let down her milk. After the stimulation signal has been received by the brain, the pituitary gland releases a hormone, oxytocin, into the blood.

Oxytocin travels to the udder and causes contraction of the muscle fibers (or myoepithelial cells) that surround the alveoli. About 60 percent of the milk is stored within the alveoli and small ducts that drain the alveoli. The remainder is stored in the large ducts and udder cistern. Contraction forces milk into the large ducts and cisterns where the milking machine then can remove the milk.

Stimulation Causes Milk Let-down

On many farms, the time delay from first stimulation until units are applied, (to be referred to as stimulation time), ranges from 2 to 6 minutes. But, long stimulation times can contribute to lower milk production, slower milking time, and higher somatic cell counts or mastitis problems. Maximum oxytocin concentration in the blood occurs 1 minute from the beginning of stimulation. Thereafter, within 1.5 to 2 minutes, oxytocin concentration drops dramatically to half the maximal concentration and the let-down is reduced.

For most effective milk let-down, attach the units after 1-minute stimulation. Use a clock to time yourself and, if necessary, change your routine. A 5-minute stimulation time has been shown to reduce milk production by 16 percent.

Many milkers spend only 5 to 8 seconds to wash and dry a cow's teats. A 5- to 8-second hand wash with running water was shown to be ineffective in stimulating milk let-down. By comparison, hand stimulation of the teats for 30 seconds increased milk production by 26 to 33 percent.

LD
5655
A762
no. 404-227
VPI
Spec

Sensitive receptors for stimulating milk let-down are located in the teat skin. Milkers must spend enough time in preparing cows so maximum milk let-down occurs. There can be a 40- to 45-second time delay from the time of stimulation until oxytocin causes milk let-down to begin. Do not attach teat cups too early.

Studies at the University of Minnesota indicate that stimulation times of less than 1 minute or more than 2 minutes are associated with the development of severe, chronic lesions on teat ends. Get in the habit of attaching the milking machine at 1 minute from the time that stimulation begins.

Don't prepare too many cows in advance. If you spend the desired 25 to 30 seconds per cow, you don't have time to prepare more than two cows before you must go back and attach the milking units. If cows are dirty and you spend more time on any one cow, don't proceed on to the next cow until after the units are attached to the first cow.

Use Strip Cup (Figure 2)

Stripping three to four streams of milk from each quarter is beneficial because it allows you to detect early stages of clinical mastitis, removes foremilk which may have high bacteria counts, may serve as the primary stimulus for milk let-down, and assists in reducing mastitis.

In USDA (Beltsville) studies, stripping before washing and drying the udder reduced the incidence of new udder infections from 18 to 7 percent. Stripping after udder preparation was less effective.

Mastitis-causing bacteria enter the teat canal either at the end of milking or between milkings. Then, at the next milking, these bacteria can enter the gland and cause infection. The massaging action that occurs with washing and drying teats can help bacteria move upward into the gland. Stripping flushes bacteria out of the teat canal and helps prevent development of infection.

Stripping assists in the early detection of clinical mastitis. The appearance of flakes, clots, watery secretions, hard quarters, swelling, or redness provides an early warning that a serious problem may develop very soon.

Use a strip cup with a black surface. The detection of a watery secretion may indicate that a problem is developing. Take her temperature. Many mastitis organisms are air-borne and live outside the udder. When a strip cup is not used, milk often is squirted onto the feet and legs of the cow being prepared, or the adjacent cow. Infections can be transferred via the feet and legs to the bedding, whereby an uninfected cow may use the stall next and becomes infected. The bacteria can thrive in dirty, wet stalls.

Wash Teats with a Sanitizing Solution (Figure 3)

Scrub teats and teat ends thoroughly with a paper towel or direct a stream of water on the teats and wash by hand. Do not wet the udder beyond two to three inches above the teats. Remove all dirt and manure from the teats, including the back sides of the teats that are most difficult to reach. Use only as much water as needed to cleanse the teat. The more water you use, the harder it is to dry off the teats.

Pre-rinsing the teats with water to remove dirt and manure before wiping with a towel soaked in disinfectant will reduce the number of bacteria on the teat more than the use of a disinfectant solution alone.

Do not wash teats with a common sponge or cloth. A bucket of sanitizing solution does not kill all bacteria present on an udder cloth or sponge. Thus, these bacteria are transferred from infected cows to clean cows. Get rid of such cloths or sponges.

Dry Teats Thoroughly (Figure 4)

No water should remain on the teats or udder after drying. As the water droplets drain toward the teat end, they pick up bacteria. This dirty water can be sucked inside the teat cup and raise your bacteria count. Admitting large amounts of air into the teat cup causes milk droplets to move backward and up the milk tube (Figure 5). It's like a fine aerosol spray, causing milk droplets and any bacteria inside the teat cup liner (contaminated liners or dirty water on teat ends) to impact against the teat end.

Bacteria may strike the teat ends with enough force to cause them to enter the teat canal. These impacts are caused by vacuum loss created when units are attached, when units are removed without shutting off the vacuum, by squawking teat cups, machine stripping, or unit falloff.

Dry wet teats and udders thoroughly. Leave no water on the teat or udder. Use single service paper towels, such as those used by gas stations for washing windshields. Some paper towels are rough and not very absorbent. Don't use them! Some dairymen use face or hand towels, but they have enough towels so each cow has one. Do not use a towel on two cows as infection may spread. A bucket of sanitizing solution often does not kill all organisms. These towels do a better job of getting teats dry, are preferred by milkers, and may be cheaper. Towels must be laundered between cows and milkings.

Milking Routine

Establish a uniform work routine that results in smooth cow flow, uses good milking practices, and makes best use of your time.

Manual unit take-off

- A. Prep cow 1: Forestrip; wash and dry teats.
- B. Prep cow 2: Forestrip; wash and dry teats.
- C. Attach unit to cow 1 and then cow 2.
- D. Prep cows 3 and 4.
- E. Attach units to cows 3 and 4.
- F. Admit cows to side 2.
- G. Check and remove units from cows 1-4.
- H. Teat dip cows 1-4 and open exit gate.
- I. Prep cows on side 2; follow A-H.

No attempt should be made to prepare cows on side 2 while cows on side 1 are milking, although there may be a milking unit at each stall. Follow the above routine when milking units have to be transferred from side 1 to side 2. If a specific cow is known to have a longer milk-out time, prep and milk her first. If a cow's teats are quite dirty, pre-wet the teats and proceed to another cow. Then come back to the dirty cow. Wash and dry teats, follow with the strip cup.

Automatic detaching units

- A. Prep cow 1: Forestrip; wash and dry teats.
- B. Prep cow 2: Forestrip; wash and dry teats.
- C. Attach unit to cow 1 and then cow 2.
- D. Prep cows 3 and 4.
- E. Attach units to cows 3 and 4.
- F. Continue with other cows on side 1.
- G. Admit cows to side 2.
- H. Prep and attach units to cows on side 2, two cows at-a-time.
- I. Check cows on side 1 for proper milk out, teat dip, and open exit and entrance gates.
- J. Prep and attach units to cows on side 1, two cows at-a-time.
- K. Check cows on side 2, etc.

Milking barns. Start milking at the low point of the milking pipeline and work up the slope. An important objective is to apply the milking unit within 30-60 seconds after preparation begins.

- A. Prep cow 1.
- B. Prep cow 3.
- C. Apply unit to cow 1.
- D. Apply unit to cow 3.
- E. Prep cow 2.
- F. Check and remove unit, cow 1.
- G. Apply unit to cow 2.
- H. Teat dip cow 1.
- I. Prep cow 4.
- J. Check and remove unit, cow 3.
- K. Apply unit to cow 4.
- L. Teat dip cow 3.
- M. Continue this sequence of steps.

With three milking units per operator, it may be best to check and remove the unit before prepping the next cow for that unit.

Handling the Milking Unit

Adjust and align teat cups so the quarters milk out properly (Figure 6). As the teat cup is attached, hold the short milk tube down over the claw ferrule to minimize the amount of air that rushes in. Position the teat inside the teat cup so that milk flow is not impeded. Use a support arm for milker hoses or claws. If a teat cup should squawk, adjust it as soon as possible. Vacuum loss contributes to the reverse movement of milk droplets inside the liner and bacteria can impact against the teat end and enter the teat canal. When replacing teat cup liners, be sure the liner does not become twisted inside the shell. Also, make sure there isn't any water between the shell and the liner. If milking only three teats, twist the fourth teat cup and lay it over the claw so that it does not admit air. If plugs are used, wash them properly after milking.

In most cases, if cows are properly prepared and milked with a good milking system, machine stripping is not necessary. If practiced, machine stripping should take no more than 15 to 20 seconds. Massage each quarter in a gentle downward motion with one hand while applying a slight downward pressure on the claw with the other hand. Do not exert enough pressure to cause air to leak around the mouthpiece.

Research conducted by the USDA at Beltsville showed that 1.6 minutes of machine stripping resulted in higher leucocyte counts and more milk being discarded because of mastitis. Nebraska studies suggested that milking techniques were improved, working conditions were more relaxed, and labor efficiency was higher by eliminating stripping.

Remove the units from cows by shutting off the vacuum (Figure 7). After several seconds, the teat cups will slide off gently. Do not pull teat cups off before the vacuum has been shut off. This kind of removal causes a stress on the teat and air leakage is detrimental. Wait until all four quarters are milked out and then remove all teat cups at the same time by shutting off the vacuum at the claw. Faster-milking quarters may be milked out one to two minutes before other quarters. Leave them alone unless they begin squawking, in which case the squawking teat cups should be removed immediately by pinching off the short milk tube of the teat cup liner.

Also, do not remove a teat cup by pinching off the short milk hose and twisting the liner around the ferrule on the claw. In most cases, air will enter the mouthpiece and cause vacuum loss inside other teat cups. There is less damage to leaving that teat cup on for another 10 to 20 seconds or even a minute.

Remove the unit as soon as the cow is milked out. Do not squeeze the short milk tube at the bottom of the liner to detect milk flow. The constriction causes vacuum fluctuation at the teat end. Most cows will milk out in four to six minutes. Studies at the University of Minnesota indicate that condition of the teat end deteriorates when units remain on the cow for more than five minutes. You cannot remove all of the milk from the udder. Approximately 10-15% of the milk remains in the udder as residual milk.

If you aren't able to remove the units as soon as the cow is milked out, maybe you are attempting to use too many units. Most operators cannot use more than two units properly in a stanchion or milking barn and three units in a parlor. Automatic detachers have increased labor efficiency, but many Virginia dairymen with automatic detachers have two operators milking in double-6 and double-8 parlors. Sound milking procedures are most important.

Some older cows may not milk out completely with automatic detachers. Our dairymen say they have to reattach the milkers to about 10% of the cows, but it's usually the same cows. Minimize vacuum loss as the units are reattached. Remove them properly.

After-milking Hygiene

As soon as the units are removed, dip teats in a sanitizing solution that is intended for teat dipping. Do not use multipurpose cleaners or sanitizers. Squawking teat cups, vacuum losses, contaminated teat cup liners, and wet-cow milking contaminate teat skin with bacteria that can cause mastitis. Cracks and lesions on the skin surface are additional problems because they harbor bacteria and make sanitizing more difficult.

Teat dips should kill these organisms. In addition, a good teat dip should leave a residue on the teat so the antimicrobial action is still present when the cow lies down in a free stall or any other place where sanitary conditions are less than ideal.

Cover the entire teat with dip (Figure 8). Don't forget the back sides, especially if you use a spray. Occasionally, check the far side of the rear teats as soon as they've been dipped. Is coverage complete? In many cases, the back sides are hardly touched. A dipper filled with sanitizing solution is preferred over a spray because it makes covering the whole teat easier.

At the end of milking, throw away any teat dip remaining in the cup or dipper. Don't pour it back into the bottle and contaminate the contents. During cold weather, store teat dips where they will not freeze.

Don't allow any chance for other sanitizing solutions to be mistaken for teat dip. *Be sure the sanitizer is a teat dip, and, when bottles of sanitizing solution are refilled, make sure all bottles are clearly marked and every milker understands what solution is in each bottle.*

Dipping Milker Units

When removed from a cow, most teat cup liners are contaminated with bacteria. For many herds, dipping of teat cup clusters in a sanitizing solution is not worthwhile. In herds where cell count averages over 500,000, this practice may be beneficial. Rinse teat cups in lukewarm water followed by a rinse in a hot sanitizing solution. Hang teat cups for several minutes so they can drain and dry. Teat cup liners must be dry before they are placed on the next cow. The solution must be kept relatively hot and changed as soon as it starts to change color or becomes lukewarm. Automatic backflush units are available in some parts of the country and may be beneficial in certain dairy herds.

In Summary

1. Maximum milk let-down requires 25 to 30 seconds of stimulation per cow, followed by attaching milkers 1 minute after preparation was started.
2. Strip three to four streams of milk from each quarter before preparing the cow.
3. Wash teats with only as much water as necessary.
4. Dry teats thoroughly.
5. Check your timing. Get milkers on 1 minute after stimulation was started.
6. Milking units must be properly aligned on the udder.
7. Don't overmilk. Remove milking units by shutting off the vacuum.
8. Dip teats.

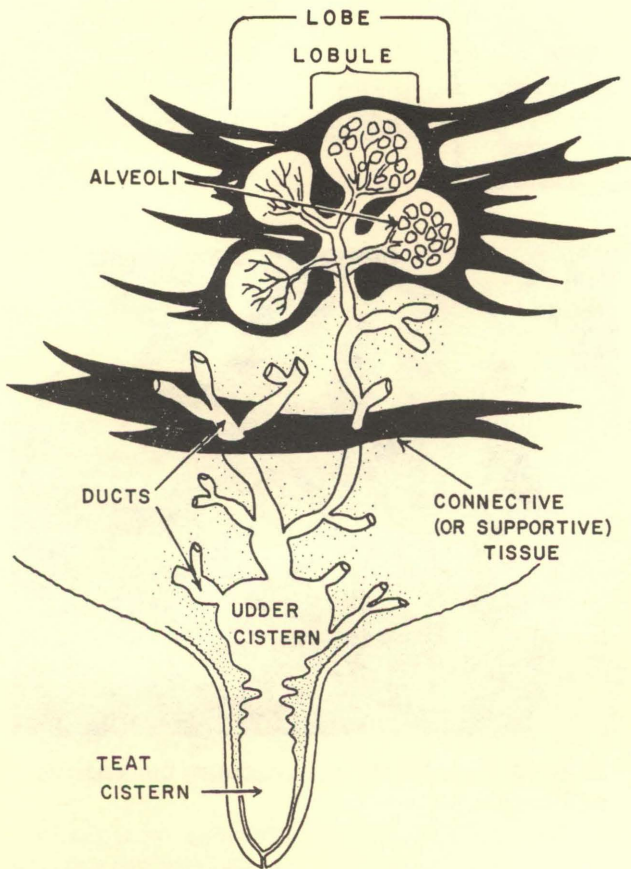


Figure 1. Each quarter consists of many lobes, each of which contains many smaller lobules which in turn contain many alveoli. The teat is connected to each of these millions of alveoli by a duct system (C. W. Turner, 1973, *Harvesting Your Milk Crop*, 3rd ed., Babson Bros. Co.).



Figure 2. Use a strip cup to check milk for abnormal secretions and to stimulate milk let-down.



Figure 3. Wash teats, but not udder, with sanitizing solution.

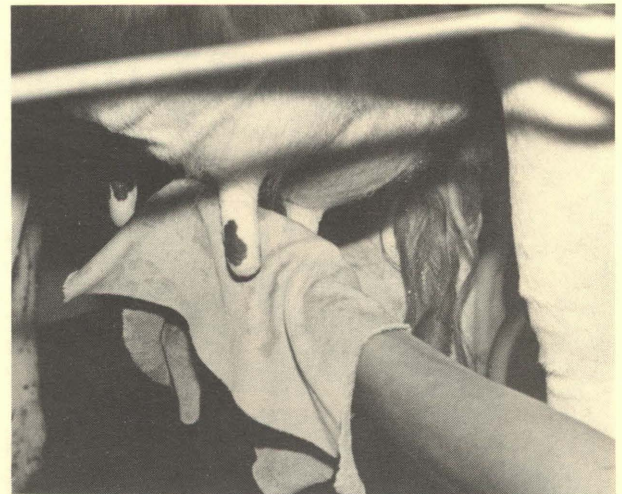


Figure 4. Dry teats thoroughly. Leave no water. Don't use same towel on two cows.

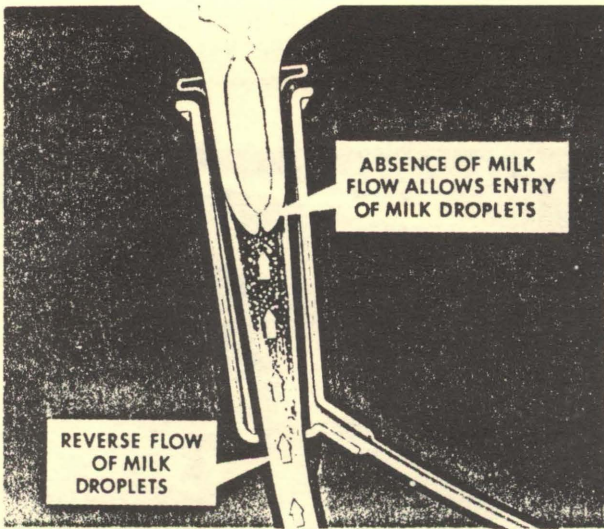


Figure 5. Slipping or squawking teat cups or improper unit removal permit air to reverse the flow of milk droplets which impact against the teat end and carry pathogens through the teat canal.

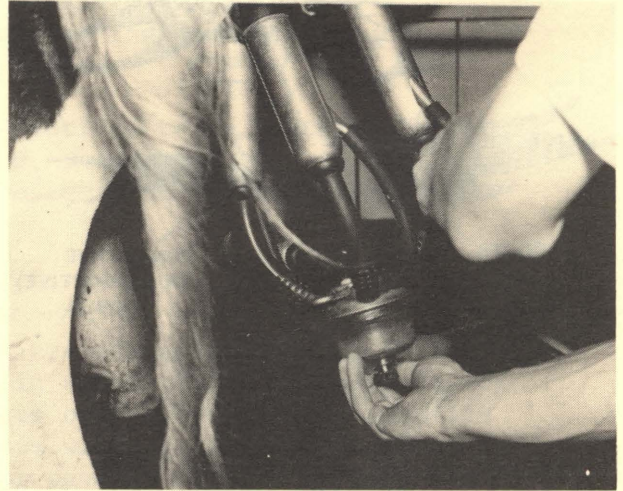


Figure 7. Shut off vacuum to remove milkers.

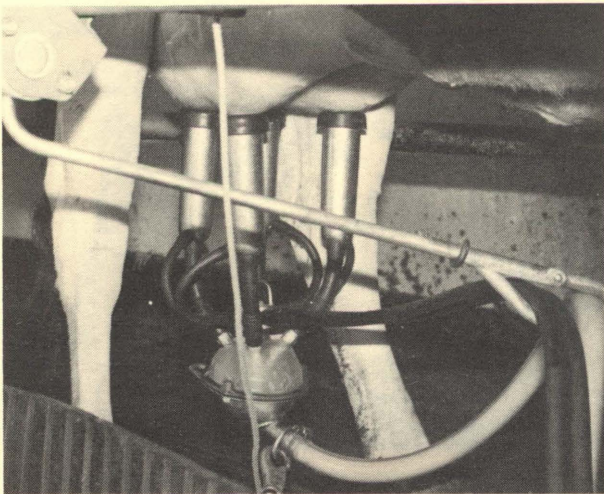


Figure 6. Properly adjust teat cups to avoid squawking. Use support arms for milk hose.

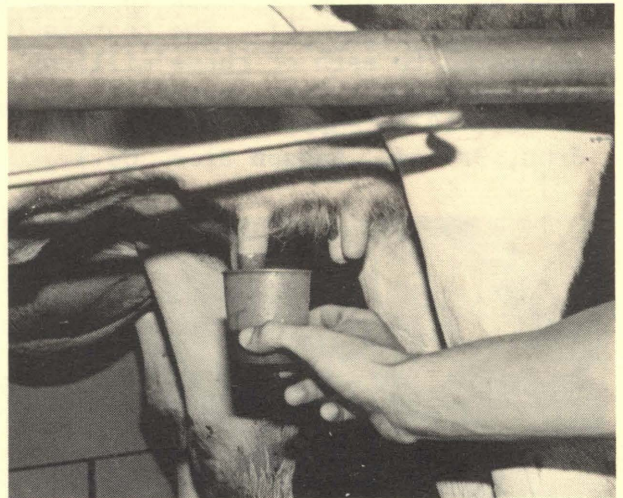


Figure 8. Cover most of the teat with teat dip.