

**Effectiveness Of
Premilking Udder
Preparation Practices
On Milk Quality And
Udder Health**

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Effectiveness Of Premilking Udder Preparation Practices On Milk Quality And Udder Health

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The objectives of good premilking udder preparation are to produce high quality milk — clean and normal and to minimize mastitis by maintaining good udder health, as well as achieve optimum milk production and milking efficiency. Methods and effectiveness of premilking preparation vary among dairymen; however, there are principles and practices that must be combined to achieve the best results. This paper summarizes a series of recent research trials at Cornell, along with other research reports and field experiences as a basis for making recommendations about udder preparation procedures.

Since teats are commonly contaminated with bacteria and a certain amount of manure, dirt and bedding at the time of milking, procedures for udder preparation should ensure that teats are manually cleaned and thoroughly dried before machine attachment. If the preparation is not done effectively, milk quality will be lessened due to higher bacterial counts and more sediment in the milk. Since the risk of new mastitis infections is related to the number of bacteria exposed to the teat, good mastitis control should be practiced to reduce the bacterial population on the teats as much as possible. To the extent this can be achieved by effective udder preparation before milking, reduces the likelihood of bacteria entering the teat canal and udder under some circumstances that can occur during machine milking (i.e. liner slippage, machine removal with vacuum at teat end).

Although methods and effectiveness of udder preparation have always varied among dairymen, the trend has changed during recent years due to increased concern about environmental-related mastitis (i.e. *Streptococcus* species and coliforms) and milk quality, and to changes in milking systems. Our research suggests that udder surfaces should be dry (even if dirty) and teats should be cleaned and dried before milking. Research indicates that wetting any portion of the udder above the teats without thorough drying will result in dirty, bacteria-contaminated water draining into the top of the teat cup liner during milking, thus lowering milk quality and increasing the risk of mastitis. When water is applied to the udder surface, time needed to dry the udder manually or allowed for surfaces to drip dry to prevent water drainage is excessive and not efficient. However, thoroughly drying a wet udder during the time available in most milking routines is impractical and unlikely to be done correctly. If drainage occurs during milking, water will collect around the teat at the top of the liner which suggests udder preparation procedures need to be improved.

Dryness is possible and practical to achieve when only the teat surfaces are wetted. Air drying of teats is not satisfactory for maximum hygiene (bacterial counts and sediment in milk). The physical force of manual drying with an individual paper towel for at least 10 seconds can remove up to one-half of the bacterial population on teats and thereby is more effective for maximum hygiene and milk quality than is air drying of wetted teats. Another advantage of drying teats is

that teat cup liners are less likely to initially slip or fall off. The type of towel (paper, cloth) that should be used to dry teats depends on the amount of water used, the cleanliness of the teats, and the way the towel is used in drying the teats. In some herds, more absorbent towels may be needed to achieve the objective of clean, dry teats.

To avoid potential problems from wet udders and teats and the extra time needed for drying, some dairymen have followed 'dry prep procedures', which in some cases means wiping teats with a dry hand or dry towel, but in other cases means no prep at all. While a poor job of washing and inadequate drying of teats and udders may be no better (and in some cases, worse) than no prep at all, the best results are achieved from a good job of cleaning and drying teats. Results of recent research comparisons at Cornell showed that even with cows whose teats were visibly clean, there were 3 to 16 times more bacteria in milk from either "no prep" cows, "wet udder" cows, or "dry wipe" cows than from "properly prepped" cows. The best preparations in these comparisons were using either (1) a hose and water with sanitizer directed on teats only, plus hand scrubbing or manipulation of the teats during washing followed by manual towel drying; or (2) using a wet paper towel in cleaning the teats only followed by manual towel drying.

In light of milking efficiency (cow throughput per worker), manual drying may not be desired especially in large herds. The practice of manual drying may not be needed if the herd somatic cell count and the incidence of clinical mastitis are low, and milk quality is very good. However, if any one of these parameters are not within the desired range, or the dairyman desires to minimize risk of future problems, then manual drying should be done to improve the overall effectiveness of the udder preparation.

Research results have shown that udder wash sanitizers have marginal benefit in reducing bacterial populations in milk. The small benefit is most consistent when sanitizers are used with water hose preparation procedures. Their limited benefit is likely due to low germicidal activity, method of application (inadequate dispensing of solution, and covering of teats), short contact time on the teat skin, and the relatively greater effect from physical action that usually occurs during cleaning and drying in reducing bacterial populations in milk and on teat skin. Therefore, udder wash sanitizers should not be used with the thought that they kill a major portion of bacteria on teat skin. Sanitizers may be of somewhat greater benefit in killing bacteria in water lines, on milkers' hands, and in milking machines. Recent Pennsylvania work indicates that certain bacteria (i.e. *Pseudomonas aeruginosa*) may live in water lines even with a sanitizer present. Thus, they suggest that flushing water from the wash hoses before their use at each milking may reduce exposure of the cows to the organism.

Cornell work indicates that predipping teats, plus manual drying with a paper towel, is as effective as a good job of washing teats with water (hose or wet towel) plus manual drying, in reducing bacteria on teat skin and in milk. Recent research results from Cornell and Vermont show that predipping can reduce new mastitis infections 43-51% more than from a good job of washing and drying teats. With predipping, manually drying all four teats with an individual paper towel is not only essential for reducing bacteria and sediment, but also to avoid a problem of disinfectant residue in milk. In other words, if manual drying is not done correctly, predipping should not be practiced. If teats are contaminated with dirt or manure whereby predipping with subsequent drying does not physically clean the teats, then teats should be washed prior to predipping. Washing should occur only when the benefit of achieving cleaner teats can be realized which depends on the cleanliness of teats and the procedures used in applying the predip and drying.

Dairymen should only use dips with proven efficacy; manufacturers should provide these data, if available. The disinfectants should be applied via a dip container or sprayed on the teats. For

proper coverage and effectiveness from dipping or spraying, an effort should be made to ensure that all teats are covered with the dip. Too often, the teats on the opposite side from the milker are inadequately dipped or sprayed. In New York, three to four gallons of teat dip are used with dipping both pre- and postmilking, compared to four to six gallons used with spraying. The amount of dip used should be monitored carefully.

A minimum of 15 to 20 seconds for skin contact time is needed for a predip teat disinfectant to effectively kill bacteria. When the environmental related mastitis pathogens are at a high level on the teats, a skin contact time of 30 seconds may be needed to reduce bacterial numbers on the teats, thus, reducing the risk of environmental mastitis.

A good job of predipping with subsequent manual drying may decrease cow throughput by 8 to 12% compared to the use of wash and drip pens with no udder preparation in the parlor. This decrease would not be as great when forestripping, cleaning, or drying of teats is practiced in addition to the use of wash and drip pens. Generally, the operator work routine time per cow for predipping is 3-6 seconds, manual drying is 6-8 seconds, and forestripping is 4-7 seconds. Even if predipping with manual drying takes longer, the benefit of reducing environmental mastitis by 50% may justify the practice, especially during wet muddy weather and if the cow's teats (and udder) are wet when entering the parlor. The need for the benefit of predipping may be monitored based on the incidence of both subclinical and clinical environmental mastitis in the herd.

Predipping with manual drying may not be sufficient for good milk letdown for low producing cows immediately after machine attachment. Thus, the automatic detachors may have to be overridden during early part of each cow milking. Forestripping may enhance the milk letdown, if necessary.

Undiluted udder wash sanitizers should not be used as premilking disinfectant dips, since they are not formulated for this purpose and do not have the same germicidal activity level as formulated teat dips. If concentrated sanitizers are used as dips, teat tissue damage may result.

We suggest to producers that forestripping (4-7 seconds) may not be necessary in herds that primarily experience environmental-related mastitis. Clinical cases of environmental mastitis (organisms other than *Strep agalactiae*, *Staph aureus*, and *mycoplasma*) can be detected through methods other than detecting milk for clinical mastitis signs. If forestripping is practiced, we recommend that it occur prior to cleaning or disinfecting the teats (predipping). Certainly, forestripping after cleaning or drying of teats may deposit bacteria and dirt back on the teats. Also, forestripping while a disinfectant (predip) is on the teats, may expose the milkers' hands to prolonged chemical exposure.

It is not surprising that the critical aspect in the overall effectiveness of premilking preparation procedures is how well they are performed. Superficially relating to the recommended steps does not guarantee a satisfactory job. Washing with a hose and water is often done with the intent of only wetting the teat surfaces, but in reality the udder surfaces are also wetted. The side surfaces of teats during washing usually are cleaned relatively well, but the teat ends may not be. The greater benefit from predipping in herds may be because the dip consistently comes in contact with the teat end experiencing environmental mastitis and better kills bacteria at the teat end than the use of the water hose or wet towel washing procedures. Management needs to select the proper preparation procedures for the given herd conditions and then ensure that the preparation is done correctly on a continuous basis to achieve best results for high milk quality and good udder health.

Cows and teats are best kept clean between milkings by environmental management rather than routinely trying to get dirty teats clean at each milking. This requires attention to stall design,

bedding, and condition of corrals. Clean cows contribute to high quality milk, better working conditions, and reduce exposure to environmental types of mastitis-causing organisms. Cleanliness of cows at milking time certainly can modify the effectiveness of udder preparation, and may be just as important as udder preparation. A high level of bacteria in the bulk tank is highly correlated with cooling of milk, cleanliness of the milking equipment, degree of udder preparation, and bacterial numbers in the bedding. Thus, udder preparation and bedding management influence milk quality as well as the risk of machine-induced infections.

Effective cleaning of teats only (including the teat ends) with water (water hose or wet towel) or a disinfectant predip, followed by manual drying with dry paper towels, is needed to reduce bacterial numbers and to reduce sediment and chemical residues. Regardless of the udder preparation practiced, the bottom line is to ensure clean, dry teats at machine attachment time.

Results of Cornell Experiments on Udder Preparation

The following series of tables, based on recent research at Cornell, give dramatic evidence to the importance of proper udder preparation in decreasing bacteria on teats and in milk, and in reducing new mastitis infections. The main points from each of a series of research trials are highlighted here:

Table 1. Bacterial counts in milk associated with the use of the water hose in wetting both the udder and teat surfaces.

Procedures on both <u>UDDER</u> and <u>TEAT</u> surfaces			Bacteria in Milk ^a	Primary factor
<u>Water hose</u>	<u>Wash sanitizer</u>	<u>Manual drying</u>	<u>% Change</u>	
X			+ 13	Water Drainage
X	X		-10	Sanitizer
X	X	X	-68	Manual drying

^aPercent change of bacterial in milk compared to no preparation

- Wetting the udder surface, and teats, without adequate drying, can increase bacteria in milk due to drainage from the udder surface
- An udder wash sanitizer has relatively small benefit in reducing bacteria in milk because of its low germicidal concentration, method of application and short contact time on the skin.
- Manual drying is of major benefit in reducing bacteria, due to 'physical action' of wiping as well as 'drying'.

Table 2. Bacterial counts in milk associated with cleaning teats only.

Procedures on <u>TEATS</u> only					Bacteria in Milk	Primary factor
<u>Dry towel</u>	<u>Water hose</u>	<u>Wet towel</u>	<u>Wash sanitizer</u>	<u>Manual drying</u>	<u>% Change</u>	
X					-38 ^b	Physical effect
	X				-65	Drainage from
	X		X		-67	udder surface
	X			X	-76	Drying
	X		X	X	-88	Drying plus sanitizer
		X			-71	No drainage from
		X	X		-62	udder surface
		X		X	-79	Drying
		X	X	X	-78	Drying

^aPercent change of bacteria in milk compared to no preparation.

^bResult depends on "dirtiness".

- Premilking preparation should wet and clean teats only.
- 'Dry wiping' can remove some bacteria (largely as part of sediment) due to physical action. The degree of result depends on how dirty teats are. Dry wiping alone is never the best procedure
- Drying of teats prevents movement of bacteria in water.

Table 3. Milk sediment associated with udder preparations.

Procedures on <u>TEATS</u> only					Milk Sediment ^a	Primary factor
<u>Dry towel</u>	<u>Water hose</u>	<u>Wet towel</u>	<u>Pre-dip</u>	<u>Wash sanitizer</u>	<u>Manual drying</u>	<u>% Change</u>
X						-38 ^b
	X					-29
		X				-56
		X			X	-57
			X			-4
			X		X	-42

^aPercent change of milk sediment compared to no preparation (2.4 g/l).

^bResult depends on dirtiness.

- Physical action (i.e., scrubbing with a liquid during washing or drying after disinfectant [liquid] application) is a significant factor in reducing sediment in milk

Table 4. Bacterial counts in milk associated with various udder preparations.

Procedures on <u>TEATS</u> only					Bacteria in milk ^a	Primary factor
<u>Water hose</u>	<u>Wet towel</u>	<u>Predip</u>	<u>Wash sanitizer</u>	<u>Manual drying</u>	<u>% Change</u>	
X					-4	No drying
X			X		-3	
X				X	-39	Drying
X			X	X	-49	
	X				-27	Liquid scrubbing
	X		X		-30	no surface drainage
	X			X	-63	Liquid-
	X		X	X	-68	scrubbing-drying
		X			-34	Germicide
		X		X	-54	Germicide-drying

^aPercent change of bacteria in milk compared to no preparation.

Table 5. Bacterial counts on teat skin associated with various udder preparations.

Procedures on <u>TEATS</u> only					Teat skin bacteria before machine-on	Primary factor
<u>Dry towel</u>	<u>Wet towel</u>	<u>Predip</u>	<u>Wash sanitizer</u>	<u>Manual drying</u>	<u>% Change</u>	
X					-4	
	X				-40	Scrubbing
	X		X		-40	
	X			X	-77	Drying
	X		X	X	-85	
		X		X	-85	Drying

^aPercent change of bacteria in milk compared to no preparation.

* These experimental results (Tables 4 & 5) indicate that predipping with a postmilking teat dip plus drying is as effective as using water (hose, wet towel) and sanitizer plus drying in reducing bacteria in milk and on teat skin.

* Drying is beneficial as a result of physical action and for removal of bacteria-laden water and chemical residues

Table 6. Iodine in milk for different premilking udder treatments.

Predip	Wiping and drying of teats	Postdip	Iodine in Milk	
			Increase ^a	Content ^a
<u>1.0 % Iodine</u>		<u>1.0 % Iodine</u>	<u>%</u>	<u>p.p.m.^b</u>
+	+	-	29.4	.328
+	+	+	56.5	.485
+	-	-	349.8	1.067

^aIncrease compared to control period without iodine dips.

^bWith no iodine teat dips (either pre- or postdip), milk iodine was .285 ppm due to iodine from feed.

* A 1% iodine dip used here increased milk iodine by 29% as a predip and by 56% as a pre- and postdip; the latter may be attributed to iodine absorption through the skin between milkings and teat surface contamination. In both cases, milk iodine level was within an acceptable range.

* Teats that are predipped must be wiped and dried thoroughly to avoid residues in milk. As illustrated here, not wiping off a 1% iodine predip resulted in a 350% increase and an unacceptable iodine content in milk.

Table 7. Milk iodine residues in herds practicing iodophor premilking teat disinfection.

Predip	Wiping and drying of teats	Postdip	Iodine in Milk	
			Increase ^a	Content ^b
<u>0.1 % Iodine</u>		<u>0.1 % Iodine</u>	<u>%</u>	<u>p.p.m.^b</u>
-	-	+	13.6	.292
+	+	+	16.0	.294
<u>1.0 % Iodine</u>		<u>1.0 % Iodine</u>		
-	-	+	29.2	.336
+	+	+	39.6	.388

^aIncrease compared to control period without iodine dips.

^bWith no iodine teat dips (either pre- or postdip), milk iodine was .260 ppm due to iodine from feed.

* These results are from a field trial with 7 commercial dairy herds totaling 560 cows. Lower iodine concentration in a teat dip as well as thorough wiping and drying helps keep lower iodine residues in milk. This is important as responsible action to avoid contamination of milk. Increased iodine levels in milk is a human health factor.

Table 8. Effects of udder preparation on the rate of new intramammary infections under experimental bacterial challenge conditions. (Cornell Study)

NONE	Udder Preparation		Manual drying	Postdip	New intramammary infections		
	Wet towel	Predip			Quarters	Reduction	
					-----%-----		
X				.25 % Iodine	26.8		
	X		X	.25 % Iodine	15.2	43.3 ^b	
		X	X	.25 % Iodine	8.9	66.3 ^c	41.0 ^d
(0.1 % Iodine)							

^aExperimental challenge, teats dipped in Strep uberis broth 3 hours before milking

^bDifferent from no preparation.

^cDifferent from no preparation.

^dDifferent from wet towel, drying.

Table 9. Summary of new intramammary infections with environmental pathogens in predip studies in four commercial farms. (University of Vermont)

Treatment	Infected quarters			Quarters	Reduction
	Streptococcus species	Coliforms	Total		
	-----no.-----			-----%-----	
Wet towel plus drying	31	41	72	13.0	
Predipping plus drying	18	21	39	6.3	51.5 ^a

^aDifferent from wet towel, drying.

In terms of mastitis control, these experimental results (Tables 7 and 8) clearly show that an effective job of pre-milking teat preparation is very important.

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