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Use of Individual, Premoistened, Disposable Wipes in Preparing Cow Teats for Milking and Resultant Raw Milk Quality and Production[1]

ROBERT W. ADKINSON*, RONALD H. GOUGH, and JEFFREY J. RYAN[2]

Department of Dairy Science, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, Louisiana 70803

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ABSTRACT

Two methods of preparing cows for milking were compared. One preparation consisted of wiping each teat clean with individual, premoistened, disposable wipes. This method was compared with washing teats with a hand-held water nozzle and drying with individual paper towels. Two groups of eight Holstein cows each were randomly assigned to the two treatments. Aseptically collected weigh jar milk samples from individual cow milkings were analyzed for standard plate count, preliminary incubation count, laboratory pasteurization count, and coliform count. Pretrial bacterial counts were monitored for 2 d and were used as covariates in statistical analyses. Cows were sampled for 7 d followed by a 2-d rest after which treatments were switched and cows sampled for another week. Method of udder preparation did not affect daily milk production, fat or protein percent. Standard plate counts and preliminary incubation counts were significantly lower for wipe treatment (363 vs 933 CFU/ml and 263 vs 661 CFU/ml). There was no treatment difference for laboratory pasteurization count or coliform count. Raw milk quality as determined by standard plate count and preliminary incubation count was improved by the wipe treatment.

Many different methods of preparing udders for milking are being used by dairymen. Most methods involve using water to wash away manure, mud, and other soils from teats and udder prior to machine attachment. Previous research (*3,5-7*) has shown that preparation method can affect milk quality and may influence rate of intramammary infection (*1,2,4*). In general, drier teats and udders at machine attachment and during milking have resulted in better milk quality (*7*). Premilking teat dipping and the use of sanitizers in udder wash preparations have been studied and in general reduce numbers of bacteria on teat skin, improve milk quality, and may reduce intramammary infections (*6,8,10*). However, conflicting results have been reported indicating that in some specific cases such practices may be of limited or no benefit (*12-14,16,17*).

A method of udder preparation that would combine control of wetness and sanitization might be of benefit in improving milk quality and reducing mastitis. The objective of this study was to evaluate such a method relative to effects upon milk quality and production.

MATERIALS AND METHODS

Preparation procedures

Several commercially available premoistened, disposable towels or wipes, commonly used in human infant hygiene, were screened for practicality of use in cleaning teats prior to milking. Screening was accomplished by allowing milking personnel to use all available wipes and subjectively choose the brand that they thought cleaned best. A product called CHUBS®, manufactured by Lehn and Fink Products Group, a division of Sterling Drug, Inc., Montvale, NJ, was selected for the study based mainly upon milkers' perception of towel size and strength. Ingredients included water, SD Alcohol 40, propylene glycol, Aloe Vera gel, PEG-60 lanolin, sodium nonoxynol-9 phosphate, sorbic acid, Oleth-20, fragrance, citric acid, and disodium phosphate. Wipes were packaged in a plastic container that dispensed towels individually and could be closed between milkings.

Udder preparation using wipes consisted of cleaning each teat with individual wipes. No water was used regardless of how soiled teats and udder were. No effort was made to clean any area other than teats. Cattle were housed in a freestall barn and allowed access to exercise lots during the day. Lots had muddy areas and some udders were extremely dirty, requiring several wipes to clean a teat. This method was compared with the common practice of washing teats with a hand-held spray nozzle and water hose followed by drying with paper towels. Milkers were instructed in proper execution of these two methods and monitored routinely to make sure procedures were being followed.

Experimental design

Sixteen lactating Holsteins were selected based upon production and stage of lactation. Cows were assigned randomly to treatment (wipe or wash) resulting in two groups of eight cows each. All cows were housed and managed together as a single group. Milk samples were collected aseptically from weigh jars daily using disposable pipets and syringes. Samples were transferred to Whirl Pak® bags (Nasco, Ft. Atkinson, WI) and placed on ice until analyzed. Each sample was analyzed in duplicate for standard plate count, laboratory pasteurization count, coliform count, and preliminary incubation count (*12*). Preliminary incubation count was reported by Johns (*9*) in 1960 and is based upon

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[2]*Mid-America Dairymen, Inc., 3253 East Chestnut Expressway, Springfield, MO 65802.*

the theory that the normal bacterial flora of the udder do not grow well at 13°C, whereas many external bacterial contaminants do.

Personnel determining counts were not aware of treatment assignments. Pretrial counts were collected for 2 d to estimate means and variances of response variables. These data are presented in Table 1 along with corresponding values for the two weeks of experimental sampling. Means and standard deviations from the pretrial data were used to estimate sample sizes needed for the experiment. In order to detect differences between treatment means equal to half the size of the standard deviation with α=.05 and β=.05, each treatment should have at least 106 observations (*11*). Since the largest pretrial standard deviation was 1.16 for log of laboratory pasteurization count, this was considered an acceptable size. Pretrial levels were included as covariates in statistical models due to these results and the fact that sample standard deviations appeared to have stabilized after about 15 observations (Fig. 1). Samples were collected on each cow daily for 7 d. Treatment groups were then switched and a 2-d adjustment period was followed by another 7 d of sampling.

TABLE 1. *Means, standard deviations and ranges for pretrial and trial data.*

Pretrial data (n= 30 to 32)				
	LCOLI[a]	LSPC	LLPC	LPI
Average	.37	2.66	1.48	2.43
Standard deviation	.73	1.05	.62	1.23
Minimum value	0	0	0	0
Maximum value	4.77	5.77	2.70	5.46
Trial data (n= 220 to 224)				
	LCOLI[a]	LSPC	LLPC	LPI
Average	.48	2.82	1.56	2.68
Standard deviation	.54	1.15	.66	1.16
Minimum value	0	0	0	0
Maximum value	2.32	5.23	2.73	4.11

[a]LCOLI= log coliform count; LSPC= log standard plate count; LLPC= log laboratory pasteurization count; LPI= log preliminary incubation count.

Statistical procedures

Data were analyzed using SAS under DOS 3.0 (*15*) on an IBM PC/AT computer. Data were adjusted by adding one to all values to eliminate zeros and $\log_{10}$ transformed. After analysis, data were transformed back to counts and one subtracted. Model included transformed pretrial count as a linear covariate, cow group, treatment, and group by treatment interaction. Presence of a group by treatment interaction would indicate that treatment effect was not consistent when groups were switched. The statistical model was:

$$Y_{ijkl} = \mu + \beta_i X + T_j + B_k + (T*B_k) + \varepsilon_{ijkl}$$

where:

- Y = ith quality measure (standard plate count, preliminary incubation count, coliform count, laboratory pasteurization count);
- β = regression coefficient for regression on pretreatment level of ith quality measure as covariate;
- T_j = effect of jth treatment (wipe, wash);
- B_k = effect of kth block (cow group);
- (T_j*B_k) = treatment by block interaction; and
- ε_{ijkl} = random error.

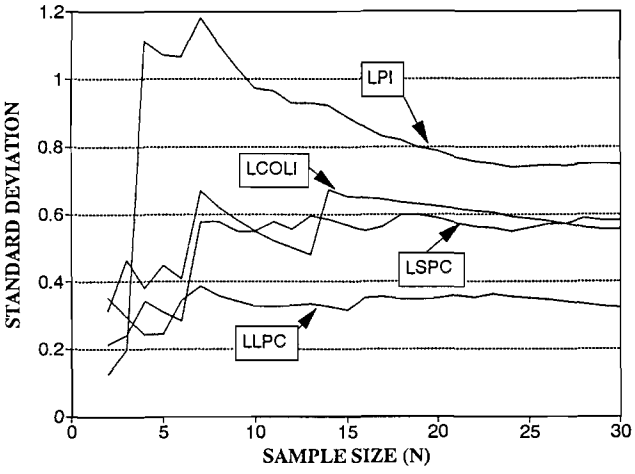

Figure 1. *Relationship between sample size and standard deviation for log of bacteria counts in pretrial weight jar samples (LPI=log lab pasteurization count; LCOLI=log coliform count; LSPC=log standard plate count; LLPC=log laboratory pasteurized count).*

RESULTS

Results of statistical analyses are presented in Tables 1 and 2. Table 2 data show that significant treatment differences existed for standard plate count and preliminary incubation count. Standard plate counts for the wipe treatment averaged 363 vs 933 CFU/ml for the wash group. This represents a 61% reduction in gross bacterial contamination of the raw milk. Preliminary incubation counts averaged 263 and 661 CFU/ml for the wipe and wash treatments, respectively. This represents a 60% reduction in contamination of the raw milk by organisms more likely to be of environmental origin.

No difference in coliform counts was detected and counts were low at 1.8 vs 2.6 CFU/ml for wipe and wash, respectively. Though not significant, coliform counts were slightly lower in milk from cows cleaned with wipes. Laboratory pasteurization counts did not differ between cleaning methods. Individual cow milk production, fat and

TABLE 2. *Least squares means for bacteria counts by treatment and cow group.*

	Treatment							
	Wash				Wipe			
Count[a]	COLI	SPC	LPC	PIC	COLI	SPC	LPC	PIC
Cow Group								
I	3.1	639**	20	568* 1.5		357**	93	185*
II	2.2	1336**	79	753* 2.3		364**	19	369*
Overall	2.6	933**	40	661* 1.8		363**	42	263*

[a]COLI= Coliform count; SPC= Standard plate count; LPC= Laboratory pasteurization count; PIC= Preliminary incubation count (13°C/18 h); all expressed as CFU/ml.

*Treatment means for the same count on the same line differ (**α=.01 or *β=.05).

protein percentages were recorded throughout the trial, and there were no differences between the two methods.

DISCUSSION

Cleaning teats with premoistened, disposable wipes significantly improved raw milk quality as determined by standard plate counts and preliminary incubation counts. Based upon these two criteria, bacteria numbers in raw milk at the weigh jar were decreased by more than one-half.

Wipes used in this study were designed and intended for use in human infant hygiene. For this reason, measures of parlor efficiency and economic comparisons between the two methods were not made. The study was not designed to test other factors which might be important such as possible effects upon mastitis or presence of residual cleaning formula in harvested milk. Some of the ingredients were not generally recognized as safe (GRAS) for human consumption and the active bactericide was probably not one that would be chosen for routine use in dairy applications. A formulation possessing the same characteristics could be made using GRAS ingredients with acceptable bactericide should results of this study support it.

Based upon results of this study, further research is indicated to a) determine best physical characteristics and packaging of a wipe for dairy use; b) determine best formulation of lotion or moistening agent for premilking hygiene; and c) investigate possible effects of wipe prepping on mastitis.

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