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Short communication: Removal of hair from the mammary gland: Recovery of bacteria from teat skin and milk

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ABSTRACT

It has been assumed that the presence of udder hair can interfere with safe milking practices and reduce the wholesomeness of milk relative to bacterial content. This study determined the effect of removal by singeing udder hair on the microflora of teat skin (total bacteria, coliform, and esculin-positive and -negative streptococci) and milk (total bacteria, coliform, psychrotrophic, and thermoduric counts) as opposed to not singeing udder hair, using different pre-and postmilking disinfection (predip, postdip, or both) combinations. The 4 different pre-and postmilking disinfection combinations were predip and postdip, postdip only, predip only, and no predip and no postdip. Differences in bacterial numbers recovered from teat skin and milk in singed and not singed glands were not significantly affected by treatment. Findings of this trial do not support the concept that udder hair removal results in improved milk quality as measured by bacterial content.
Key words: udder hair removal, teat disinfection, milk quality, bacteria

Short Communication

Regulations stipulate that milk intended for human consumption must be harvested from clean udders [European Council; 2004; Grade A Pasteurized Milk Ordinance (**PMO**), 2011], and specifically, from udders that have had their hair clipped or removed from areas around the udder and in particular, at the base of the teat [Grade A PMO, 2011]. The presumption is that hair removal will reduce the bacterial content associated with extra- and intramammary sources. Udder hair removal has been advocated in the control of IMI. Studies examining the association between herd management practices and low milk SCC indicated an association with the practice of regular removal of udder hair (Barkema et al., 1998; Elmoslemany et al., 2010; Dufour et al., 2011). However, Silk et al. (2003), in a 1-yr study on the effect on milk quality after monthly hair removal, did not find a significant difference in the number and types of IMI compared with udder halves where hair was not removed. Yet these authors conjectured that premilking udder preparation techniques that included minimal use of water to clean teats and the use of a high concentration teat disinfectant (1% iodine) both before and after milking, might have adequately disinfected teats not affected by hair removal. It has been demonstrated that premilking teat preparation can influence the bacterial content of milk (Galton et al., 1984; Hubble and Mein, 1986) and the bacteria recovered from teat skin (Galton et al., 1984). Thus, the purpose of this study was to determine if various pre-and postmilking udder cleaning and disinfectant routines interacted with udder hair removal to affect bacteriological content of milk and teat skin microflora. The microflora tested were of 4 classes for milk and skin. For milk, bacterial classes were the total, psychrotrophic, thermophilic, and coliform counts. For skin, bacterial classes were the total, esculin-positive *Streptococcus* sp., esculin-negative *Streptococcus* sp., and coliform counts. These were similar classes studied by others (Galton et al., 1984; Hubble and Mein, 1986; Silk et al., 2003). Milk quality in the United States is officially assessed by standard plate count and coliform (PMO, 2011) and milk processors often require either the psychrotrophic or thermoduric counts. We chose to assess streptococcal counts and coliform counts on teat skin because these pathogens were most likely to be reduced with predipping (Pankey et al., 1987).

Sixty cows at the Washington State University (**WSU**) Dairy Center were randomly selected from the pool of cows past 100 d in milk. Cows in this trial were managed in accordance with the Institutional Animal Care and Use Committee's regulations and the Committee approved the use of these animals in this trial. Cows were milked twice daily in a double 5 herringbone parlor that included automatic milking unit detachers (Boumatic LLC, Madison, WI). Cows were housed in a free stall barn where composted dairy waste solids were used as bedding. Visibly soiled bedding was removed

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and replaced daily and whole stall bedding replacement was done weekly. Udder and leg hygiene scores had been evaluated in a previous trial at the WSU with the scoring protocol used by Schreiner and Ruegg (2003).

Enrolled cows were randomly allocated to 1 of 4 groups. Groups differed by the method of premilking teat preparation (disinfection or no disinfection) and postmilking teat care (disinfection or no disinfection). Treatments groups were (1) premilking teat preparation, immersing the teat in a 0.1% iodine commercial (QuarterMate, WestAgro Inc., Kansas City, MO) disinfectant and removing the disinfectant with a moist towel followed by postmilking care with teat immersion in a 1% iodine commercial (Bovadine, WestAgro Inc.) disinfectant; (2) premilking teat preparation, cleaning with a moist towel followed by postmilking care with teat immersion in a 1% iodine commercial disinfectant (Bovadine, WestAgro Inc.); (3) premilking teat preparation, immersing the teat in a 0.1% iodine commercial (QuarterMate) disinfectant, and removing the disinfectant with a moist towel followed by no postmilking disinfection; and (4) premilking teat preparation, cleaning with a moist towel only, followed by no postmilking care. All towels were moistened with tepid tap water, and were clean, single service, and terry cloth. Udder hair had not been removed from enrolled cattle in the previous 3 mo. Prior to the start of the trial, the standard routine of premilking teat preparation included disinfection with QuarterMate and postmilking teat disinfectant with Bovadine. A preliminary acclimation period was established. Ten days before udder hair removal and the collection of samples, the standard routine was deferred and replaced with the described 4 treatments. All 4 teats of cows in each group received their respective treatment.

Udder hair was removed at the start of the trial. Udder hair surrounding the teats was removed by singeing with a handheld, modified, propane torch as described (Silk et al., 2003). In brief, an oxygen-starved flame was waved over one side of the udder, right or left. The udder half side chosen to receive singeing treatment was a function of the cow's identification number. Even numbered cows had teat hairs singed on the right side and those with odd-numbered identification numbers were singed on the left. The side not singed was considered the control side. Twenty-four hours after singeing, milk and teat skin swabbing solutions were collected immediately before a milking. Teats were prepared for milking following treatment group specifications. Following cleaning, teat skin swabbing solutions were collected from the teat end and lateral sides of the teat, by rolling the areas with sterile cotton tipped swab moistened with 0.2% thiosulfate quench solution. A new swab was used for each teat, and 2 swabs from each side were returned to the same tube of quench solution (5 mL). Milk from udder halves was separated during the milking process by diversion into separate buckets. Milk from each udder half was thoroughly mixed, and 50 mL was collected into a sterile container. Each bucket was rinsed, cleaned, rinsed, and sanitized after each cow milking using solutions prepared in accordance with manufacturers' instructions (Ridstone, Dynemate, and Mega-San, WestAgro Inc.). From skin swabbing solutions, the total bacteria and coliform counts were determined as described (Silk et al., 2003), and esculin-positive and -negative streptococci were enumerated on Columbia Blood Agar with esculin (Hardy Diagnostics, Santa Maria, CA). From milk, the total bacterial, coliform, psychrotrophic, and thermoduric counts were determined (Silk et al., 2003). General linear model procedure (SAS software 9.2, SAS Institute Inc., Cary, NC) was used to determine the dependent effects of treatment (hair removal or control) and cow (replicate) by group on the independent variables of log(10) bacterial counts (teat skin and milk).

The $\log_{10}$ bacterial counts in milk and skin for singed and control mammary quarters are summarized in Table 1. In milk, the total, psychrotrophic, thermoduric, and coliform bacterial counts for teats that were singed and then immersed in iodine disinfectant before and after milking (group 1) tended to be lowest compared with counts on control-treated teats, but differences were not significant ($P > 0.05$). No significant effect of singed treatment was observed in a reduction in total psychrotrophic, thermoduric, and coliform bacterial counts compared with controls with any treatment ($P > 0.05$).

The total bacterial counts recovered from skin differed little when comparisons were made within group between treatments; mean count differences were not significant ($P > 0.05$). It appears that counts between groups were also very similar. Similar observations could be made within and between groups for the esculin-positive streptococci recovered from skin, mean count differences were not significant ($P > 0.05$). It appeared that coliform counts recovered from skin of control teats was much greater than for singed teats for teats that were immersed in iodine disinfectant before and after milking; however, differences were not significant ($P > 0.05$). Mean coliform counts recovered from singed teats in group 4 appeared to be much greater than counts associated with control skin, but again, means were not significantly different ($P > 0.05$).

The purpose of the study was to determine if removing udder hair around the teats by singeing would influence the recovery of bacteria from teat skin and milk