R-MR-5: The Impact of Forestripping and Lag-time on Holstein Cows Milked Thrice Daily

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Introduction

The milk-ejection reflex is activated upon tactile stimulation of the bovine mammary gland. Timing of milking unit attachment is important to correctly harvest milk. The pre-milking routine is typically performed manually; variation in the pre-milking routine from person-to- person and day-to-day is commonplace. The pre-milking routine consists of many components and has been designed to improve overall milk quality, proper milk letdown, and mammary health. The pre-milking routine can involve sanitation of the teat and/or mammary gland, forestripping, drying, and timing of milking-unit attachment. A summary of studies from the past 30 yr indicated that stimulation of at least 20 sec and a total prep-lag time of 60 sec reduced milking unit on-time and increased the average flow rate when compared to no stimulation (Reneau and Chastain, 1995). Those studies were performed on cows that were either milked twice daily, were crossbred cattle, or had levels of production that were lower than today. Weiss and Bruckmaier (2005) indicated that a short pre-stimulation time would increase stall capacity if full udders were milked and that prolonged stimulation might be beneficial when milking udders that are not full. Our objective was to determine the impact of forestripping, lag-time, and their interaction on milking parameters of Holstein cows with various days in milk (DIM) and milked three times daily.

Materials and Methods

Seven hundred and eighty (n=780) cows from a 1,800 cow farm were enrolled. Cows were milked 3X daily on a 50-bail rotary parlor. The milking system had a vacuum setting of 14.8" Hg (50 kpa) and pulsation rate of 60 cycles/min and a pulsation ratio of 65:35. The experiment was conducted from February through November of 2008. Cows included in the study were housed in one of two pens based on DIM. All cows had to be ≤ 400 DIM at the time of enrollment. All cows had to have four functioning quarters and could not have had a case of clinical mastitis during the current lactation. Treatments involved either forestripping or not forestripping as well as lag times to attachment of 0, 45, 60, 90, 120, 180, or 240 seconds. Cows were randomly assigned to one of three treatments. A treatment lasted for 7 d with the first 3 d (9 milkings), representing an adaption period and the last 4 d (12 milkings), representing the data-collection period.

Consistent lag-time was achieved by starting a stopwatch at first tactile stimulation of the cow and then attaching it to the stall that the cow occupied. Milkers depressed the start button for milking unit attachment when the stop watch was 5-sec prior to the indicated lag-time for the given treatment.

Separate statistical analyses were performed for all cows, early-to mid-lactation cows (17-170 DIM), and late-lactation cows (177-407 DIM). Milking parameters measured were: milk yield, milking unit on-time, maximum flow, average flow, bimodality and milk harvested in the first 2 min. All values are analyzed with SAS (SAS, 1999) and reported as least square means ± standard error (LSM±SE) unless otherwise noted. The final model contained milk yield, maximum milk flow, DIM, stimulation, lag-time, the interaction of stimulation and lag and an error term. Significant differences were declared at $P < 0.05$ for main effects and interactions and a tendency was declared at $0.05 \leq P < 0.1$.

Results

Average DIM for all cows, early-to mid-lactation and late lactation cows were 172, 88, and 274 d. The range in milk yield/milking was from 13.0 to 14.2 kg for all treatments and was found to be significantly different ($P < 0.05$). Even though milk yield was found to be significantly different it is thought that the large number of animals used was the reason a difference was detected not the effect of the treatments. Average milk flow ranged from 3.3 to 3.5, 3.7 to 3.9 and 2.8 to 3.0 kg/min for all cows, early-to mid-lactation and late-lactation cows, respectively. Milking unit on-time for all cows differed ($P <0.001$) and ranged from 259 to 275 sec for the thirteen treatments. All treatments except for lag= 0 and lag= 45 sec without forestripping had milking unit on-times of ≤ 269 seconds. The range in milking unit on-time for early-to mid- lactation and late-lactation cows was from 275 to 291 and 236 to 257 sec, respectively. The percentages of bimodal milk curves were 15, 12, and 20% by group. The highest percentage of bimodal milk curves (22 to 29%) was when the milking unit was attached immediately; however, the lowest percentage of bimodal milk curves (3 to 6%) was when the lag time was equal to 90 sec. The percentage of milk harvested during the first 2 min of milk for all groups was lowest for lag times of 0 and 45 sec and highest when lag-time was ≥ 60 sec.

Forestripping tended ($P < 0.10$) to shorten milking unit on time as compared to not forestripping, whereas an increase in lag-time significantly ($P < 0.01$) shortened milking unit on time. Late lactation cows showed an increased benefit from a longer lag time. Increased lag-time had a greater impact on milking time parameters as compared to forestripping or not, however, the interaction of forestripping or not forestripping along with increased lag-times was indicative of the highest flow rates and shortest unit on times for high producing Holstein cows milked three times daily.

References

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