

Randomized clinical trial evaluating the effects of the administration of acidogenic boluses on the day prior to dry off on dairy cow welfare

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Introduction

Voluminous milk production at dry off has been previously associated with increased udder pressure, discomfort and pain in the early dry period. The use of acidogenic boluses has been described as beneficial in helping decrease milk production and udder pressure at dry off. Therefore, the objectives of this study were to evaluate the effects of the administration of acidogenic boluses before dry off on udder pressure, rear teat distance, milk leakage, as well as blood and urine pH during the first 2 weeks after dry off.

Materials and methods

This randomized control trial was performed in a tie-stall facility at the University of Minnesota. Cows were randomly assigned to one of 2 groups 24h prior to dry-off; treatment cows (TRT; n = 12) received 2 acidogenic boluses (Bovikal[®] Dry; Boehringer Ingelheim Animal Health) whereas control cows (CON; n = 15) did not receive any boluses. All cows received an antimicrobial and internal teat sealant in all quarters at dry off. Blood and urine pH were evaluated at 12, 24, 48 and 72 h post bolus administration. Udder comfort measures (rear teat distance, milk leakage, udder pressure) were measured at 12, 24, 36, 48, 60, 72, 84, 96, 120, 144, 168 and 336 h post dry off. Baseline measures were taken before bolus administration. Udder pressure was measured at 4 different spots (5 and 20 cm from the teat base on both rear quarters) using a handheld digital algometer. Distance between rear teats (cm) was determined using a tape measure to obtain the distance from the outer edges of the teats. Milk leakage was defined as the visual observation of milk dripping from 1 or more teats. Blood pH was measured with an i-STAT using CG8+ cartridges (i-STAT Alinity v, Abbott) and urine pH with a pH Meter (Oakton[®] EcoTestr[™], Antylia Scientific). Continuous outcomes (udder pressure, rear teat distance, blood and urine pH) were analyzed using a linear mixed-effects model with repeated measures. Fixed effects include baseline measure for the specific outcome, treatment group, time relative to bolus administration or dry off, left or right rear quarter, and an interaction term between treatment and time. Cow ID was added as a random effect in all models. A Cox proportional hazard regression, adjusted by baseline measures of teat distance and udder pressure, was used to analyze milk leakage.

Results

No differences were found on baseline measures. Cows in the TRT group had an udder pressure of 0.93 kgf/cm² (95% CI: 0.62, 1.25) while cows in the CON group had an udder pressure of 1.37 kgf/cm² (95%CI: 1.08, 1.68) at 24 h after dry-off at 5 cm ($P = 0.04$). At 20 cm distance from the base of the teat, cows in the TRT group had an udder pressure of 0.93 kgf/cm² (95% CI: 0.61, 1.26), contrasting with 1.33 kgf/cm² (95% CI: 1.03, 1.65) observed in the CON group, 36 h after dry-off ($P = 0.04$). Teat distance was 8.7 cm (95% CI: 7.9, 9.6) vs. 10.3 cm (95%CI: 9.6, 11.1) for the TRT and CON group, respectively, at 24 h after dry off ($P = 0.01$). No differences were found between TRT and CON groups for the hazard of milk leakage during the follow up period (HR: 0.96; 95% CI: 0.35, 2.63, $P = 0.9$). Cows in the TRT group had a decreased blood pH (TRT: 7.42 vs. CON: 7.49 ± 0.01 [SE]; $P = 0.003$) only at 12 h after bolus administration. Urine pH was lower at 12 (TRT: 7.55 vs. CON: 8.41 ± 0.12 [SE]; $P < 0.001$) and 24 h (TRT: 7.85 vs. CON: 8.27 ± 0.12 [SE]; $P = 0.02$) after bolus administration for cows in the TRT compared to CON group.

Significance

Cows receiving the acidogenic boluses showed decreased udder pressure at 24 and 36 h after dry off, as well as a decreased teat distance at 24 h after dry off. The administration of acidogenic boluses resulted in a temporary decrease in urine and blood pH in the first 24 h. The hazard of milk leakage was not affected by study treatment. The bolus showed to be a promising tool to facilitate the transition from lactating to dry periods and potentially improve animal welfare in the early dry period.

