Effect of switch trimming on fly avoidance behaviors, udder cleanliness, and milk quality in lactating Holstein and Jersey dairy cows

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Abstract

The objective of this study was to observe differences in fly avoidance behaviors, udder cleanliness, and milk quality in Holstein and Jersey dairy cows due to switch trimming. Both breeds (n=12 each; half trimmed, half intact) were divided into 3 groups of 8 and observed for 1 week. Cows were assigned an udder hygiene score (HS) using a multi-zone system for udder cleanliness (1=very clean to 4=very dirty; Cook, 2002). Fly counts (FC), foot stomps (FS), tail swings (TS), and panniculus reflexes (PR) were recorded during a 5-min period/cow twice daily. Composite milk samples were collected and somatic cell count (SCC) was determined using the DeLaval Cell Counter. Milk samples were cultured and incubated for 48-hr using a Tri-plate agar (University of Minnesota Easy Culture). Statistical analysis of FC, FS, TS, and PR, and SCC were conducted using the MIXED procedure, and HS and bacterial species counts (BSC) were evaluated using the FREQ procedure in SAS (v9.4). No differences in TS, FS, PR, FC, SCC, or BSC were observed among treatments. Cows with an intact switch exhibited improved HS compared to cows with trimmed switches (6.02 vs. 12.04% HS 2, P = 0.02; and 12.04 vs. 5.09% HS 3, P = 0.01 for trimmed vs. intact switches). No differences in FS, PR, or BSC were observed among breeds. Jerseys swung their tails more than Holsteins (12.44 vs. 9.59 ± 0.71, P = 0.005) and had lower FC (17.43 vs. 25.40 ± 2.9, P = 0.009). However, Jerseys had greater somatic cell scores than Holstein cows (4.65 vs. 2.39 ± 0.60, P = 0.02). These results indicate that cows with a trimmed switch are equally able to perform fly avoidance behaviors as cows with intact switches, and that Holstein cows had improved milk quality over Jerseys.

Introduction

- Tail docking is a common practice performed on dairy farms with the intent to eliminate the spread of bacteria from debris on the switch and allow for improved milker comfort (Ohio Dairy Industry Resources Center).
- The absence of the tail reduces the risk of spreading harmful bacteria to the udder; therefore, reducing the risk of common infections that lead to mastitis (Barnett et al., 1991).
- However, docking tails provokes welfare concerns for these animals (Ingle et al., 2017). Consequences of tail-docking include long-term pain associated with the nubbed tail, inability to communicate naturally, and altered methods of fly prevention behaviors (Ohio Dairy Industry Resources Center).
- In contrast, an intact tail poses the threat of increased mammary gland exposure to coliform bacteria, which, as a result, can negatively impact cattle as well as milk consumers (Schreiner and Ruegg, 2002).
- An intermediary solution has been devised in which the tail switch is trimmed, rather than docked completely.
- This method is superficial, similar to a haircut, and does not inflict pain on the animal.
- As a result, the cow can perform natural behaviors without risking the spread of harmful bacteria.
- Switch trimming has the potential to positively impact the dairy industry by providing an alternative to tail-docking that ensures both optimum health and welfare of dairy herds while simultaneously providing safe, high-quality milk production.

Objective

- The objective of this study was to determine the effect of tail switch trimming on fly avoidance behaviors, udder hygiene, somatic cell count, milk bacterial load, and milk production in Holstein and Jersey dairy cows.

Methodology

- Two groups of cows (12 Holsteins and 12 Jerseys; 24 total) randomly received 1 of 2 treatments (trimmed or in-tact switches) during three experimental periods for evaluation.
- Experimental periods consisted of three consecutive days of data collection in addition to two days of data analysis, each spaced four weeks apart.
- One group of cattle had their switches left intact, and the other groups' switches were trimmed completely using a commercial tail trimming device **(Figure 1).**
- To determine FAB, total fly counts, TS, FS, and PR (involuntary skin twitches) were recorded for each cow for 5 total minutes 2 times per day (0800 and 1600h) for 3 consecutive days (Eicher and Dailey, 2002). A visual multi-zone hygiene scoring system was utilized to examine udder cleanliness (Cook, 2002) once per day, each day of the experimental periods.
- Milk samples underwent SCC testing via the DeLaval cell counter. A cassette was used to draw up a small portion of each sample and was then placed into a DeLaval Cell Counter to quantify SCC (**Figure 2**).
- All milk samples were then plated on a tri-plate agar, stored in an incubator set to 100°F, and interpreted for bacterial species culture growth after 24 and 48 hours (**Figure 3**).
- Observations and records of bacterial growth took place during the final 2 days of each experimental period.
- Milk production, somatic cell count, and fly avoidance behaviors were analyzed using the MIXED procedure in SAS.
- Treatment and breed were evaluated as the main effects with cow considered a random effect. The FREQ procedure in SAS was used to evaluate the effect of treatment on hygiene scores and culture results.
- Results are reported as least squares means (LSM) with corresponding standard error of the mean (SEM) for fixed effects of treatment and breed. Residual distribution was evaluated for normality and homoscedasticity. Statistical significance was declared at $P \leq 0.05$ and trends at $0.05 < P \leq 0.10$.

Table 1. Least Squares Means for milk yield, somatic cell score, and milk conductivity by breed.

Measure	Jersey	Holstein	SEM	P-value
No. of cows	12	12		
Milk yield, kg/d	22.12	34.84	3.05	0.02*
Somatic cell score [a]	14.65	12.39	0.60	0.02*
Conductivity, mS/cm	9.54	7.71	0.12	0.01*

[a] Somatic cell count data was transformed using the following formula: SCS = log2(SCC/100) + 3.
* Significant difference at $P < 0.05$.

Table 2. Least Squares Means for fly counts and fly avoidance behaviors (tails swings, foot stomps, and panniculus reflex) by breed.

Measure	Jersey	Holstein	SEM	P-value
Fly count	17.43	25.40	2.88	0.009*
Tail swings	12.44	9.59	0.71	0.005*
Foot stomps	0.29	0.24	0.12	0.74
Panniculus reflex	2.32	1.67	0.43	0.28

*Significant difference at $P < 0.05$.

Results and Discussion

- Holstein cattle are expected to have a higher milk yield than Jersey cattle, as was observed in the present study (**Table 1**). According to past research, higher producing cows often experience higher SCS (Prendiville et al., 2010). However, in this study, Holstein cattle, despite having greater milk yield**,** showed a slightly improved average SCS compared to Jerseys (**Table 1**). Likewise, Holstein cattle had a lower average milk conductivity value, which together with a lower SCS indicates that Holsteins had improved milk quality over Jerseys (**Table 1**).
- Jersey cows had more tail swings and lower fly counts than Holstein cows (**Table 2; Figures 4 and 5**). One might expect that cows with fewer total flies, likely due to a greater amount of tail swings, might exhibit improved milk quality; however, that was not the case in the present study. These observed differences could just be due to small sampling size (n=12 per breed).
- Cows with docked tails traditionally perform increased numbers of tail swings and foot stomps as modified acts of fly avoidance compared to cows with in-tact tails (Botner et al., 2012). No difference was observed between cows of either treatment in relation to these modified behaviors in the present study**.**
- Contrary to our hypothesis, the hygiene scores between study groups showed that cows with in-tact switches had slightly improved hygiene scores than those with trimmed switches (**Figure 6**). The differences observed in hygiene scores between treatments were subtle, with no differences observed on either extreme end of the spectrum (very clean or very dirty). Even though the hygiene scores were assigned by the same individual throughout the trial, the subtle difference between a score of 2 or 3 could be negligible.
- There were no statistical differences observed for bacterial species cultured in the milk samples for either treatment or breed groups.

Conclusion

- Mastitis in dairy cows is among one of the largest threats to a dairy operation.
- This study examined the relatively new method of switch trimming (rather than docking) to observe potential affects on fly avoidance behaviors, milk productivity, and overall udder health; while taking into consideration animal welfare concerns and productivity of the cow.
- These results indicate that cows with a trimmed switch are equally able to perform fly avoidance behaviors as cows with intact switches, and that they have similar milk quality.
- Additionally, we observed that Holstein cows had lower SCS and milk conductivity than Jerseys, indicating improved milk quality.
- No differences were observed for species of bacteria cultured from milk samples between treatments or breeds.
- Switch trimming resulted in similar milk quality and natural behaviors as cows with in-tact switches; however, additional research is necessary to understand if trimmed switches are a viable alternative to docking tails.

References

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Schreiner, D. A., and P. L. Ruegg. 2002. *Effects of tail docking on milk quality and cow cleanliness*. J. Dairy Sci. 85.10: 2503-2511. https://www.sciencedirect.com/science/article/pii/S0022030202743336

Figure 1. Using the TailWell 2 Power Tail Trimmer device to remove the switch hair from tails of cows in the trimmed switch treatment.

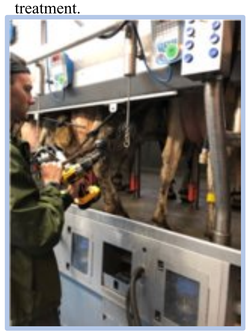

Figure 2. Determining and recording the somatic cell count of each milk sample using the DeLaval Somatic Cell Counter.

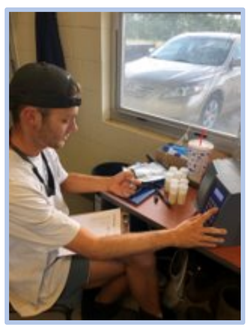

Figure 3. Plating milk samples on a tri-plate culture medium using a sterile swab.

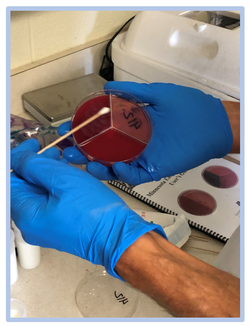

Figure 4. Mean number of tail swings for Holstein and Jersey cows during experimental periods. Holsteins averaged 9.59 ± 0.71 total tail swings and Jerseys averaged 12.44 ± 0.71 mS/cm (P = 0.005).

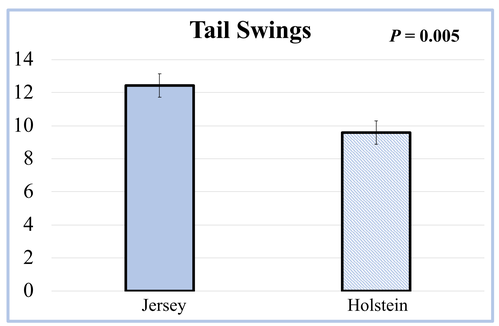

Figure 5. Mean number of flies counted for Holstein and Jersey cows during experimental periods. Holsteins averaged 25.40 ± 2.88 total flies and Jerseys averaged 17.43 ± 2.88 mS/cm (P = 0.009).

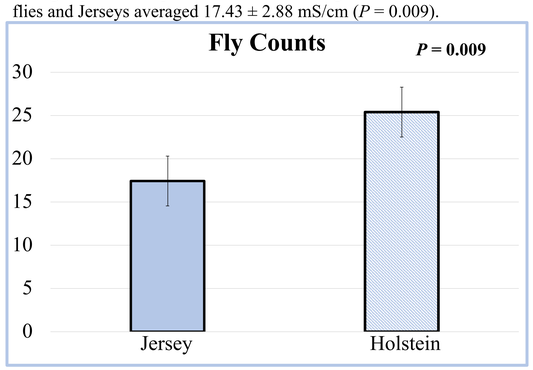

Figure 6. Mean udder hygiene score frequencies by treatment (P = 0.003). Cows were not more likely to score a 1 or 4 in either in-tact or trimmed switch treatment (P = 0.18 and P = 0.17, respectively). In-tact cows scored 2* more frequently (P = 0.02) and trimmed cows scored 3+ more frequently (P = 0.007).