Gradual vs. Abrupt Cessation of Milking at Drying off in Dairy Cows

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Introduction: It is a challenge to dry-off cows that are producing high levels of milk. Cows producing > 21 kg/d at dry-off were 1.8 x more likely to experience a delay in teat canal closure due to milk leakage (Dingwell et al., 2004). Milk leakage is a risk factor for increased intra-mammary-infections (Klaas et al., 2005) and drying off methods that limit leakage may be advantageous. Another important aspect of drying-off cows is an assessment of the impact of the dry-off method on cow welfare. Once milking is stopped, pressure builds up within the gland and discomfort is experienced by the cow. Several authors have reported that as mammary gland pressure increases, cows reduce time lying down. Behavior may also be impacted negatively by concurrent changes in diet and/or water accessibility at dry-off.

Research Paper Review: A paper published by Zobel et al., 2013 reported the results of research designed to assess the effects of abrupt vs. gradual cessation of milking on cow comfort (as indicated by changes in lying behavior and time standing at gate), milk leakage, and udder health. Holstein cows (24) producing 24 ± 5 kg/d of milk and a DIM = 319 ± 35 d were used in the experiment Cows were moved into the experimental pen at d -4 relative to initiation of the dry-off protocols and fed a TMR (DM: 48%, CP: 14.2% DM, NDF: 41.0% DM). On d 0, the diet was switched to ad libitum oat straw (DM: 93%, CP: 6.7% DM, NDF: 68.7% DM) and 10 kg of tall fescue grass hay (DM: 93%, CP: 16.4% DM, NDF: 49.1% DM)/cow. This ration shift had been shown to decrease milk production and increase feeding time by 19% (Valizaheh et al., 2008). Cows had ad lib access to water. Cows were housed at a 50% stocking density with 12 sand bedded stalls and 12 headlocks.

Cows were assigned to pairs, with one cow from each pair randomly assigned to 1 of 2 experimental treatments: (1) abrupt cessation of milking or (2) gradual cessation of milking consisting of a series of single-missed and double-missed milkings (d 0–2 = morning milking only; d 3 = afternoon milking only; d 4 = no milking; d5 = morning milking and dry-off). On d 0, abrupt cows were milked and then completely dried-off; gradual cows were dried-off on d 5. Intramammary antibiotic, internal teat sealer and external teat sealant were administered at dry-off to both treatment groups. Behavior and milk leakage were observed from d -3 to 8 relative to the first skipped milking. Behavioral data were categorized for 3 periods: period 0 (baseline; d -3 to d -2), period 1 (abrupt cows dry, gradual cows milking; d 0–4), and period 2 (all cows dry; d 5–8). Video was used to determine motivation to be milked (standing at the gate) and feeding behavior. Milk leakage was monitored every 20 min for 2-h periods following the milking times of 0500 and 1500 h after the complete cessation of milking (period 1 for abrupt dry-off cows and period 2 for gradual dry-off cows). Overall leakage incidence for each treatment group was summarized as either 0 (no milk leakage observed during all 4 d) or 1 (milk leakage observed at some point over the 4 d). Composite milk samples were taken on d -1 (gradual and abrupt), 0 (abrupt), 5 (gradual), as well as first colostrum, d 1and 7-10 d postcalving (gradual and abrupt). Milk samples were analyzed for SCC and bacteria (in cases of mastitis). A logarithm transformation [SCS = log2 (SCC/100,000) + 3] was used to convert SCC to SCS.

Results

Milk production: There was no difference in milk yield between treatments on the day before dry-off, averaging 24.2 and 23.8 kg/d in the abrupt and gradual treatments, respectively. During the 5 d of skipped milkings for the gradual treatment, milk production declined (on average 0.6 kg/d; $P < 0.0001$). Production for the gradual cows averaged 10.9 kg at final milking before complete dry-off compared with 14.1 kg at final milking for abrupt cows ($P < 0.02$). The decline in milk yield in the gradual treatment over the 5 day period represents the impact of diet change (lower energy) as well as the change in milking frequency on milk yield.

Behavior: Treatment did not have an effect on any of the behaviors monitored ($P > 0.05$ for treatment and treatment × period). Period did have an effect on behavior. Lying time, frequency of lying bouts, lying bout duration, and feeding time changed with period. Dry-off (regardless of treatment) had the biggest impact on behavior. Lying time decreased from 14.1 vs. 13.2 h/d ($P < 0.0001$). Lying bouts/d decreased from 10.7 to 8.3 ($P < 0.0001$). Lying bout duration increased from 1.4 vs. 1.7 h/bout ($P < 0.0001$) and feeding time increased from 5.0 vs. 5.9 h/d ($P < 0.0001$). Cows that produced more milk before dry-off spent less time lying down after dry-off ($P= 0.04$). Cows producing more milk also had increased feeding time ($P = 0.01$). Compared with baseline (Period 0), the odds of standing at the gate increased for abrupt cows (period 1: odds ratio = 6.2; 95% CI: 2.7–14.4; and period 2: odds ratio = 5.2; 95% CI: 1.8–14.6). No increase in time spent standing at the gate was noted in gradual cows.

Milk Leakage: During the observation days following complete cessation of milking, more abrupt cows (9/12) leaked compared with gradual cows (3/11; $P = 0.04$). Abrupt cows began leaking 1 d after dry-off, and leaking continued for the next 2 d of observation. Gradual cows were observed leaking milk only on d 3 after dry-off. Of the cows that leaked after dry-off, abrupt cows leaked for a higher percentage of the total observations (Table 1). Milk production before dry-off did not differ between cows that later leaked or did not leak milk (Table 1).

SCS: Treatment did not have an effect on SCS ($P > 0.05$ for treatment and treatment × sample time). No difference was observed between d -1 and final milking (d 0) SCS for abrupt cows. However, after removal of 1 outlier, which was having undue influence on SCS before dry-off, the gradual treatment's SCS increased between d -1 and final milking (d 5; 2.3 vs. 3.7; $P = 0.04$). Therefore, changes in SCS from baseline (d-1) to after calving were tested separately for each treatment. Both treatments had an increase in SCS at calving (colostrum) and both returned to below pre-dry-off levels within 7 to 10 d after calving (Table 2). Three cows developed clinical mastitis at after calving (2 gradual dry-off cows and 1 abrupt dry off cow).

Conclusion

Late lactation, high producing cows reduced their lying times and increased daily feeding time, regardless of dry-off procedure. Dry-off was stressful for the cow regardless of the dry-off procedure used. The gradual dry-off procedure did result in a reduction in the frequency of milk leakage but it had no influence on SCS when compared to abruptly dried-off cows. The reduction in ration energy density during dry-off, as well as the dry-off mammary treatment

regime with an antibiotic and internal and external teat sealant, may have played a role in mitigating the impact of dry-off method on cow health in this experiment.

Table 1. Percent of total observations in which cows were leaking for abrupt and gradual dry-off treatments, as well as milk production of both leaking and nonleaking cows.

	Abrupt dry-off (n = 12)			Gradual dry-off (n=11)		
Item	Mean	SD	Range	Mean	SD	Range
Total observations in which cows were leaking, %	36	16	8-62	10	8	3-18
Last milking milk production (cows that leaked),* kg/d	13.6	3.0	10.5-18.0	13.7	2.8	11.0-16.5
Last milking milk production (cows that did not leak),* kg/d	15.7	3.6	11.5-18.0	9.5	3.7	5.5-16.0

*last milking day dependent on treatment group (abrupt = d 0 and gradual = d 5).

Table 2. Changes in SCS after calving compared with baseline samples taken for each treatment on the last day of milking (abrupt = d 0, gradual = d 5).

	Abrupt dry-off[1] (n = 12)			Gradual dry-off[2] (n=11)		
SCS	Estimate	SED	P-value	Estimate	SED	P-value
Colostrum	2.7	0.5	<0.0001	1.1	0.5	0.02
24 h after calving	1.6	0.5	0.02	0.7	0.5	0.22
7 to 10 d after calving	-0.6	0.5	0.3	-2.4	0.6	<0.0001

1. Abrupt dry-off baseline (d-1) SCS (mean +/- SD: 2.3 +/- 1.4).
2. Gradual dry-off baseline (d-1) SCS (mean +/- SD: 3.7 +/- 1.3).

References

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