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Short-term effects of regrouping on behavior of prepartum dairy cows

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ABSTRACT

The objectives were to determine the effect of regrouping during the dry period on feeding, social, rumination, and lying behavior for cows that were moved to a new pen and cows that remained in their home pen but had new cows introduced. Forty-eight prepartum Holstein dairy cows were housed in groups of 6 and regrouped in groups of 3 (16 triads) with 1 triad moving to another pen and 1 triad staying in the same pen; the triad was considered the experimental unit. For 7 d before and 8 d after regrouping, cows were continuously monitored for feeding, rumination, and lying behavior by means of an electronic feeding system, a rumination logger on each cow's neck, and a data logger attached to 1 of the hind legs, respectively. Video recording was used to monitor displacements at the feeder for 3 h following the afternoon fresh feed delivery before regrouping and for the 2 subsequent afternoon feed deliveries after regrouping. Cows that were moved to a new pen after regrouping decreased DMI by approximately 9% on the day of regrouping compared with baseline values, but cows that remained in their home pen showed no significant decrease in intake after regrouping. Feeding rate decreased in both treatments by 10% after regrouping. Rumination times also decreased by approximately 9% in both treatments, reaching the lowest values on the day of regrouping for cows that stayed in the home pen and on the day after regrouping for the moved cows. Cows that were moved to a new pen displaced other cows at the feeder twice as frequently after regrouping, but no such effect of regrouping on cows that stayed in the home pen was observed. These results indicate that regrouping can affect behavior of prepartum dairy cows, especially those cows that are moved to a new pen.

Key words: regrouping, dry period, behavior, rumination

INTRODUCTION

In modern dairy production systems, regrouping of cows is a common management practice, and many cows experience 4 or more regroupings per lactation. As regrouping strategies are usually based on stage of lactation, reproductive status, and dietary requirements, the majority of regrouping events take place immediately before, during, and immediately after the dry period (Cook and Nordlund, 2004). For example, at the end of lactation the cow may be regrouped to facilitate dry-off. After dry-off, cows are often regrouped into a far-off group, followed by another regrouping into a close-up group at approximately 21 d before calving. Cows are again moved and often regrouped in a maternity pen in the days immediately before parturition, and moved again to a fresh pen immediately after calving when the cow enters the lactating herd (Smith et al., 2001). Each regrouping exposes the cow to new individuals or new combinations of individuals, hence a changing group composition, contributing to social turmoil (Cook and Nordlund, 2004; von Keyserlingk et al., 2008).

When lactating cows are regrouped they re-establish social relationships using non-physical and physical interactions (Arave and Albright, 1976; Kondo and Hurnik, 1990). Earlier work has shown that regrouping can have negative consequences on both milk production (Arave and Albright, 1976; Hasegawa et al., 1997) and behavior, such as an increase in agonistic interactions (Brakel and Leis, 1976) or a decrease in feeding time (Hasegawa et al., 1997). von Keyserlingk et al. (2008) monitored cows in midlactation before and after they were placed into a new social group. Their results show that after regrouping, the animals decreased time spent feeding, time spent lying down, and time spent engaged in allogrooming compared with before regrouping.

Previous work has shown that the number of aggressive interactions is most frequent immediately after regrouping (Brakel and Leis, 1976; Kondo and Hurnik, 1990; von Keyserlingk et al., 2008), with regrouped cows being displaced more often from the feeding area by other cows. Much of the social competition in a group pen occurs in the feeding area (Val-Laillet et al., 2008) and this competition can lead to a dramatic decrease

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in time spent feeding, particularly for subordinate cows (DeVries et al., 2004; Huzzey et al. 2006).

Changes in feeding time and DMI likely affect rumination behavior (Okine and Mathison, 1991), and factors that directly affect rumination may affect feeding behavior and DMI. For instance, steers that were prevented from ruminating by wearing a tight mask, preferred to ruminate instead of eat fresh hay when the mask was removed (Welch, 1982). Moreover, it has long been accepted that rumination is necessary for particle breakdown and microbiological digestion required for passage through the digestive tract (Balch, 1952). Hence, one would assume that preventing a ruminant from ruminating and emptying the rumen would cause a decrease in voluntary feed intake.

Social stress in cattle can be linked to a decrease in time spent ruminating (Bristow and Holmes, 2007). Yet, only one study (Hasegawa et al., 1997) has examined the effects of regrouping on rumination behavior in loose-housed cattle, but this work studied heifers and did not start to monitor rumination until 2 d after regrouping.

Although some studies show evidence suggesting that regrouping events are associated with changes in behavior for animals relocated to a new pen (Lamb, 1976; Arave and Albright, 1976), to date, no study has examined the effects of regrouping on cows already in the pen. Moreover, little work has been done to investigate the effect of regrouping on dairy cows during the dry period.

The objectives were to determine the effect of regrouping cows during the dry period on DMI, feeding behavior, rumination behavior, and lying behavior for a) cows that were moved to a new group in a different pen and b) cows that were in a pen in which new cows were introduced. Given the results of previous work we hypothesized that regrouping far-off dairy cows would result in decreased feeding time, DMI, lying time, and time spent ruminating, and increased feeding rate and aggressive behavior at the feed bunk. We also hypothesized that these effects of regrouping would be greater for cows moved to a new pen than for cows kept in their home pen.

MATERIALS AND METHODS

Animals, Housing, and Diet

A total of 48 multiparous nonlactating Holstein dairy cows (parity = 2.2 ± 1.4; mean ± SD) were observed. The cows were enrolled at 40 ± 8 d before their expected calving date and had been not lactating 21 ± 10 d. The study was conducted between November 2008 and January 2009 at the University of British Columbia's Dairy Education and Research Centre (Agassiz, BC, Canada). Animals were cared for according to the guidelines set by the Canadian Council on Animal Care (1993).

Two experimental pens, housing 6 cows each, were used. The pens were separated by a non-experimental pen that housed 12 cows, ensuring no direct social contact between cows housed in the 2 pens. All pens were located in 1 row on the same side in 1 barn and had the same measurements of 10.2 × 13 m. Each pen was equipped with 6 Insentec feed bins, 1 Insentec water bin (Insentec, Marknesse, the Netherlands), and 12 stalls (for stall dimensions see Reich et al., 2010) in 2 rows of 6, fitted with a mattress (Pasture Mat, Promat Inc., Woodstock, Ontario, Canada) covered with approximately 5 cm of washed river sand. Cows were provided access to only 3 of the 6 feed bins, resulting in a cow-to-feed bin ratio of 2:1. The Insentec system was programmed to allow all cows to access all 3 feed bins and the water bin. Cows were allowed access to 1 of the 2 rows of stalls with the other row being blocked, resulting in a cow-to-stall ratio of 1:1.

The cows were fed a TMR formulated according to the recommendations provided by the National Research Council (NRC, 2001). Cows were fed with ad libitum intake and fresh feed was provided twice daily at approximately 0800 ± 1 h and 1600 ± 1h. Feed samples were collected twice weekly, at the time of fresh feed delivery, from both pens and then pooled. The samples were stored in a freezer and then thawed and dried at 60°C for 2 d to determine the DM content. For nutrient analysis, the dried samples were sent to Cumberland Valley Analytical Services, Inc. (Maugansville, MD) to determine the average (±SD) CP, ADF, NDF, total digestible nutrients, and NE_L content of the feed fed throughout the study. The TMR consisted of 43.6% grass silage, 39.7% corn silage, 12.7% straw, and 4.0% mineral and concentrate mix on a DM basis (DM: 95.05 ± 0.25%; CP: 15.1 ± 1.4% of DM; ADF: 32.2 ± 3.3% of DM; NDF: 53.05 ± 4.55% of DM; and NE_L: 1.43 ± 0.7 Mcal/kg).

Experimental Design

A total of 48 cows (parity = 2.2 ± 1.4) was used, divided into 4 replicates of 12 cows. For each replicate, 12 nonlactating cows were randomly selected, without replacement, using a random number generator (Excel, version 2003; Microsoft, Redmond, WA) and divided into 2 groups of 6 cows. Each group of 6 was housed in 1 of 2 experimental pens. Groups were allowed to stabilize for 3 d and then baseline recordings for feeding, rumination, and lying behaviors were taken for 7 consecutive days before regrouping (d −7 to −1).Regroup-