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Effect of prepartum grouping strategy on displacements from the feed bunk and feeding behavior of dairy cows

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ABSTRACT

The objective of the current study was to determine whether providing stable pen management affected displacements from the feed bunk and feeding behavior of prepartum dairy cows. Two hundred and twenty-four nonlactating Jersey primiparous and multiparous cows were enrolled in the study. The 2 treatments were all-in-all-out (AIAO; 44 cows were moved into the close-up prepartum pen as 1 group, with no additions during the 5-wk repetition) or traditional (TRD; with weekly entrance of new cows to maintain a pen density of 44 cows). Cows (253 ± 3 d of gestation) were balanced for parity and projected 305-d mature-equivalent milk yield and assigned randomly to either AIAO or TRD treatments. At enrollment, cows with a body condition score <2 or >4 (1–5 scale; 1 = emaciated and 5 = obese) or with a locomotion score >3 (1–5 scale; 1 = normal gait and 5 = severely lame) were not included. Displacements from the feed bunk were measured weekly for both treatments when TRD cows were moved into the close-up pen (d 0) and additionally on d 1, 2, 3, and 7 for 3 h after fresh feed delivery. A displacement rate was created to take into account differences in stocking density throughout the experiment. Displacement rate was calculated as the number of displacements divided by the number of cows in the pen at that time. Feeding behavior was measured using video 10-min scan sampling for 24-h periods at d 0, 1, 2, and 7. Displacements and feeding behavior were recorded for all 5 wk of each repetition. Treatment × week interactions were detected for number of displacements and displacement rate. The TRD treatment had more displacements from the feed bunk than AIAO in wk 1, 3, and 5, with no differences in wk 2 and 4. Similarly, the TRD treatment had a greater displacement rate than the AIAO treatment in wk 1 and 5, with a tendency in wk 3. No differences between the treatments were detected in wk 2 and 4. A treatment × week interaction existed for feeding time. Cows housed in the AIAO treatment had longer average feeding times in wk 2 with a tendency in wk 3, but spent 39 fewer minutes eating than those in the TRD treatment during the wk 1 of the study. Housing prepartum close-up cows with stable pen management reduced displacements from the feed bunk and altered average daily feeding times.
Key words: prepartum dairy cow, feeding behavior, social behavior

INTRODUCTION

The transition period (considered 3 wk before to 3 wk after parturition; Grummer, 1995) is a critical time for the dairy cow. During this period, cows experience physiological, immune, and nutritional changes that make the cow at risk for metabolic and infectious diseases (Goff and Horst, 1997). Dry matter intake depression occurs during the final 2 to 3 wk before parturition, yet is a time when demand for nutrients is increasing (Grummer et al., 2004). Up to 25% of cows are culled or die during the first 60 DIM (Godden et al., 2003), which could be attributed to an unsuccessful transition period. Minimizing stressors during the transition period may allow for a successful transition from the nonlactating to the lactating stage.

On large commercial dairy farms, cows are commonly subjected to many pen changes during their lactation and dry period (Grant and Albright, 2001). One strategy recommended to nutritionally manage prepartum dairy cows is to have a far-off and a close-up dry period (Watters et al., 2008). These pens are typically subjected to once-per-week or twice-per-week inclusions of new animals after cows leave the pen for calving to maintain a desired stocking density. These pen movements may disrupt the social dynamics of the group and negatively affect DMI (Cook and Nordlund, 2004). When dairy cattle are subjected to regrouping, increased physical agonistic behaviors, such as displacements, threats, and butting, and a decrease in milk production occur (von Keyserlingk et al., 2008). Prepartum cows moved into a new pen had reductions in DMI and rumination time, and these moved cows displaced other cows already pre-

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viously in the pen twice as frequently after regrouping (Schirmann et al., 2011). These negative physical interactions usually moderated 3 d after regrouping (Kondo and Hurnik, 1990). The lower-ranking animals seemed to be the most affected by regrouping. These animals spent more time standing without eating and ate at a faster rate, putting the animal at risk for ruminal acidosis and lameness events (Proudfoot et al., 2009).

Nordlund et al. (2006) recommended that producers adopt a stable social grouping during the prepartum period to minimize social disruptions. Cows with a similar calving date can be grouped together during the prepartum close-up period and stay in that pen until calving or calve in bedding pack pens (Cook, 2009). During this time no new cows are added to the pen until all to most of the current animals have calved. A disadvantage of the stable pen management system is the need for additional pens, which increases building cost. Cook (2009) recommends sizing the pens to accommodate 140% of the average weekly calving rate with stable pen management. At times, pens will be underused while a few remaining cows await parturition. A study that examined stable pen management versus a dynamic pen did not find a difference in the number of displacements from the feed bunk, DMI, plasma NEFA concentrations, and milk production up to 30 DIM (Coonen et al., 2011). In that study, approximately 1 cow was added at a time to a small pen with only 10 cows. Additionally, cows in their study calved in the dry cow pen. It is unknown whether these results would be similar to movements of small groups of cows into a larger pen, with cows being moved to a calving pen as they near parturition, similar to conditions experienced on large commercial dairies.

The objective of our study was to examine whether having a stable social group or all-in-all-out (**AIAO**) treatment during the close-up prepartum period would alter the number of displacements from the feed bunk or total daily feeding time compared with cows housed under traditional (**TRD**) pen management, with weekly entrance of new animals in a large dairy setting. We hypothesized that the AIAO treatment would result in fewer displacements from the feed bunk and a longer daily feeding time than the TRD treatment.

MATERIALS AND METHODS

Animals and Housing

A total of 224 primiparous and multiparous nonlactating Jersey cows were allocated to 4 groups (2 treatments × 2 replications) from June to September 2011. The study was conducted at a large commercial dairy farm (6,400 lactating animals) in south-central Minnesota. Prepartum cows were provided a TMR once daily at approximately 0500 h and fed from a feed alley by headlocks. Feed was pushed up frequently throughout the day by farm personnel.

When cows demonstrated signs of calving, farm personal moved the cows to an individual box stall. At d 1 postcalving, cows were moved into a freestall pen with 240 stalls and 260 headlocks stocked at 100% based on the number of stalls for 21 d. Video observation ceased when the cows left the dry period treatment pens.

Experimental Treatments and Design

At enrollment, all cows were in ≥1 lactation. Cows were required to have a BCS between 2 and 4 (1–5 scale; 1 = emaciated and 5 = obese) and a locomotion score <3 (1–5 scale; 1 = normal gait and 5 = severely lame) or were not included in the study. Cows 253 ± 3 d in gestation were balanced for parity (1 or ≥2 lactation) and projected 305-d mature-equivalent milk yield at enrollment and were assigned to 1 of the 2 study pens. The 2 treatments were AIAO: 44 cows assigned to a pen as a group and no new cows added during a 5-wk period (n = 2, with a total of 88 cows) or TRD treatment: weekly entrance of new cows to maintain a pen density of 44 cows after cows in the pen calved (n = 2, with a total of 136 cows). During the initial week of each replicate, 44 cows entered the AIAO treatment, with no new cows entering the pen during the 5-wk observation period. During the initial week, cows enrolled in the TRD treatment were added to a group of close-up cows to reach a pen stocking density of 44 cows. New cows were enrolled weekly in the TRD treatment pen to maintain a stocking density of 44 cows (92% feed bunk; 100% stall stocking density) across the study period. At the end of the 5-wk replicate, a new TRD and AIAO group started, but treatments switched pens to avoid location bias.

Two experimental pens housing 44 cows each were used. The pens were on either side of a feed lane in a 12-row low-profile cross-ventilated freestall barn and located on one end of the middle rows of the barn adjacent to the dairy's additional, nonexperimental close-up prepartum pens. Both experimental pens had the same measurements of 31.7 × 11.0 m, and had 44 sand-bedded freestalls [229 (length) × 107 (width) × 114 (height) cm] with a head-to-head configuration and forty-eight 0.61-m headlocks (92% feed bunk stocking density). Two water troughs were located in the pen and measured 366 × 56 cm. One water trough was located at the end of the bank of freestalls and a shared water trough was located between the treatment pen and an adjacent nonexperimental pen. Hourly pen temperatures were collected for the duration of the study