

Feed Stalls Affect the Social and Feeding Behavior of Lactating Dairy Cows

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ABSTRACT

The first objective of this study was to study the effects of increased bunk space on the frequency of aggressive behavior at the feed bunk and on feed access. The second objective was to determine whether the addition of partitions (feed stalls) between adjacent cows would provide additional protection while feeding, particularly for subordinate cows. Twenty-four lactating Holstein cows were subjected to each of 3 treatments in 3 successive 10-d treatment periods using a 3×3 Latin square design. The treatments tested were: 1) 0.64 m of feed bunk space/cow, 2) 0.92 m of feed bunk space/cow, and 3) feed stalls (0.87 m of feed bunk space/cow with feed stall partitions separating adjacent cows). Time-lapse video was used to quantify the feeding and standing behavior, as well as the aggressive behavior (displacements) displayed by the cows at the feed bunk. To meet our first and second objectives, we compared data from the 0.64 m/cow treatment with that from the 0.92 m/cow treatment, and data from the 0.92 m/cow treatment with that from the feed-stall treatment, respectively. Total daily feeding time increased when feed bunk space was increased from 0.64 to 0.92 m/cow. Further, the time spent standing in the feeding area while not feeding and the frequency of aggressive interactions at the feed bunk decreased when more bunk space was provided. The addition of feed stalls resulted in more pronounced effects compared with when cows had 0.92 m/cow of bunk space. The feed stalls also forced cows to change the strategy by which they displaced others from the feed bunk, forcing them to also initiate contact at the rear of the animal they were displacing rather than only from the front and side, as in the other 2 treatments. Further, when the cows were provided with additional feeding space, particularly when combined with feed stalls, those cows with lower social status at the feed bunk experienced the greatest decreases in the number of times they were displaced per

day. The results indicated that providing increased feed bunk space, particularly when combined with feed stalls, will improve access to the feed and reduce competition at the feed bunk, particularly for subordinate cows.

Key words: feed stall, feeding behavior, competition, dairy cow

INTRODUCTION

In the dairy industry 0.61 m of linear feed bunk space has traditionally been regarded as an adequate amount space per lactating dairy cow (Grant and Albright, 2001). In previous research we examined the effect of feed bunk space on the spacing, competitive, and feeding behavior of dairy cows, and found that increasing the amount of feed bunk space above 0.61 m led to increased spatial separation between cows and fewer aggressive interactions while feeding (DeVries et al., 2004). These changes in spacing and aggressive behavior allowed cows to increase feeding activity, and this effect was the most dramatic for the subordinate animals. In a follow-up study, we demonstrated that decreased stocking density at the feed bunk reduced competition and increased feeding time, regardless of the type of feed barrier used (Huzzey et al., 2006).

Even though the additional feed bunk space in both of these experiments reduced competition at the feed bunk, it did not eliminate it, suggesting that additional factors are contributing to this competition for food resources. Research undertaken with other domesticated species indicates that the configuration of feeding spaces can have profound effects on feeding competition. Several researchers (e.g., Baxter, 1986; Barnett, 1997; Andersen et al., 1999) have investigated the effects of different feed trough partitions on the aggressive behavior of pigs observed during feeding. Without exception, these researchers found that partitions between adjacent feeding animals reduced aggression and displacements at the feed trough and that longer partitions resulted in greater reductions in aggressive behavior.

In many modern dairy systems, dairy cattle are separated from their feed by a post-and-rail feed barrier,

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which allows the cows to move their head to and from the feed as well as from side to side. For cattle, which often displace one another while feeding by swinging and butting with the head, modifications to the barrier that restricts contact between the head of a cow and the head or body of an adjacent cow may be particularly effective in reducing competition. We recently completed 2 studies (Endres et al., 2005; Huzzey et al., 2006) comparing the post-and-rail barrier to the headlock barrier. The headlock barrier provides a limited division (a vertical bar) between the necks of adjacent cows. In both studies, the use of the headlock barrier significantly reduced the incidence of displacements at the feed bunk. However, the use of the headlock did not completely eliminate aggressive behavior at the feed bunk, indicating that the neck division may not provide full protection.

Konggaard (1983) suggested that cows might feel more protected when a physical separation exists between conspecifics during feeding. To date, limited data are available comparing feed barrier designs in free-stall facilities that provide a partition between adjacent animals while feeding at the feed bunk. Bouissou (1970) tested different partitions between dominant and subordinate cows at the feed trough to determine which type of partition allowed the subordinate cow to feed for the longest period of time. Bouissou found that partitions separating the heads and those separating the heads and bodies of the individuals significantly increased the feeding times of the subordinate cows. Unfortunately, this research was conducted using only pairs of animals, which prevents extrapolation of the results to larger and more socially complex groups. Further, the cows used by Bouissou were horned, which may explain why the head separations provided the greatest benefit in terms of increased feeding times.

In summary, there is a growing body of evidence suggesting that decreasing stocking density at the feed bunk will reduce competition and increase feed access. Further, researchers have demonstrated in pigs and cattle that providing partitions that separate the bodies of adjacent animals can have profound effects on reducing competition and allow animals to feed for longer periods of time. Based on this research, our first objective was to study the effects of increased bunk space on the frequency of aggressive behavior at the feed bunk and on feed access. Our second objective was to determine whether the addition of partitions (feed stalls) between adjacent cows would provide additional protection while feeding, particularly for subordinate cows.

MATERIALS AND METHODS

Animals, Housing, and Diet

Nine primiparous and 15 multiparous (parity = 3.3 ± 1.1 ; mean $\pm$ SD) lactating Holstein dairy cows were

used in the study. The animals were 141.7 ± 16.4 DIM at the beginning of the data collection period. The cows were housed in a free-stall barn located at The University of British Columbia Dairy Education and Research Centre (Agassiz, BC, Canada) and were managed according to the guidelines set by the Canadian Council on Animal Care (1993). The cows were fed *ad libitum* a TMR consisting of 14.7% corn silage, 21.3% grass silage, 12.3% alfalfa hay, and 51.7% concentrate mash on a DM basis. The composition of the TMR was 47.1% DM and contained, on a DM basis, 18.2% CP, 35.2% NDF, 19.0% ADF, 0.88% Ca, and 0.42% P. The TMR was formulated according to the NRC (2001) nutrient requirement recommendations for high-producing dairy cows. Cows ate from a feed bunk with access via a post-and-rail feed barrier, which was the same as that described by Huzzey et al. (2006). Animals were delivered feed at approximately 0630 and 1515 h each day. Feed was pushed up closer to the cows at 1100, 1830, and 2230 h daily. The animals were milked between 0615 and 0645 h in the a.m. and between 1615 and 1645 h in the p.m. Milk yields were automatically recorded at each milking.

Representative samples of the TMR were taken for each group at the time of each feed delivery and from the orts on d 5 and 10 of each treatment period. Dry matter content of the samples was determined by oven-drying at 60°C for 2 d. Dry matter intake for each group for each day on the treatment was recorded by subtracting the DM weight of the orts from the DM weight of the delivered feed. The daily orts averaged $10.7 \pm 4.7\%$ (mean $\pm$ SD) of the delivered feed provided over the course of the experiment. This study was designed to test predictions concerning feeding and competitive behavior and was not designed to test DMI or milk production differences (because of the inability to measure individual DMI and the relatively short treatment periods, respectively); therefore, treatment differences for these later variables were not tested. The cows had an average DMI of 25.0 ± 1.3 kg/d and an average milk yield of 39.9 ± 7.7 kg/d over the course of the experiment.

Experimental Treatments and Design

The animals were divided into 3 equal groups of 8 cows, which were balanced according to DIM, projected 305-d milk production ($11,409.4 \pm 1,874.4$ kg), and average parity (2.9 ± 1.6). These groups were created by blocking cows into groups of 3 cows (similar in parity, DIM, and projected 305-d milk production), and then randomly assigning the cows in these blocks to 1 of the 3 experimental groups.

The groups were randomly assigned to 1 of 3 adjacent pens, each having a total of 7.38 m of accessible feed

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