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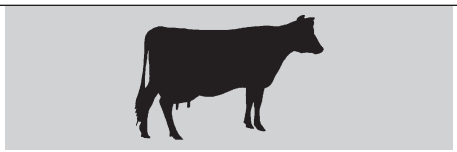

Case Study: Lying behavior of dairy cows presented with different cubicle arrangements

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ABSTRACT

In most freestall dairy herds cows must choose between lying in a freestall facing another cow or lying in a freestall facing a wall. In this study, we monitored lying behavior preferences of 12 lactating cows (6 primiparous and 6 multiparous) for 11 consecutive d during summertime. The 12 focal cows were in a pen with 17 additional cows and had access to 36 freestalls: 18 facing a wall (133 cm high) and 18 facing another freestall (STS; 2 rows of 9 freestalls each). The freestalls facing a wall (SFW) were the farthest from the feed bunk. The feed alley had a width of 4.6 m, and the alley between STS and SFW was 4.1 m wide. All freestalls were 130 cm wide and 237.5 cm long plus an additional 90 cm of frontal space for the cow to lunge forward while standing up. The focal cows were marked with paint, and their lying activity was video recorded during 12 d from 0800 to 2200 h. Cows lay down more in SFW in the afternoon and more in SFS in the morning. Overall, there were no differences in lying time between both freestall settings. However, cows lay in STS almost a double number of occasions than in SFW, but interestingly, lying bouts were longer in SFW than in STS. The shorter bouts in SFS compared with SFW were most likely because of the disturbance caused by an incoming cow in the opposite freestall (which could not occur in SFW). In fact, in 72% of the occasions, resting of cows on SFS was terminated when a cow entered to lie down in the freestall in front. It is concluded that once cows lie in SFW, they spend more time resting than when lying in SFS.

Key words: behavior, design, resting, stall

INTRODUCTION

Improving cow comfort may have positive consequences on milk yield, productive life, and overall profits of a dairy operation. An important component of cow comfort is linked to the fulfillment of the needs associated with lying behavior of dairy cows. Dairy cows spend between 9 and 14 h/d lying down (Tucker et al., 2004; Endres and Barberg, 2007). It is well known that dairy cows prioritize resting over other behaviors (Munksgaard et al., 2005), and cows that are prevented from lying show behavioral and physiological stress responses (Munksgaard and Simonsen, 1995; Fisher et al., 2002), increased risk for mastitis (Kjaestad and Simensen, 2001), and impairments of claw health (Faull et al., 1996) and welfare and cow comfort (Herlin, 1997). Behavior is one of the most commonly used and sensitive indicators of animal welfare (Haley et al., 2001). Time spent lying down, the frequency of lying bouts, and the duration of individual bouts have been proposed as measures of stall comfort (Haley et al., 2000) and are considered to be useful proxies for animal welfare (Fregonesi and Leaver, 2001). For instance, lying behavior, in particular around feed delivery time, has been shown to be a good indicator of lameness (Yunta et al., 2012).

Dairy herd owners must undertake multiple and long-term choices during the planning and building of new freestall barns, including stall surface, dimensions, divider designs, and freestall arrangement (i.e., 2 vs. 3 rows). Most of these aspects, such as stall surface and bedding quality (Tucker et al., 2003; Fregonesi et al., 2007b; Norring et al., 2010), stall size and configuration (Tucker et al., 2004, 2005, 2006), stocking density (Fregonesi et al., 2007a), pen flooring (Fregonesi et al., 2004), and milking and feeding management (Overton et al., 2002; Devries and von Keyserlingk, 2005) have been thoroughly evaluated. However, to our knowledge, the potential effect of freestall

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arrangement within a barn (i.e., freestalls facing a wall or freestalls facing each other) on lying behavior of dairy cows has been only partially assessed (Wagner-Storch et al., 2003). In 3- or 6-row barns, the number of freestalls (or cubicles) for cows that are facing each other is lower than in 2- or 4-row barns, and although building space is typically lower (and thus construction is less expensive) for 3- or 6-row barns compared with 2- or 4-row barns, the latter tend to have better ventilation and feeding space for cows (Smith and Harner, 1998). In 2- or 4-row barns, freestalls could be positioned to have cows either facing each other or lying tail to tail. To our knowledge, there are no studies that have evaluated whether freestall layout (either facing a wall or facing a second cow) has an influence on lying behavior of cows. Thus, the objective of the current study was to evaluate the lying behavior of dairy cows exposed to the same number of freestalls facing a wall or facing another stall in a 3-row barn.

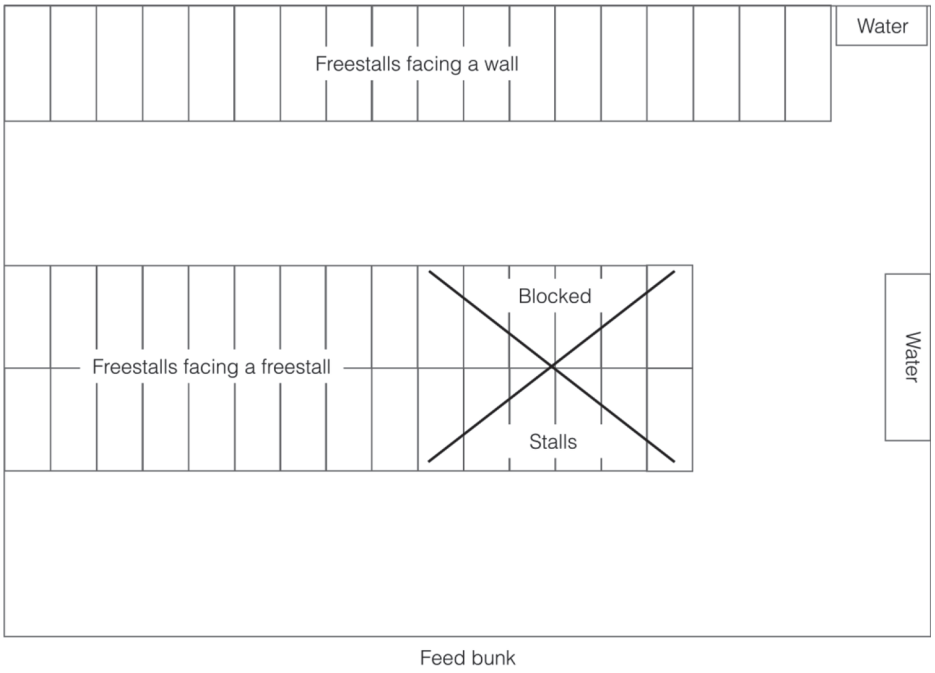

Figure 1. Floor plan of the testing area. There were 18 freestalls facing a wall and 18 operational freestalls facing each other.

MATERIALS AND METHODS

Animals and Experimental Setting

This study was conducted under the supervision of the Animal Care Committee of the Institut de Recerca i Tecnologia Agroalimentàries in the joint research facilities of Blanca from the Pyrenees (Hostalets de Tost, Spain). Twelve lactating cows (6 primiparous and 6 multiparous) with optimal health status and no locomotive problems were selected as focal cows to monitor lying behavior for 11 consecutive d during summertime. The 12 focal cows [172 ± 42.3 (mean ± SD) DIM and 30.2 ± 4.1 (mean ± SD) kg of milk/d] were housed in a 3-row pen (27.5 × 17.8 m) with 17 additional cows (29 animals in total) and had access to 36 freestalls (a stocking density of 81%). All cows had been in the experimental pen for at least 1 mo before the study was conducted. One row of freestalls was composed of 18 stalls facing a wall (**SFW**). The wall was 133 cm high. The other 2 rows were composed of a total of 18 stalls, 9 per row, each facing another stall (**SFS**; Figure 1). All freestalls were 130 cm wide and 237.5 cm long and provided an additional 90 cm of frontal space (for both SFS and SFW) for the cow to lunge forward while standing up. The feed alley had a width of 4.6 m, and the alley between SFS and SFW was 4.1 m wide. The pen had a total of 48 stalls, but 12 stalls from the rows of freestalls facing other stalls were blocked (6 from each side) to maintain the number of stalls of each type even (Figure 1). The SFW were the farthest from the feed bunk (Figure 1). None of the stalls was exposed to direct sunlight at any time of the day. Cows were fed every day at 0800 h and milked at 0700 and 1830 h in a rotary parlor (time away from the pen was less than 30 min per session). Freestalls were bedded with abundant chopped barley straw every 2 d. The 12 focal cows were marked with paint, and their lying activity was video recorded during 11 consecutive days from 0800 to 2200 h using 2 high-definition video cameras (D-Link DCS-6113, Madrid, Spain) placed on the celling of the barn. After the study finished, all video footage was evaluated to determine the number of lying bouts, lying duration for each bout, lying location (SFW or SFS), and side (SFS next to the feed bunk or SFS opposite side of the feed bunk) for each cow on a daily basis. Last, whenever a cow lying in SFS stood up, whether a cow entered the stall in front of it was assessed by visual observation and noted.

Calculations and Statistical Analysis

Because there was no interest in evaluating changes over time nor the interaction between stall location and time, all data pertaining to number of lying bouts, lying bout duration, total lying time, lying location (SFW or SFS), and side (SFS next to feed bunk or SFS opposite side to feed bunk) were averaged by day over the 12-d period within cow. Thus, all statistical analyses were conducted on 12 observations (one for each animal). All data were checked for normality, and lying bout duration and number of lying bouts were root transformed to achieve normal distributions. Then,