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Dairy cow preference and usage of an alternative freestall design

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ABSTRACT

Freestall housing for dairy cows was created to reduce the amount of bedding and labor needed to keep stalls clean. However, some aspects of stall design may restrict stall usage by cows. The aim of this study was to assess dairy cow preference and usage of a conventional stall (with a neck rail and metal stall dividers) and an alternative stall design with no neck rail or stall dividers other than a wooden board protruding slightly (8 cm) above the lying surface. In the no-choice phase of the study, 48 cows were randomly assigned to 8 groups (of 6 cows each); groups were alternately allocated to the 2 treatments. Each group was observed for 7 d on one treatment and then switched to the alternate treatment for 7 d. For the choice phase (also 7 d), groups in adjacent pens were merged (to form 4 groups, each with 12 cows) and cows had free access to both treatments within the merged pen. In the no-choice phase, cows spent more time standing with 4 hooves in the alternative versus conventional freestall (0.60 ± 0.06 vs. 0.05 ± 0.06 h/d), but stall designs had no effect on time spent lying down (13.2 ± 0.4 vs. 12.9 ± 0.4 h/d). In the choice phase, cows spent more time lying down in the conventional freestall (9.4 ± 0.8 vs. 4.1 ± 0.8 h/d) and more time standing with all 4 hooves in the alternative stall (0.24 ± 0.03 vs. 0.02 ± 0.03 h/d). These results illustrate how different stall design features can affect different types of stall use; the more open design facilitated standing fully in the stall, but the protruding partitions likely made the stall less suitable for lying.
Key words: cow comfort, preference test, barn design, welfare

INTRODUCTION

Conventional freestalls in dairy barns include stall partitions, neck rails, and other design features intended to minimize the likelihood that cows will defecate and urinate in the stall. For this reason, freestall barns typically require less bedding (Schmisseur et al., 1966) and less time to maintain the stall surface (Fregonesi et al., 2009a) than open pack systems. Freestall design features help to maintain stall cleanliness. For example, narrow stall partitions (Tucker et al., 2004), the presence of a brisket board (Tucker et al., 2006), and restrictive neck rail positioning (Bernardi et al., 2009; Fregonesi et al., 2009a) all reduce the risk of cows soiling the stall.

However, these same design features may also have unintended effects on the cow's ability to use the stall. For instance, restrictive neck rail placements prevent cows from standing in the stall (Tucker et al., 2005; Fregonesi et al., 2009a). This, in turn, appears to increase time spent standing fully or partially outside of the stall, increasing the risk of lameness (Bernardi et al., 2009). Similarly, narrow stall partitions (Tucker et al., 2004) and the presence of a brisket board (Tucker et al., 2006) can both reduce the time cows spend lying down in freestalls.

Current stall designs thus seem to leave producers with 2 imperfect options: restrictively configured stalls that help maintain a relatively clean stall surface and lower stall maintenance costs, or less-restrictive configurations that may improve cow comfort and reduce the risk of lameness. Research to date has either compared different configurations of traditional freestalls (e.g., by moving stall partitions to vary stall width; Tucker et al., 2004) or compared freestalls with open packs (Fregonesi and Leaver, 2002). Little research has compared freestalls with alternative stalls that still guide the cow's lying position but do so with less reliance on design features that are known to interfere with stall use.

The aim of the current study was to compare a conventional freestall with an alternative design that did not include a neck rail or side partitions. Individual lying spaces were instead created using wooden boards that protruded above the stall surface. We predicted that cows would prefer these less restrictive stalls, spending more time lying down and more time standing in these stalls.

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MATERIALS AND METHODS

The experiment was conducted at the University of British Columbia's Dairy Education and Research Centre in Agassiz, British Columbia, Canada. Forty-eight mid-lactation Holstein cows were randomly assigned to 8 groups of 6 animals each. Groups were balanced based on average (mean ± SD) parity (3 ± 1.6 lactations), DIM (165 ± 43 d), BW (700 ± 85 kg), body height (149 ± 4.1 cm; measured at the third thoracic vertebra), body length (201 ± 10 cm; measured between the first cervical and the most caudal vertebra at the base of the tail), and BCS (3 ± 0.3; scored from 1 to 5 following Edmonson et al., 1989). Before the experiment, cows were gait scored (from 1 to 5 following Flower and Weary, 2006); all cows with gait score >3.0 were excluded and the groups were balanced to have equal number of cows with gait score 2.0, 2.5, and 3.0.

Cows were housed in 4 pens in a naturally ventilated wood-frame freestall barn with curtained sidewalls. Each of the pens (7.5 × 13.5 m) contained 12 stalls configured in 3 rows, 2 rows facing one another and the back row facing a cement wall (Figure 1). Conventional pens were equipped with stalls divided by Dutch-style partitions. The stalls in the alternative pens were divided using wooden boards buried in the sand and protruding 8 cm above the bedding.

Cows were fed ad libitum a TMR consisting of 22.3% grass silage, 16.6% corn silage, 49.4% concentrate mix, and 11.7% alfalfa hay. Fresh feed was provided twice daily (0600 and 1500 h), and feed was pushed up 3 times per day. Water was freely available from a self-filling trough. Cows were milked twice daily (at 0600 and 1600 h) in a double-12 parallel milking parlor.

Experimental Design

The 2 conventional and 2 alternative pens, with 12 stalls each, were arranged in a checkerboard fashion within the barn. In the first replicate of the experiment, 4 groups of 6 cows each were randomly assigned to the 4 test pens. Each group was initially tested in a 7 d no-choice phase; the first 4 d cows were allowed to habituate to the pen, and behaviors were recorded for the last 3 d. Groups were than switched to the alternate treatment (in an adjacent pen) for a second 7-d period with behaviors again recorded during the last 3 d. During the choice phase, adjacent pens (one alternative and one conventional) were merged creating a single large pen with 12 cows and 24 stalls, allowing free access to the 2 treatments. The choice phase was also 7 d with behavior recorded during the last 3 d. Once this replicate was completed, the treatments were reversed (i.e., the conventional pens were reconfigured as alternative and vice versa) and 4 new groups of 6 cows each were assigned to the 4 test pens and tested in the no-choice phase. After that, the pens were merged again for the choice phase. In this way, we tested a total of 48 cows composed of 8 test groups in the no-choice phase and 4 test groups in the choice phase.

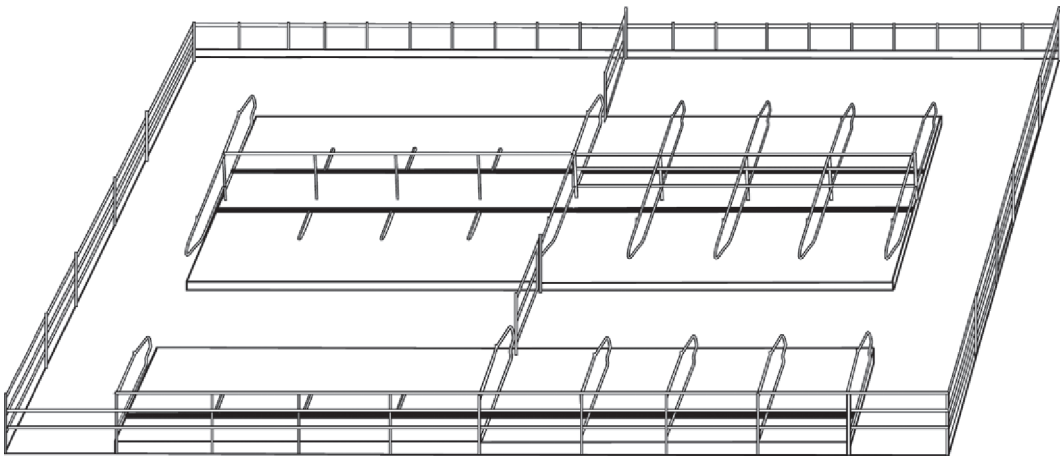

Figure 1. Layout of a conventional pen (right) and an adjacent alternative pen (left). Conventional pens used stalls with a bed length of 2.4 m divided by Dutch-style partitions measuring 1.2 m wide from center to center with the neck rail positioned at 1.1 m above the stall surface and 1.7 m from the inside of the rear curb. The brisket board (height = 0.1 m above the stall surface) was positioned 1.8 m from the inside of the curb. The curb was 0.2 m in height as measured from the floor of the alley. The stall was deep bedded with 0.3 m of washed river sand raked and cleaned every morning and afternoon milking. Flooring elsewhere in the pen was concrete and cleaned 6 times/d with automatic scrapers. The feed bunk measured 7 m and had a post-rail feeding barrier. Alternative pens were identically configured, except all stall partitions and the neck rail were removed, leaving only the posts used to secure the freestall partitions. Wooden boards (length = 80 cm, height = 30, and width = 5 cm), also spaced 1.2 m wide from center to center, were butted against the brisket board and buried in the sand such that that 8 cm protruded above the bedding.