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Dairy cow preference for different types of outdoor access

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ABSTRACT

Dairy cows display a partial preference for being outside, but little is known about what aspects of the outdoor environment are important to cows. The primary aim of this study was to test the preference of lactating dairy cattle for pasture versus an outdoor sand pack during the night. A secondary aim was to determine whether feeding and perching behavior changed when cows were provided outdoor access. A third objective was to investigate how the lying behavior of cows changed when given access to different outdoor areas. Ninety-six lactating pregnant cows were assigned to 8 groups of 12 animals each. After a baseline phase of 2 d in which cows were kept inside the freestall barn, cows were habituated to the outdoor areas by providing them access to each of the 2 options for 24 h. Cows were then given access, in random order by group, to either the pasture (pasture phase) or the sand pack (sand phase). As we tested the 2 outdoor options using space allowances consistent with what would be practical on commercial dairy farms, the space provided on pasture was larger (21,000 m²) than that provided on the sand pack (144 m²). Cows were tested at night (for 2 nights in each condition), from 2000 h until morning milking at approximately 0800 h, as preference to be outdoors is strongest at this time. During the next 3 nights cows were given access to both outside options simultaneously (choice phase). Feeding and perching behaviors were recorded when cows were indoors during the day and night periods. Lying behavior was automatically recorded by HOBO data loggers (Onset, Bourne, MA). Cows spent more time outside in the pasture phase (90.0 ± 5.9%) compared with the sand phase (44.4 ± 6.3%). When provided simultaneous access to both options, cows spent more time on pasture than on the sand pack (90.5 ± 2.6% vs. 0.8 ± 0.5%, respectively). Time spent feeding indoors during the day did not change regardless of what type of outdoor access was provided, but

there was a decline in perching during the day when cows were provided access to either outdoor option at night. Lying time in the pasture phase was lower than in the baseline or sand phase. During the nighttime, lying time outside was not different between the sand (55.4 ± 7.9%) and pasture (52.0 ± 7.4%) phases. In summary, cows spent a considerable amount of time outside during the night when given the opportunity and showed a preference for a large pasture versus a small sand pack as an outdoor area.

Key words: sand pack, pasture, animal welfare, free range, exercise

INTRODUCTION

Pasture access provides certain benefits to dairy cows (reviewed by Charlton and Rutter, 2017), including increased opportunities to express natural behaviors such as grazing and exploring. Providing cows access to pasture can also be positive for udder (Washburn et al., 2002), foot, and leg health (Haskell et al., 2006; Olmos et al., 2009).

Freestall-housed cows spend different portions of their time outside when given access to pasture, with the percentage of time spent outside varying across studies from 72% (Krohn et al., 1992) to 10% (Charlton et al., 2011b). One reason for this variation may be that cows in different studies varied in their experience with pasture. Experience can influence preference (Kirkden and Pajor, 2006), with animals often preferring environments with which they are familiar (Fraser and Matthews, 1997). This may help explain why in the study of Charlton et al. (2011b) the cows, which had limited pasture experience, spent more time indoors.

Preferences of animals can be complex (Fraser and Matthews, 1997). For example, cows may prefer different environments for engaging in different behaviors. They may prefer one environment for feeding but another for socializing. Many factors influence the preference of dairy cows for pasture access. An important factor that influences preference for pasture is the weather (e.g., Legrand et al., 2009; Charlton et al., 2011a, b). Cows spend more time on pasture at night (Charlton et al., 2011a, 2013; Motupalli et al., 2014), especially

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when ambient temperatures during the day are high (Legrand et al., 2009). It has also been shown that distance to pasture affects its use during the day but not during the night, which is consistent with a higher motivation of cows to access pasture during the night (Charlton et al., 2013; Motupalli et al., 2014).

Despite the clear benefits of pasture access for dairy cattle, it is often difficult to implement pasture access on dairy farms. Outdoor areas other than a pasture may be more practical to implement on some farms because the space requirements are normally lower than for pasture. However, little is known about what aspects of outdoor access are important to dairy cattle (Charlton and Rutter, 2017). For instance, are cows motivated specifically to graze? Or is their preference driven by preferences for alternate lying and standing surfaces not available indoors?

To our knowledge, no work has attempted to test whether freestall-housed cows prefer to access a pasture versus some other outdoor area, particularly during the night when cows show the strongest motivation for outdoor access (von Keyserlingk et al., 2017). In addition, although some work has shown welfare benefits of exercise in an outdoor pack (Loberg et al., 2004; Regula et al., 2004), no work has investigated whether the behavior of cows while in the barn changes when the cows have access to the outdoors. As changes in flooring (Fregonesi et al., 2004) and cubicle design (Bernardi et al., 2009) can influence the standing, lying, and perching behavior (standing with the 2 front hooves in the stall) of cows, the provision of outdoor access may also lead to changes in behavior of cows when inside their normal freestall housing.

Cows prefer to lie on pasture as opposed to in freestalls when environmental conditions are favorable (Legrand et al., 2009; Falk et al., 2012), probably because pasture provides cows with a less restricted environment than any type of loose housing environment (Krohn and Munksgaard, 1993; Charlton and Rutter, 2017). A soft outdoor pack can provide cows with some of the same benefits as pasture, as it allows cows to stand, walk, and lie down without having to navigate the confines of a freestall. Indeed, when given a choice between freestalls and an open sand pack indoors, cows spent more time lying and standing with 4 feet in the pack than in the freestalls (Fregonesi et al., 2009b). In addition, cows spent more time standing outside of the stall (typically on wet concrete surfaces) and more time perching with their front legs on the bedded surface when in freestalls versus the open pack (Fregonesi et al., 2009b); such behaviors increase the risk of lameness (Bernardi et al., 2009).

The primary objective of this experiment was to determine the preference of lactating dairy cows for

pasture versus an outdoor sand pack during the night. Our second objective was to determine whether feeding and perching behavior inside the barn changed when cows were provided outdoor access. A third objective was to investigate how lying behavior was affected by providing cows access to different outdoor areas.

MATERIALS AND METHODS

Cows and Treatment

This experiment was carried out at the University of British Columbia Dairy Education and Research Centre (Agassiz, BC, Canada) and took place between August and October 2015. This experiment and all procedures were approved by the University of British Columbia Animal Care Committee (protocol A15-0082).

We used 96 pregnant Holstein cows that were assigned to 8 groups (12 cows/group). Cows had (mean \pm SD) a parity of 2.5 ± 0.2 , DIM of 243 ± 17 , a projected 305-d milk production of $10,937 \pm 448$ kg, a BCS of 3.4 ± 0.1 (range: 2.5–4.5), and a gait score of 2.0 ± 0.1 (range: 1–3). Two experienced observers assessed the BCS and gait scores of each cow. The BCS was assessed using a 5-point scale (1 = severely under condition, 5 = severely over condition) with quarter-point increments following Edmonson et al. (1989). Gait scoring was done using a 5-point scale (1 = healthy, 5 = severely lame) following Flower and Weary (2006). Severely lame cows (gait score 4 and 5) were not included in the experiment. The majority of cows had previously been kept on pasture for varying periods as heifers, and some had also been kept on pasture during previous dry periods.

Two groups were tested simultaneously. Each group was housed in 1 of 2 experimental pens for at least 14 d. After regrouping, animals were given at least 3 d to allow for the social behavior to stabilize (see von Keyserlingk et al., 2008). Groups were kept in the freestall barn for 2 additional days to allow for baseline observations (baseline phase). All animals had previous experience with sand bedding because they were kept on sand-bedded freestalls. Animals were given access to the sand pack and the pasture on alternate days for approximately 24 h each (i.e., from 1100 h until morning milking the following day) before data collection began. To ensure that cows were familiar with both outdoor areas during this habituation period, they were moved outside during these experience days at 1500, 2000, 2200, and 0600 h, if not already outdoors.

The data collection during which cows were provided free access to the outdoors consisted of 2 parts. The first followed immediately after the habituation phase. Cows were provided access to either the pasture (pasture phase) or the sand pack (sand phase) for 2 nights

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