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Effects of metritis on stall use and social behavior at the lying stall

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ABSTRACT

Metritis in dairy cows has been associated with changes in behavior at the feed bunk, but little is known about the effects on behavior at the lying stall. The aim of this study was to investigate stall use by primiparous dairy cows diagnosed with metritis, specifically time spent in the stall, social interactions at the stall, and lying-related behaviors. After parturition, primiparous cows were housed in a mixed-parity pen with a constant group size of 20. Cows had access to 12 electronic feed bins, 2 electronic water bins, and 24 lying stalls. Four cameras installed above the experimental pen allowed for observation of cows in the feeding and lying area. Every 3 d after parturition, cows were examined for metritis by evaluation of the visual appearance and olfactory character of vaginal discharge. Cows diagnosed with metritis (n = 16) were compared with healthy individuals (i.e., cows without metritis or other clinical disease, n = 16). Healthy individuals were selected based on data availability, body weight, and calving date and, based on these criteria, paired with metritic cows. Video of the 3 d before diagnosis (d −3 to d −1) in the metritic animals (and video from the corresponding days in milk for paired healthy cows) were used to measure behavior. Behaviors assessed included those in the stall (lying, perching, and standing fully in the stall), social behaviors (when a cow either displaced or was displaced by another cow; i.e., actor and reactor replacements), and lying-related behaviors (including visits when the cow entered and left the stall without lying down, aborted lying events when behaviors indicative of the onset of a lying bout were not followed by the cow lying down, and latency to lie down, defined as the time between an aborted lying event and the first lying bout). Cows with metritis spent more time standing fully in the stall on all 3 d, resulting in more time spent standing on d −2 and −1. Cows with metritis tended to have more aborted lying events on d −2, and significantly more on d −1. Cows with metritis tended to be replaced more often at the lying stall on d −3 and tended to have a longer latency to lie down on d −2. We observed no differences between health groups in the number of actor replacements or the number of visits to the stall. In summary, cows with metritis spent more time standing fully in the lying stall and had more aborted lying events. These results suggest that primiparous cows with metritis may be identified by altered behavior at the lying stall.
Key words: sickness, pain, disease, welfare

INTRODUCTION

Reduced feeding, decreased social interactions, and increased resting are associated with the onset of sickness in many mammals (Dantzer and Kelley, 2007). In dairy cows, feeding behaviors and social behaviors at the feed bunk in particular have been explored, and some of these behaviors have shown promise as early indicators of disease. Compared with healthy cows, ill cows consume less DM (Huzzey et al., 2007; Fogsgaard et al., 2015), spend less time feeding (González et al., 2008; Goldhawk et al., 2009), engage in fewer competitive interactions at the feeder (Huzzey et al., 2007), and avoid the feed bunk at peak feeding times when competitive interactions are most common (Sepúlveda-Varas et al., 2016).

Avoidance of social interactions by ill cows may also be evident in contexts other than feeding. For example, cows that became ill with either mastitis or metritis in the days following calving increased use of an area visually separating them from the remainder of the herd (Proudfoot et al., 2014). Freestalls do not provide visual separation, but as partitions at the feed bunk reduce competitive social interactions during feeding (DeVries and von Keyserlingk, 2006; Hetti Arachchige et al., 2014), lying stall partitions that separate animals from one another may also offer a protective environment and therefore may be more attractive when animals are ill.

Dairy cows alter lying behavior in response to sickness (Sepúlveda-Varas et al., 2014; Itle et al., 2015) and pain (Mølgaard et al., 2012). Multiple studies have

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reported shorter lying times in cows with clinical mastitis compared with healthy animals, suggesting that cows may be avoiding painful pressure on the inflamed udder (Siivonen et al., 2011; Fogsgaard et al., 2012, 2015). Previous work has found that cows experiencing painful conditions (e.g., dystocia and mastitis) lie down more often (i.e., have more lying bouts; Proudfoot et al., 2009; de Boyer des Roches et al., 2017), but other work has shown that cows with metritis lie down less often in the days before diagnosis (Neave et al., 2018). However, changes in lying time in response to disease are not always observed; for instance, cows with metritis, an infectious disease associated with visceral pain (Stojkov et al., 2015), showed no difference in lying times compared with healthy cows (Neave et al., 2018), despite showing other signs of malaise (e.g., reduced feed intake; Huzzey et al., 2007; Schirmann et al., 2016) and reduced activity (measured by neck-mounted accelerometer; Liboreiro et al., 2015). In summary, sickness and pain can both lead to behavioral changes, but these changes may differ depending upon the cause, making it difficult to predict how cows that experience both sickness and pain will respond. For example, metritis is frequently associated with a febrile response (Sheldon et al., 2006) that might be expected to increase lying time, as ill animals typically rest for prolonged periods (Hart, 1988); however, metritis is also associated with visceral pain (Stojkov et al., 2015), possibly resulting in avoidance of lying down or hindering the lying down movement.

To our knowledge, no research has investigated if cows alter their behavior in response to malaise or pain at the lying stall independently from lying times. Thus, the objective of our study was to investigate stall use, including times spent at the stall, social interactions, and lying-related behaviors, by primiparous cows diagnosed with metritis. We hypothesized that cows with metritis would increase stall usage, specifically standing in the stall, engage in fewer antagonistic interactions and show more aborted lying events in the days before diagnosis.

MATERIALS AND METHODS

Cows in our study were part of a larger project on metritis investigating the effects of parity on changes in behavior (Neave et al., 2017), sickness behavior in the days before diagnosis (Neave et al., 2018), and treatment with meloxicam (Lomb et al., 2018). The study was conducted from July 2013 to October 2014 at the University of British Columbia's Dairy Education and Research Centre in Agassiz (BC, Canada). All animals were cared for according to the Canadian Council on Animal Care (2009) and procedures were approved by the University of British Columbia's Animal Care Committee (Protocols A10–0163 and A14–0040).

Housing and Management

During the study, behaviors and the health status of all animals in the herd (n = 337 Holstein cows) were monitored from approximately 3 wk before to 3 wk after calving. By the end of the study period, data for 105 primiparous cows had been collected.

Within 24 h after parturition, all cows were moved into a mixed-parity postpartum pen where they remained for a minimum of 21 d. Whenever a freshly calved cow was introduced, the cow with the highest DIM (DIM at removal ranged from 21 to 37, with a mean of 30) was removed to maintain a stocking density of 20. On a single occasion in spring 2014, where a longer lag occurred between calving events, 8 cows with high DIM were replaced with pregnant filler cows to maintain stocking density. Feed and water were provided from 12 electronic feed bins and 2 electronic water bins, respectively (Insentec, Marknesse, Holland; validated by Chapinal et al., 2007). The lying area consisted of 24 lying stalls, equipped with mats (Pasture Mat, Promat Inc., Woodstock, ON, Canada) covered with 5 cm of sand. The stalls were 120 cm wide (center to center) and 260 cm long, with the brisket board placed 170 cm from the inside of the back curb. The neck rail was positioned at 115 cm above the bedded surface, 165 cm as measured from the horizontal axis, and 200 cm as measured from the diagonal axis to the inside of the back curb. Stalls were raked clean twice daily when the cows were brought up for milking, and fresh sand was added on Monday and Friday every week of the study. Concrete floors in both alleys (i.e., feed alley and the alley between lying stalls) and crossover alleys were covered with vulcanized rubber mats (Gummiwerk KRAIBURG Elastik, Tittmoning, Germany).

Cows were milked twice daily at approximately 0700 and 1700 h. At approximately 0800 and 1600 h, cows were provided fresh feed formulated to meet the NRC (2001) nutrient requirements. Feed samples were taken once weekly, pooled into monthly samples, and analyzed. The postpartum cow TMR included 26% corn silage, 13% grass silage, 7% alfalfa hay, 4% grass hay, and 50% grain concentrate mash (DM = 50.35 ± 2.5%, CP = 18.3 ± 0.58% DM, ADF = 18.1 ± 0.71% DM, NDF = 28.5 ± 1.2% DM, and NE_L = 1.72 ± 0.014 Mcal/kg; described in full by Neave et al., 2017).

Diagnosis of Disease

Based on the methodology described by Huzzey et al. (2007), cows were screened for metritis on every