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Behavioral changes before metritis diagnosis in dairy cows

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ABSTRACT

Metritis is common in the days after calving and can reduce milk production and reproductive performance. The aim of this study was to identify changes in feeding and social behavior at the feed bunk, as well as changes in lying behavior before metritis diagnosis. Initially healthy Holstein cows were followed from 3 wk before to 3 wk after calving. Behaviors at the feed bunk were recorded using an electronic feeding system. Lying behavior was recorded using data loggers. Metritis, based upon the characteristics of vaginal discharge at d 3, 6, 9, 12 and 15 after calving, was diagnosed in 74 otherwise healthy cows. Behavior of these cows, beginning 2 wk before calving until the day of diagnosis, was compared with 98 healthy cows (never diagnosed with any health disorder, including ketosis, mastitis, and lameness) during the transition period. During the 2 wk before calving, cows later diagnosed with metritis had reduced lying time and fewer lying bouts compared with healthy cows. In the 3 d before clinical diagnosis, cows that developed metritis ate less, consumed fewer meals, were replaced more often at the feed bunk, and had fewer lying bouts of longer duration compared with healthy cows. We concluded that changes in feeding as well as social and lying behavior could contribute to identification of cows at risk of metritis.
Key words: sickness behavior, social competition, animal welfare, precision farming

INTRODUCTION

During the transition period, characterized as the 3 wk before and after calving, the dairy cow must cope with changes in energy demand as a result of fetal growth and the onset of lactation, which consequently increases the risk of metabolic illnesses and the risk of infection through the vaginal canal and teat ends (LeBlanc, 2010). The combined effects are such that the majority of health disorders are diagnosed in the month following calving, reducing milk production and reproductive performance and increasing culling rate (Esposito et al., 2014).

Changes in feeding behavior around calving can identify cows at risk for postpartum health disorders. For example, decreased feed intake, feeding time, and feeding rate have been observed in the 3 d before ketosis diagnosis (González et al., 2008). Some studies have shown changes in these behaviors prepartum can be predictive of postpartum health disorders. For example, Urton et al. (2005) and Huzzey et al. (2007) found that cows with lower feeding times and intakes in the weeks before calving were more likely to be diagnosed with metritis after calving.

Few studies have reported changes in meal frequency or meal duration in relation to health disorders. Parasitized cattle tended to have reduced meal frequency 7 wk after infection (Szyszka et al., 2013) and meal duration increased following anthelmintic treatment (Forbes et al., 2004). Cows decreased the number of meals per day before they were identified as lame (González et al., 2008) and as they became lame (Bach et al., 2007). It follows that meal frequency and duration may be expected to decline in cows with health disorders during the transition period.

Social behaviors, typically reported as competitive interactions or displacements at the feed bunk, are also a promising early indicator of illness (Proudfoot et al., 2012). Displacements are typically recorded using either video or live observation of animals, but both methods are time consuming. Data from an electronic feeding system can be used for automated identification of competitive replacements at feed bins (Huzzey et al., 2014). To date, 2 studies have used this method to examine social competition in relation to cow health (Sepúlveda-Varas et al., 2014; Schirmann et al., 2016).

Several studies have investigated changes in lying behavior as an indicator of ill health. For example, cows diagnosed with ketosis after calving stood longer before and during calving and changed from standing to lying less often on the day of calving (Itle et al.,

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2015). A small study of prepartum behaviors of crossbred cows housed in paddocks found no difference in standing time or standing bouts between healthy cows and metritic cows after calving, but metritic cows spent more time standing inactive (Patbandha et al., 2012). Sepúlveda-Varas et al. (2014) reported longer lying times and a tendency of longer lying bouts for grazing primiparous dairy cows that were diagnosed with more than 1 clinical health disorder.

Studies have reported behavioral changes relative to day of diagnosis for mastitis (Sepúlveda-Varas et al., 2016) and ketosis (González et al., 2008), but this has yet to be documented for metritis. Metritis is typically diagnosed in the first 2 or 3 wk after calving (Sheldon et al., 2006, 2008). To our knowledge, no study has investigated whether behavior differs depending on when metritis is diagnosed.

The objectives of our study were to identify changes in lying, feeding, and social behavior in the days before diagnosis of metritis, and to describe how behavioral changes relate to the day of diagnosis. This study also served to build upon the findings of a previous study (Huzzey et al., 2007) that described changes in prepartum feeding behavior of cows subsequently diagnosed with metritis. Because Huzzey et al. (2007) did not exclude ketotic cows in their study, we speculated that behavioral differences from healthy cows might be driven by the presence of both metritis and subclinical ketosis; thus, we also included subclinically ketotic animals in a secondary analysis.

MATERIALS AND METHODS

Animals, Housing, and Diet

All cows in our study were cared for under the Canadian Council of Animal Care guidelines (CCAC, 2009), and all procedures were approved by the UBC Animal Ethics Committee (Protocol A14–0040). All cows enrolled in the current study were a convenience sample from the herd at the University of British Columbia's Dairy Education and Research Center in Agassiz, British Columbia, Canada. This study used the same population of animals reported in Neave et al. (2017), and the same animals that were enrolled in a study investigating the effects of nonsteroidal anti-inflammatory drug administration following metritis diagnosis (Lomb et al., 2018).

Our target sample size was 90 metritic cows, chosen to achieve the primary objective of the nonsteroidal anti-inflammatory drug administration study [data from Huzzey et al. (2007) showed that 45 cows per treatment group were required to detect a difference of 1.7 kg/d of DMI (SD = 2.9) or 25 min/d of feeding time (SD = 40) between treatment groups; power = 0.80; $\alpha = 0.05$]. Based upon expected rates of metritis, we followed a total of 337 Holstein dairy cows, 105 primiparous (i.e., never previously calved) and 232 multiparous [average parity 1.8 ± 1.9 (SD); range of 0 to 8 lactations]. Cows were enrolled in the study 3 wk before expected calving between July 2013 and November 2014. Cows were not enrolled if their gait score was >3 (following Flower and Weary, 2006) in the week before enrolment in the study.

Cows were housed in prepartum and postpartum group pens equipped with 12 Insentec (Insentec, Marknesse, the Netherlands) feed bins and 2 Insentec water troughs. Each pen was equipped with 24 freestalls (2.6 × 1.2 m; neck rail positioned 1.2 m above the stall surface) separated by Y2K freestall partitions (Artex, Langley, BC, Canada), and each stall was fitted with a mattress (Pasture Mat, Promat Inc., Woodstock, ON, Canada) covered with 5 cm of sand bedding. Stocking density in the pens was maintained at 20 cows per pen and group composition was dynamic depending on expected and actual calving dates. Cows were moved into the prepartum pen approximately 3 wk before their expected calving date and then moved to the maternity pen when they showed signs of calving (checked twice during the day and once at 2200 h for tense and enlarged udder, relaxed pelvic ligaments, or raised tail; Proudfoot et al., 2013). The maternity pen contained a sawdust-bedded pack with 6 Insentec feed bins and 1 Insentec water trough. A maximum of 2 cows were kept in the maternity pen at any given time. Within 24 h after calving, cows were moved to the postpartum pen and monitored for a further 3 wk. Postpartum cows were milked twice per day at approximately 0700 and 1700 h in a double 12 parallel milking parlor; waiting time in the holding area before milking did not exceed 30 min per milking.

Pre- and postpartum groups were fed a TMR at approximately 0800 and 1600 h. Feed samples were collected weekly and then pooled into monthly samples. Samples were dried at 60°C for 48 h to determine DM content and sent for nutrient analysis (A&L Canada Inc., London, ON, Canada). Before calving, cows were fed a TMR consisting of 32% corn silage, 37% alfalfa hay, 18% ryegrass straw, and 13% grain concentrate mash (DM = 52.4 ± 4.7%, CP = 14.3 ± 0.34% DM, ADF = 34.6 ± 0.60% DM, NDF = 46.5 ± 0.17% DM, and NE_L = 1.39 ± 0.0071 Mcal/kg). After calving, cows were fed a TMR consisting of 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).