



Changes in behaviour of dairy cows with clinical mastitis



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ABSTRACT

Behaviour is an important tool for recognizing illness in animals. One of the most common diseases in dairy cattle is clinical mastitis. Evidence suggests that cows with this disease show sickness behaviours, but little is known about the progression of behavioural changes before and after the disease becomes clinical. The aims of this study were to determine changes in feeding and competitive behaviour at the feed bunk of dairy cows before the diagnosis of clinical mastitis and determine the effect of intramammary antibiotic treatment on behaviour. Dry matter intake, feeding time, number of visits to the feeder, rate of feed intake, number of replacements occurring at the feeder (when one cow displaced a feeding cow and took her position at the feed bin) and the percent of intake during peak feeding time were measured daily in eight cows diagnosed with clinical mastitis in one quarter of the udder. Clinical mastitis was diagnosed based on daily rectal body temperature as well as condition of the foremilk and udder assessed by the milker at each milking from calving until 30 days in milk. Starting on the day of diagnosis, cows received an intramammary antibiotic twice daily for three consecutive days. During the 5 days period before diagnosis, cows decreased feed intake by 1.2 kg/d (SE = 0.2, $P < 0.001$) but showed no other changes in feeding behaviour during this time. The frequency of competitive replacements at the feeder (slope = -2.3 no./d, SE = 1.0, $P = 0.04$) and the percentage of intake at peak feeding time (slope = -1.8% , SE = 0.6, $P = 0.008$) were lower compared to day of diagnosis. Following treatment, cows immediately increased feed intake, feeding time and competitive replacements at the feeder. These results show that cows with naturally occurring clinical mastitis exhibit signs of sickness behaviour in the days before diagnosis, and that these behaviours rapidly recover in the days after treatment.

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1. Introduction

Mastitis is a costly disease (Halasa et al., 2007; Huijps et al., 2008) and a major animal welfare concern in the dairy industry (Kemp et al., 2008; Medrano-Galarza et al., 2012). Early diagnosis of clinical cases can improve the welfare of cows and reduce costs associated with the disease by allowing timely treatment (Milner et al., 1997).

Behaviour is becoming increasingly recognized as a useful tool for identifying ill animals (reviewed by Weary et al.,

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2009). When an animal becomes ill, an orchestrated set of behavioural changes aid its recovery. These sickness behaviours include a reduction in general activity, feed intake and social behaviours (reviewed by Dantzer and Kelley, 2007) that can be used by stock people and veterinarians for diagnosis of illness. A better knowledge of which behaviours change as mastitis develops may help improve the early detection and treatment of this disease.

Behavioural measures have been recorded for cows with experimentally induced mastitis (e.g. Siivonen et al., 2011; Fogsgaard et al., 2012). In the first few days after an *E. coli* or lipopolysaccharide (LPS) intramammary challenge, cows decreased feed intake and feeding behaviour (Fogsgaard et al., 2012; Yeiser et al., 2012), spent more time standing (Siivonen et al., 2011; Fogsgaard et al., 2012) and spent less time self-grooming (Fogsgaard et al., 2012). Cows with experimentally-induced mastitis also spent less time lying, perhaps to relieve pressure on the udder (Siivonen et al., 2011; Zimov et al., 2011; Cycles et al., 2012; Fogsgaard et al., 2012).

Few studies have assessed behavioural changes in naturally occurring cases. In a recent study, Medrano-Galarza et al. (2012) found that cows with clinical mastitis spent less time lying down after diagnosis and treatment compared with control cows. Another study found that mid-lactation cows did not show any consistent change in feeding behaviour before mastitis diagnosis, but this may have been due to variation in the severity of mastitis cases (González et al., 2008). These previous studies have focused on feeding and lying behaviours, but changes in social behaviour may also be affected by illness (as seen with mice; Crestani et al., 1991). To the best of our knowledge, no research has explored the social behaviour of cows with naturally-occurring mastitis. In addition, little research has examined the effects of mastitis treatments on any behaviour.

The aims of our study were to: (1) to determine changes in feeding and competitive behaviour at the feed bunk of dairy cows before the diagnosis of clinical mastitis in early lactation cows and, (2) to determine the effect of intramammary antibiotic treatment on these behaviours.

2. Materials and methods

This study was conducted as part of a larger investigation undertaken to describe behavioural changes in ill cows during the transition period, from 3 week before to 3 week after calving, between August 2005 and March 2007 at The University of British Columbia's Dairy Education and Research Centre (Agassiz, British Columbia, Canada). Animals were cared for according to the guidelines provided by the Canadian Council on Animal and Care (2009).

2.1. Animals, housing and diet

Records were taken from Holstein dairy cows that were diagnosed with clinical mastitis during the first 30 days in milk (DIM) during the period of study (approximately 20 months).

A pool of 230 cows was used in this study. After calving, cows were housed in a group pen with 12 electronic

feeding bins and two water bins (Insentec, Marknesse, Holland). The pen contained 20 freestalls each with a mattress base (Pasture Mat, Promat Inc., Woodstock, Ontario, Canada) covered with approximately 5 cm of sand bedding. Stocking density was maintained at 20 cows/pen, but group composition was dynamic as cows came and left the pen depending on their calving dates and DIM. Cows were milked twice daily at approximately 07:00 and 17:00 h in a double-12 parallel milking parlour and were fed a total mixed ration (TMR) at approximately 06:00 and 16:00 h. Samples of the TMR were taken three times per week, and the three samples were then pooled to create one representative weekly sample. These samples were dried at 60 °C for 2 days to determine the dry matter (DM) content.

2.2. Clinical mastitis classification and cow inclusion

All health disorders, treatments and drugs administered to cows were recorded from the day of calving until 30 DIM by trained observers. Clinical mastitis was detected by the milker using inspection of the foremilk and palpation of the udder at milking. The severity was assessed in terms of the clinical criteria described by Hogan et al. (1989) and Eckersall et al. (2001); a clinical case was assessed as 'mild' when there were changes in the appearance of the milk but the udder was normal, 'moderate' when there were changes in the appearance of the milk and the udder was hot or swollen to touch, with or without presence of fever (>39.5 °C), and 'severe' when cows also showed other systemically clinical signs such as anorexia, depression, or a decline in milk production >50%. In moderate cases, each affected quarter was treated with an intramammary antibiotic (Cefa-Lak; Wyeth Animal Health, Division of Wyeth Canada, Guelph, ON, Canada) twice daily for three consecutive days, starting on the day of diagnosis. In severe cases, cows were also treated with systemic antibiotics.

Cows were included in the study if: (1) they were diagnosed with moderate clinical mastitis in only one quarter, (2) this diagnosis was the first case of mastitis for that cow in the current lactation, (3) they did not show signs of mild or severe mastitis and, (4) they were diagnosed between 11 and 21 DIM. This period allowed us to focus on cows in early lactation, but also allowed for enough time to avoid confounding with recovery from calving, a factor known to affect feeding behaviour (see Huzzey et al., 2007).

These inclusion criteria yielded a total of 13 cases out of the pool of 230 cows. Of these 13 cows, five were excluded from the final analysis due the presence of another health conditions (two cases of retained placenta and one case each of metritis, displaced abomasum and teat injury), leaving eight cows in the final dataset. Of these eight cows, seven were multiparous and one primiparous. The average DIM for diagnosis of clinical mastitis was 14.6 ± 3.6 d (mean \pm SD; min = 11 to max = 21 days). Average daily milk production during the first 30 days after calving was 41.12 ± 2.3 kg (mean \pm SD).

2.3. Behavioural measurements

The electronic feeding system (see Chapinal et al., 2007 for a full description and validation) recorded the duration

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