Short communication: Lameness impairs feeding behavior of dairy cows

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ABSTRACT

The automated, reliable, and early detection of lameness is an important aim for the future development of modern dairy operations. One promising indicator of lameness is a change in the feeding behavior of a cow. In this study, the associations between feeding behavior and lameness were evaluated. A herd of 50 cows was investigated during the winter season in a freestall barn. Feeding behavior, feed intake, milk yield, and body weight were monitored using electronic feeding troughs and an automated milking system. Gait scoring every second week was used as a measure of lameness. To analyze the effect of lameness on feeding behavior and milk yield, linear mixed models were used. Cows with more severe lameness spent less time feeding per day (104 ± 4, 101 ± 4, and 91 ± 4 min/d for lameness scores 2, 3, and 4, respectively). An interaction between parity and lameness score was detected, with severely lame primiparous cows spending the least time feeding. Severely lame cows fed faster; however, their body weights were lower than for less-lame cows. Increase in lactation stage was associated with longer daily feeding time, longer duration of feeding bouts, and lower feeding rate. Worsening of gait was associated with lower silage intake and less time spent feeding even before severe lameness was scored. The results indicate that lameness is associated with changes in feeding behavior and that such changes could be considered in the future development of remote monitoring systems. It should also be noted that impaired feeding behavior along with lameness can put the welfare of especially early lactating primiparous cows at risk.
Key words: animal welfare, body weight, eating behavior, locomotion score

Short Communication

Lameness is common among dairy cows (Espejo et al., 2006) and often causes them pain (Whay at al., 1997). Lameness thus reduces the welfare of a large number of individual animals. Furthermore, lameness is associated with economic losses in dairy operations due to reduced milk yields (Green at al., 2002) and indirect costs that result from higher culling rates. Due to the lack of adequate monitoring, lame cows often go unrecognized (Whay et al., 2003; Espejo et al., 2006). Therefore, new approaches to detect lame cows on farms are needed. Despite recent research efforts (Potterton et al., 2012), the number of lame animals is not decreasing. Easier acquisition of data using new methodology that is applicable to large numbers of animals, together with increased knowledge about the etiology of lameness or recovery from it, will facilitate the understanding, prevention, and cure of the disease. At present, more information is also needed about behavioral adaptations and their associations with the development of lameness.

Changes in behavior may be indicative of poor health in animals (Weary et al., 2009). The connections between dairy cattle behavior and gait score have been studied, especially with regard to lying behavior (Gomez and Cook, 2010; Ito et al., 2010; Blackie et al., 2011). Despite serious attempts to use it as an indicator of lameness, lying behavior is proving to be too variable for providing a reliable measure (Ito et al., 2009; Ito et al., 2010; Yunta et al., 2012). In previous studies, changes in feeding behavior have successfully been used to detect other diseases, such as metritis (Urton et al., 2005; Huzzey et al., 2007; Goldhawk et al., 2009). However, few studies have focused on the aspects of feeding behavior as potential indicators of lameness.

Lower BCS (Espejo et al., 2006; Dippel et al., 2009) and decreased BW (Alawneh et al., 2012) have been found in lame cows. Onyiro et al. (2008) reported lower body weights to be associated with the stages of later lactation in lame cows and Alawneh et al. (2012) suggested that measurements of BW could aid in the detection of lameness. González et al. (2008) proposed

daily feeding duration as the most promising behavioral measure for lameness detection due to its relatively low variability. Indeed, lame cows have been found to spend less time grazing on pasture (Hassall et al., 1993) and reduced feeding behavior and feed intake both seem to be associated with lameness (Bach et al., 2007; González et al., 2008; Palmer et al., 2012). Such changes in feeding behavior have been investigated with regard to lameness detection (Kramer et al., 2009; Yunta et al., 2012). Kramer et al. (2009), however, were not able to model lameness due to large variation between cows, and Yunta et al. (2012) only deduced shorter feeding duration based on observations of standing behavior around feed delivery time. Therefore, more research needs to be carried out to evaluate the suitability of different aspects of feeding behavior as lameness indicators. Several studies have focused on comparing the behavior of lame cows with that of sound animals, instead of investigating early changes in behavior that may be indicative of lameness. Therefore, we attempted also to investigate the association between behavior and lameness before a change in lameness was in effect recorded.

Aim

This study evaluated the relationship between locomotion scores on feeding behavior, feed consumption, and milk yield of dairy cows. We also examined early changes in feeding behavior to detect lameness and hypothesized that changes in feeding behavior could serve as early signs of the development of lameness.

Housing and Animals

The experiment was conducted at the University of Helsinki (Helsinki, Finland) during the winter season in an insulated loose house with freestalls and an automatic milking system. Cows were housed in a group of about 50 animals and milked with a milking robot (Astronaut A3; Lely Holding S.à r.l., Maassluis, the Netherlands). The cows were fed concentrates (0 to 19 kg/d) from the milking station and from 2 automatic feeders (Cosmix; Lely Holding S.à r.l.) according to their milk production. They were fed grass silage ad libitum from 22 automatic feeding troughs. The cows had free access to all feed troughs. Silage was delivered 4 times per day and orts were removed once per day. The silage was produced from mixed meadow fescue and timothy ensiled with formic acid. The silage contained, on average, 28% DM, with 15% CP and 53% NDF on a DM basis. The commercial concentrate (Rehuraisio, Raisio, Finland) contained, on average, 87% DM, with 22% CP and 13 MJ of ME/kg of energy. Water was offered ad libitum.

The barn comprised 2 rows of stalls and 2 alleys of 35 m length. The cows had access to 45 stalls with sawdust-bedded rubber mattresses, and the feeding alley had a solid rubber floor. Data were gathered from a total of 17 primiparous and 53 multiparous (parity range 2 to 6) cows. The predominant breed was Ayrshire, but the examined group also included 3 Holsteins, 2 Brown Swiss, 1 Jersey, and 1 Finncattle. The cows were, on average, 137 DIM (SD = 87 DIM) during the experiment.

Measurements

The data were gathered for 220 d. Consumption of silage and feeding behavior were measured from roughage feeding troughs equipped with electronic gates for discrete access and data recording for each individual cow (RIC; Insentec BV, Marknesse, the Netherlands). Total daily silage consumption (kg/d) of individual cows was the summation of silage consumed during all feeding bouts for each 24-h period. The duration of feeding of individual cows was registered automatically as the occupancy in roughage feeding troughs. The beginning and end of a feeding bout were recorded when a cow put her head through the gate and when she withdrew. Only feeding bouts that were longer than 1 min were included in the final data. The milking robot registered visits, milk yield, and BW.

As a measure of lameness, the cows were gait scored 15 times at intervals of approximately every 15 d (SD = 5 d; range = 10 to 28 d) by 2 observers according to Winckler and Willen (2001). The scoring took place while each cow was encouraged to walk on a rubber alley of the loose house. A scale of 5 levels was used, where score 1 = normal gait, 2 = uneven gait, 3 = short striding gait with 1 leg, 4 = short striding gait in more than 1 leg or strong reluctance to bear weight on 1 leg, and 5 = does not support 1 leg. If the scores given by the observers differed, their average was used in the analysis. The agreement between the observers was 95%. A gait score of 2 or lower was assigned at least once to 17 primiparous and 48 multiparous cows, a score of 3 was recorded for 13 primiparous and 34 multiparous cows, and a score of 4 or higher was found for 3 primiparous and 16 multiparous cows.

Statistical Analysis

To analyze the effect of lameness on feeding behavior (total daily feeding time, length of feeding bout, feeding rate, and silage intake), milk yield, milking frequency, and BW, linear mixed models were used. For the analysis, 10-d averages of daily results were calculated. Because of the rareness of lameness scores 1 and 5, these scores were merged with scores 2 and 4,