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Preferences of lame cows for type of surface and level of social contact in hospital pens

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ABSTRACT

To investigate preferences of lame cows for flooring and level of social contact, 37 lame, lactating dairy cows (diagnosed with sole ulcer or white line disease) were housed individually for 6 d in experimental hospital pens, where they could choose between 2 equally sized areas (6 m × 4.5 m) with either deep-bedded sand or a rubber surface. On both surfaces, cows could choose between 2 equally sized areas either near or away from heifers in a neighboring group pen. Cows spent more time lying on the deep-bedded sand than on the rubber surface (870 vs. 71 min/d), whereas they spent less time upright (standing or walking) on the sand than on the rubber surface (180 vs. 319 min/d). In addition, cows spent less time self-grooming on the sand than on the rubber surface (2.2 vs. 4.7% of time spent upright). With regard to level of social contact, cows spent more time near the neighboring heifers than away from them; this was true both while lying (565 vs. 374 min/d) and upright (276 vs. 223 min/d). Self-grooming was seen significantly more near neighboring heifers than away from them (4.8 vs. 3.3% of time spent upright). When lying, cows more often positioned themselves in areas of the pen where they could maintain visual contact with neighboring heifers. Lame cows with sole ulcers or white line disease preferred deep-bedded sand for lying, and preferred to perform self-grooming while on the rubber surface. Similarly, they preferred to lie and to perform self-grooming while positioned near animals in a neighboring pen. These results suggest that provision of a deep-bedded lying area in hospital pens is important to the welfare of lame cows. We found no evidence of isolation-seeking behavior in animals with these diagnoses (and no systemic symptoms) while they were kept in individual hospital pens.

Key words: bedding, behavior, flooring, lameness, social contact

INTRODUCTION

Lameness due to hoof disorders is prevalent in modern dairy production, and the associated pain and discomfort represent a serious threat to dairy cow welfare (Whay, 2002; Thomsen et al., 2012). Today, a large proportion of dairy cows are housed in freestall systems with concrete floors in the alleys, and within such systems, lame dairy cows have been shown to move less (Walker et al., 2008), lie for longer (Chapinal et al., 2009; Ito et al., 2010; Thomsen et al., 2012), and spend less time feeding (González et al., 2008; Gomez and Cook, 2010) compared with nonlame cows.

In recent years, increasing emphasis has been put on keeping sick or injured farm animals under special conditions, such as hospital pens, to mitigate negative effects of the pathological condition on animal welfare, as well as to facilitate recovery (Weary et al., 2009). For instance, when kept on pasture, lame cows showed a faster recovery to normal locomotion scores than corresponding lame cows kept in freestall housing (Hernandez-Mendo et al., 2007). This emphasizes the importance of the environment for the management of sick animals, and flooring, as well as the surface and structures of the freestalls, is a central feature of the lame cow's environment. In stalls, healthy dairy cows preferred soft surfaces, such as deep-bedding of sand or straw, over harder mattresses or mats (e.g., Tucker et al., 2003). Furthermore, the use of rubber flooring in the alley increased cows' stride length (Telezhenko and Bergsten, 2005), and rubber flooring increased time spent at the feed manger (Fregonesi et al., 2004; Tucker et al., 2006). However, studies on the flooring preferences of lame cows in hospital pens are lacking.

Another important aspect of dairy cow housing is the level of social contact. Cattle are social animals and generally stressed by isolation (Herskin et al., 2004). However, during the initial 3 d after calving, sick dairy cows actively sought isolation to a greater extent than healthy control cows (Proudfoot et al., 2014). In addition, cows diagnosed with uterine infections engaged in fewer social interactions and avoided competition for food (Huzzey et al., 2007), which could

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have been caused by reduced social motivation, reduced competitive ability, or reduced appetite. Lame dairy cows have been shown to increase feed intake per time unit (González at al., 2008), suggesting that reduced feed intake in lame cows is more likely due to reduced competitive ability or reduced social motivation, rather than reduced appetite. However, motivational studies of lame cows are necessary to investigate whether lame cows are motivated to isolate as such, or just choose isolation to avoid competition or to protect the injured body parts. If lame cows do not seek isolation, then the use of group hospital pens with minimal competition for resources may be preferable to individual hospital pens.

The aim of the present experiment was to investigate (1) floor surface preferences of lame cows; and (2) whether lame cows seek social isolation in a situation without competition for resources and without a need to protect the injured body part from conspecifics. Such knowledge is useful for development of guidelines for the housing of lame cows.

MATERIALS AND METHODS

Experimental Animals and Inclusion Criteria

Forty-two lame, lactating Holstein dairy cows from the resident herd at the Cattle Research Centre at Aarhus University (AU-Foulum, Denmark), were included in the experiment. The cows were selected from among all lactating cows of the 125-cow herd. During the study period, all lactating cows were locomotion scored weekly (Monday afternoon) when returning from the milking parlor. The cows identified as lame [locomotion score 4 on a scale from 1 (normal gait) to 5 (severely lame); Thomsen et al., 2008] were clinically examined in a hoof-trimming chute the next morning and included in the experiment, if they (1) were diagnosed with a horn-related hoof lesion (sole ulcer or white line disease); (2) were not diagnosed with any other disease (and not treated with analgesics or any other medication); and (3) were more than 14 d after calving. Cows diagnosed with sole hemorrhages were not included in the experiment unless they were also diagnosed with white line disease or sole ulcer. If more than 4 lame cows fulfilled the above inclusion criteria in a particular week, the 4 youngest cows were selected for the experiment. If fewer than 4 lame cows fulfilled the inclusion criteria, nonlame, nonexperimental cows (locomotion score 1 and otherwise healthy) entered the experiment to fill the 4 experimental pens (see below) and ensure a constant social environment in the experimental barn. All lame cows were locomotion scored when exiting the experiment 1 wk later, and cows with a locomotion score of 1 or 2 (n = 5) were excluded from the experiment, leaving 37 experimental cows in the data set. Exclusion of cows with a locomotion score of 1 or 2 when exiting the experiment ensured that all experimental cows had been lame (locomotion score 3 or 4) throughout the 6-d experimental period, while they were kept in the experimental pens (when exiting the experiment, 18 cows had a locomotion score of 3, and the remaining 19 had a locomotion score of 4). The 37 lame experimental cows in the final data set were 8 first-parity cows, 17 second-parity cows, and 12 third- or later-parity cows. The BW of these experimental cows, when moved to the experimental pens, averaged 612 (range 505–746) kg. The experiment was completed within 15 wk in the period from September to December 2013.

Housing, Feeding, and Management

Before the experimental period, the cows were loose housed in a barn with a slatted concrete floor and freestalls fitted with 30-mm-thick rubber mattresses. Prior to the experimental period, the cows were milked twice daily in a herringbone milking parlor. Before and during the experiment, cows were fed a TMR for ad libitum intake with a forage-to-concentrate ratio of 60:40 (% DM basis).

During the experimental period, cows were housed individually in 1 of 4 identical experimental hospital pens placed in the same room. The placing of the pens ensured visual contact between the 4 experimental cows as well as 4 neighboring heifers; each experimental cow could obtain physical contact with 2 of the neighboring heifers over the fixture separating the hospital pen and the heifer group pen (Figure 1).

Each experimental hospital pen measured 9 × 6 m and consisted of 2 equally sized (4.5 m × 6 m) parts. The floor of one part of the pen was covered by 30 cm of sand (Kosand brand; Dansand, Brædstrup, Denmark; mean grain size 0.322 mm) and the floor of the other part was covered by a rubber mat [Kura Flex, Kraiburg, Tittmoning, Germany; a 19-mm-thick, pebbled-surface rubber mat with 5-mm studs on the lower side (24 mm including 5-mm studs)]. The sand was held in place by a frame made of wooden boards. To ensure equal levelling of the 2 floor surfaces, the rubber mat was fitted on plywood on top of hard core within another wooden frame.

Each of the 2 pen parts defined by the floor surface could be further divided into 2 equally sized areas, one defining an area near the group pen holding the neighboring heifers and the other defining an area further away from the neighboring heifers. Thus, four 4.5- × 3-m rectangles were defined as “sand near,” “sand far,”