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Locomotion score and claw disorders in Norwegian dairy cows, assessed by claw trimmers

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ABSTRACT

This cross-sectional study was part of a large project on free-stall housing. The aim was to assess the use of locomotion score (LocS) performed by 15 professional claw trimmers and the relation to claw disorders at claw trimming, to see if LocS recordings could be used to screen herds for claw problems. The claw trimmers scored locomotion, trimmed and recorded claw disorders in 2569 cows in 61 dairy herds. The relation between LocS and hind-claw disorders was identified by three multivariable models with binomial outcomes; model 1: LocS > 1 vs. LocS = 1, model 2: LocS > 2 vs. ≤2 and model 3: LocS > 3 vs. ≤3. Input variables were different claw disorders, type of alley floor, days in milk and parity. Significant claw disorders from separate models were put into the same model. Herd and claw trimmer were included in the model as random effects. The results were as follows: there were more heel-horn erosions in cows with LocS > 1 vs. cows with LocS = 1 with OR = 1.6 (1.4/1.9) and in cows with LocS > 2 vs. cows with LocS ≤ 2 with OR = 1.6 (1.2/2.2). There were more sole ulcers in cows with LocS > 1 vs. cows with LocS = 1 with OR = 1.8 (0.9/3.4), in cows with LocS > 2 vs. cows with LocS ≤ 2 with OR = 3.3 (1.8/5.9) and LocS > 3 vs. LocS ≤ 3 with OR = 3.1 (1.5/6.3). There were more separations (white line fissure and/or double sole in cows with LocS > 1 vs. cows with LocS = 1 with OR = 1.7 1.4/2.2), in cows with LocS > 2 vs. cows with LocS ≤ 2 with OR = 2.1 (1.3/3.4) and LocS > 3 vs. LocS ≤ 3 with OR = 3.1 (1.8/5.2). There were more corkscrewed claws in cows with LocS > 2 vs. cows with LocS ≤ 2 with OR = 1.8 (1.0/3.2).

1. Introduction

Lameness is a worldwide cause of reduced animal welfare and along with mastitis and infertility, locomotion problems are an important constraint to the dairy industry (Kossaibati and Esslemont, 1997). Losses are primarily due to prolonged calving intervals, costs of premature culling, reduced yield and quality of milk, and veterinary costs and treatments by the farmer (Enting et al., 1997; Sogstad et al., 2005). Approximately 90% of lameness cases in dairy cattle are caused by claw disorders (Logue et al., 1993; Murray et al., 1996) and lesions that have most commonly been associated with lameness are sole ulcers (Flower and Weary, 2006; Sogstad et al., 2005; Tadich et al., 2010), white-line fissures (Sogstad et al., 2005) and digital dermatitis (Frankena et al., 2009).

In Norway, approximately 88% of cows were housed in tie stalls in 2005 (Sogstad et al., 2005), however with structural changes and new legislation requiring loose housing for most herds, free stalls are expected to become the predominant system in the near future. Most studies find that cattle in free stalls have more claw lesions than in tie stalls (Faye and Lescourret, 1989; Kujala et al., 2009; Kujala et al., 2010; Sogstad et al., 2005). In free stalls cows have to walk between the lying-, milking- and feeding-area, and they depend on

Abbreviation: LocS, Locomotion score;D, dermatitis;DD, digital dermatitis;ID, interdigital dermatitis;E, v-shaped heel-horn erosion;H, haemorrhage of the white line and or the sole;SU, sole ulcer;WLF, white-line fissure;DS, double sole;SEP, WLF and or DS;CC, corkscrewed claw;WLCF, white-line crossing fissures;DIM, days in milk

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having healthy limbs and claws. Within free stalls, locomotion has been demonstrated to differ according to the type of alley floor (Fjeldaas et al., 2011; Telezhenko and Bergsten, 2005).

Depending on the type of housing, flooring, feeding routines and nutrition, regular control of all cows in all herds by a professional claw trimmer is recommended at least 2 times per year. This routine is unfortunately not the case in many herds in Norway. There is a need for practical and cheap ways to detect abnormal locomotion. Objective methods such as kinetic and kinematic analyses have been used to study cattle gait (Flower et al., 2005; van der Tol et al., 2003). Force sensors proved to be a trustable method to detect sole ulcers and white-line disease in one study (Kujala et al., 2008). Methods with visual evaluation of movement (Manson and Leaver, 1988; Sprecher et al., 1997; Tranter and Morris, 1991; Whay et al., 1997) are widely used in research, often with some adaptations. A scoring system has to be user-friendly in order to motivate farmers, veterinarians, claw trimmers and advisors to routinely monitor locomotion in herds. Thomsen et al. (2008) found acceptable levels of intra- and inter-observer agreements for 5 observers with some experience in locomotion scoring in a limited study, using a modified version of the method described by Sprecher et al. (1997). However other studies have found low repeatability between observers (de Rosa et al., 2003).

At the farm, advisors, veterinarians and claw trimmers can use locomotion scoring to a well founded argue for claw trimming. The veterinarian can make use of the method at herd-health visits in order to assess the locomotion status of the cows. Few studies have evaluated locomotion scoring on a high number of cows in cross-sectional studies under field conditions. In this study we used trained, professional claw trimmers who had no previous experience from specific locomotion scoring, to assess the relationship between LocS and claw disorders detected at claw trimming. The objective of this study was to evaluate the relationship between LocS performed by claw trimmers before the cows were taken to trimming and claw disorders recorded the same day.

2. Material and methods

2.1. Selection procedure

This claw and locomotion study was part of a large cross-sectional study in free-stall dairy herds. To be included in the complete study, the following criteria had to be fulfilled: volunteer to participate when asked by a questionnaire, free-stall housing, herd size $\geq$20 standardized cow years in 2005, and a barn built during the period from 1995 to 2005. The claw and locomotion study was designed to include around 70 herds with an approximate equal number of herds with solid rubber, solid concrete and slatted concrete in the alleys. After exclusions and drop outs, the population described above included 232 herds, though only 15 herds had solid rubber. To include more herds with rubber flooring, all 37 free-stall herds with full or partial rubber in the alleys out of the original population of 2400 were surveyed once more by a new questionnaire and asked to join the claw project, resulting in 10 more herds. In a similar questionnaire sent to a computerized stratified sample of the 232 herds, 45 herds with solid and 49 herds with slatted concrete were also asked to join the claw project.

Altogether, 70 herds were willing to join the present study. Four herds were excluded because they did not fit into any of the alley groups. An additional five herds were excluded because they were not locomotion scored. Because the cow-number could not be matched with the Norwegian Dairy Herd Recording System, or they were heifers that had not yet calved, 88 individual animals dropped out of the study. For more details on the selection procedure, see Fjeldaas et al. (2011).

2.2. Study population

Our final study population consisted of 61 herds with 2569 dry or lactating cows, mainly of the Norwegian Red breed. Altogether 14 herds were housed on solid rubber in the alleys, whereas 17 were housed on solid concrete, 23 on slatted concrete and 7 on a mix of rubber and concrete. The mean herd size in the herds was 42 cows. Altogether 1044 cows were in lactation 1; 678 in lactation 2 and 847 in lactations $\geq$3. The mean DIM at trimming was 177 (95% CI: 172/182) and the mean yearly milk production was 6437 kg (95% CI: 6348/6526). In all herds the most-recent claw trimming was performed more than three months ago. Forty-six of the herds were trimmed routinely, however it is not known how many of the animals in each herds were trimmed at these routine trimmings. Fifteen herds were only trimmed occasionally. Twenty-five herds were never at pasture.

2.3. Recruitment and training of personnel

Fifteen experienced claw trimmers (certified (Sogstad and Fjeldaas, 2008)) or participated in previous research projects on bovine claw health attended a 2-day course held by the authors. All the important aspects of locomotion scoring, claw trimming and recording of disorders were focused on to get a general agreement among the claw trimmers. Locomotion scoring was taught by theoretical and practical demonstrations. The participants were tested individually when diagnosing and recording disorders in photos and claws from slaughtered cows. The average test result for all fifteen trimmers was 78.2% correct answers (highest score: 92% and lowest score: 66%). The individual results with evaluation and comments were sent to all claw trimmers before the project start. Locomotion scoring skills could not be tested, because too few animals with abnormal locomotion were available at the site of the course.

2.4. Recording of data

The cows were trimmed once within the period from the 2nd of February 2008 to summer turn-out onto pasture. The last trimming was performed the 10th of July. Eight trimmers used electric grinders with hard-metal abrasive discs, six used hard-metal bladed discs and one used blade and mallet.

Locomotion scoring, based on the Sprecher et al. (1997) method, was performed when the cows were walking freely in the alleys before trimming. Sprecher et al. defined cows with LocS = 1 as standing and walking with a straight back, cows with LocS = 2 as standing with a straight back, but