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Risk Factors for Reduced Locomotion in Dairy Cattle on Nineteen Farms in The Netherlands

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ABSTRACT

A 3-point locomotion scoring system was used that incorporated the position of the back of cows while standing and when walking to investigate risk factors for elevated locomotion scores of 1,450 dairy cows on 19 farms in The Netherlands. Each of the farms was visited twice in an 18-mo period from February 2003 to July 2004. At each visit, all milking and dry cows were scored for locomotion by a single observer. Two multivariable regression models were constructed to identify factors associated with elevated mean locomotion score (increased abnormality) and the percentage of cows with the highest score (score 3). Risk factors for increased locomotion score were having a hoof-trimming stall with foot-lifting apparatus compared with not having such apparatus (increase in locomotion score = 0.15), presence of a footbath at the parlor exit or other site compared with not having a footbath on the farm (increase in locomotion score = 0.17 and 0.19, respectively), not providing supplemental vitamins and minerals to lactating cows compared with supplementing animals (increase in locomotion score = 0.17) and feeding corn silage to heifers compared with not doing so (increase in locomotion score = 0.10). The results provide a framework for hypotheses for future investigations of risk factors for high locomotion scores.
Key words: dairy cow, lameness, locomotion score, The Netherlands

INTRODUCTION

Lameness is a painful condition (Whay et al., 1997) and affects dairy cow well-being by reducing mobility and preventing normal behavior (Farm Animal Welfare Council, 1997). It reduces milk production (Green et al., 2002), fertility (Garbarino et al., 2004), voluntary visits to a robotic milking machine (Klaas et al., 2003), and increases replacement rates (Sprecher et al., 1997; Booth et al., 2004). It is also of great economic cost (Green et al., 2002). Economic incentives for milk quality and research have led to improvements in the management of mastitis and SCC in dairy cattle. This is partly due to financial inducement directly assigned to farmers and due to the development of generic recommendations for mastitis control and prevention, such as the 5-point plan (Blowey and Edmondson, 2000). However, there have been few improvements in management of lameness in dairy cattle. Unlike mastitis, there are no direct financial incentives to reduce lameness. Management plans to minimize lameness in dairy cattle have not yet been developed because the research evidence is not robust enough to provide such a plan.

It is clear that there is a high prevalence of lameness and this is the evidence that recommendations are needed, both general and targeted, to reduce lameness. The prevalence of lameness in Europe has been estimated at 1.2% in 34 zero-grazing herds in The Netherlands (Smits et al., 1992), 5% on 101 farms in Sweden (Manske et al., 2002), and 22% on 53 farms in England (Whay et al., 2002). It is possible that the wide variation, both regionally and nationally, in estimates of prevalence of lameness occurs because of the scoring system used and because of different observers.

Observing lameness in cattle and scoring abnormalities in locomotion is subjective. To improve the objectivity of lameness, recording a number of lameness or locomotion scoring systems have been developed (Whay, 2002). However, some of these systems include subjective definitions of their specific scores, for example "...obvious lameness, some difficulty turning..." (Manson and Leaver, 1988); "...slightly lame...markedly lame..." (Tranter and Morris, 1991); and "abnormal locomotion/tender footed...lame..." (Whay et al., 1997). The system developed by Sprecher et al. (1997) uses the position of the back as well as placement of the feet and action in moving, and has clear objective descriptions of posture and gait for scoring, including subdivisions between sound and clinically lame. The system has 5 categories of increasing severity. The first describes a normal locomotion and only considers the back

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position (flat while standing and walking), the next describes a mild abnormality only visible when the animal walks when the back is arched and gait is abnormal. The top 3 scores classify a bovine as lame and observations are arching of the back while standing and walking, and increasingly poor placement of feet.

Despite the limitations of assessment of lameness, there are studies that report associations between management and lameness. Some have focused on the presence of foot lesions and others on actual abnormal locomotion as an indicator of lameness. In the former, solid concrete floors were associated with an increased prevalence of hoof lesions when compared with straw yards around first calving (Webster, 2002), straw yards for milking cows (Somers et al., 2003), slatted-concrete floors (Frankena et al., 1992), and rubber slats (Hultgren and Bergsten, 2001). Increased hoof lesions were associated with reduced lying times (Leonard et al., 1996), discomfort when lying, and the presence of high steps and slopes in housing (Philipot et al., 1994). However, in a recent study, although 2% of nearly 5,000 cows from 101 farms had hoof lesions, only 5% were clinically lame (Manske et al., 2002), suggesting that studies of lesions may not be specific to prevent lameness.

Studies in which clinical lameness has been used as the outcome of interest (usually defined by need to give treatment) have associated a high prevalence of lameness with slippery walking areas and uncomfortable stalls (Faull et al., 1996), free stalls compared with tie stalls (Cook, 2003), concrete compared with a sand stall base (Cook, 2003), and the lack of biotin supplementation for milking cows (Hedges et al., 2001). These studies provided associations and are independently insufficient evidence to form the basis of a management program; consequently, it is not yet possible to provide a best-practice management for reducing lameness in dairy cattle from scientific literature. Exposure to different husbandry practices means that risk factors for lameness are likely to vary between farms, management systems, and countries; therefore, a generic and targeted plan is required.

The aim of Lamecow (an European Union framework 5 funded project number OLRT-2001-00969) is to use a multidisciplinary approach to reduce lameness in dairy cows through development of "best practice" in dairy enterprises in member states of the European Union and to understand the biological mechanisms by which lameness is caused and may be minimized. The first stage was to elucidate specific risks. The purpose is to report risk factors identified from an epidemiological study that were associated with increased mean and maximum locomotion scores on 19 farms in The Netherlands.

MATERIALS AND METHODS

Nineteen farms in The Netherlands (1,450 cows) were enrolled into a study of risk factors associated with high locomotion score in dairy cattle in February 2003. These farms were selected from approximately 500 farms employing 1 of 5 professional hoof trimmers at the convenience of the researchers. Each hoof trimmer worked in one area of the Netherlands, specifically the north, northeast, northwest, east, and south.

The 5 hoof trimmers each visited 4 farms and trimmed all the cattle. Each farm was also visited twice by a researcher (PK), one visit during winter housing and once when the cattle were at pasture, with the exception of one herd that was visited during the housed period only. At each visit, all cows were locomotion-scored by PK in confinement or at pasture, using an adaptation of the method of Sprecher et al. (1997), in which scores 3 to 5 were classed as score 3 (Table 1), enabling all scoring to be done using only the position of the cow's back while walking and standing. Farmers completed a questionnaire with questions on management practices that have been hypothesized as risks for lameness (Manske, 2002) including aspects of housing, nutrition, and health for heifers, lactating cows, and dry cows (Table 2). In addition, there were observations made directly on the housing environment including cubicle dimensions, bedding and floor types, and external observations of tracks and gateways. Farmers were asked to complete the questionnaire themselves; answers that were unclear were clarified at the subsequent visit by PK.

Data Management and Analysis

All data were entered into a Microsoft Access database and were examined for errors and missing values that were checked against paper records and, where possible, followed up by contacting the farmer.

The impact of management on locomotion score was assessed in 2 separate models. The individual farm mean locomotion score was calculated by summing the individual cow scores from all visits and dividing by the number of cow observations per farm. The percentage of cows with locomotion score 3 was estimated by summing the number of locomotion score 3 observations from all visits and dividing by the total number of observations. Any differences between the housing and pasture visit locomotion scores was assessed using ANOVA of the farm mean scores.

All independent variables with at least 3 farms in each category were tested first in bivariate linear regression models with mean locomotion score and then with percent locomotion score 3 as the outcome variable. Independent variables with a significance probability