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Effects of changing freestall area on lameness, lying time, and leg injuries on dairy farms in Alberta, Canada

Emily Morabito,*[1] Herman W. Barkema,* Edmond A. Pajor,* Laura Solano,* Doris Pellerin,† and Karin Orsel*
*Department of Production Animal Health, Faculty of Veterinary Medicine, University of Calgary, 3330 Hospital Drive NW, Calgary, AB T2N 4N1 Canada
†Department of Animal Science, Laval University, 2325 Rue de l'Université, Ville de Québec, QC G1V 0A6 Canada

ABSTRACT

Cow comfort is of increasing importance in the dairy industry, due to an increased focus on animal welfare. However, whether producer changes to the cows' environment affect cow comfort has not been well characterized. Our objectives were to: (1) quantify the effect of freestall area changes on the prevalence of lameness, leg injuries, and average lying time; and (2) compare cow comfort outcomes on farms that had never had an assessment of cow comfort to farms that had had a previous assessment of cow comfort. A sample of 60 Holstein-Friesian cows were selected on each of 15 farms that made changes to the freestall area after an assessment of cow comfort (change, CHG); 15 farms that did not make changes to the freestall area after an assessment of cow comfort (no change, NC); and 14 farms that had yet to be evaluated (new farms, NF). Cows in NC and NF were lame 1.50 and 1.71 times more often, respectively, than cows on CHG farms. Additionally, daily lying time was 0.33 and 0.62 h/d lower in NC and NF, respectively, than on CHG farms. The prevalence of hock and knee injuries was not different among the 3 groups of farms. No differences were detected in the parameters of interest when comparing NF with NC farms; therefore, we concluded that the NC group was not biased by a previous assessment of cow comfort. Farms in the CHG group had a lower prevalence of lame cows and greater lying time than the NC and NF groups.
Key words: dairy cattle, animal welfare, lameness, leg injury, hock injury

INTRODUCTION

Worldwide, cow comfort and animal welfare are important topics for the dairy industry (Barkema et al., 2015). Quantifying animal-based measures (e.g., prevalence of lameness and injuries, lying time, and production information), evaluating environmental factors (e.g., barn design and stall dimensions), and determining management practices (e.g., record keeping and management training) are proven methods of assessing animal welfare (National Farm Animal Care Council, 2009; Vasseur et al., 2013; Solano et al., 2015). Furthermore, prevalence and risk factors for animal-based measures of cow comfort—including prevalence of lameness (Solano et al., 2015), prevalence of injuries (Zaffino Heyerhoff et al., 2014), and lying behavior (Solano et al., 2016)—on freestall dairy farms have been well characterized, providing baseline information.

Lameness reduces cow comfort and welfare, because it causes pain (Rushen et al., 2007), negatively affects lying time (Solano et al., 2016), and is associated with low BCS (Zaffino Heyerhoff et al., 2014). Lameness prevalence varies by region, housing system, and management practice (Cook and Nordlund, 2009), ranging from 0 to 55% in North America (Cook et al., 2004; von Keyserlingk et al., 2012; Solano et al., 2015). Hock and knee injuries are important animal welfare concerns, because they can cause pain and discomfort (Huxley and Whay, 2006). In a recent Canadian study, 47 and 24% of cows had hock and knee injuries, respectively (Zaffino Heyerhoff et al., 2014). Lying time is considered a good indicator of cow comfort, because it is optimal for cows to lie down 12 to 13 h/d (Weary et al., 2009), and suboptimal stall design reduces lying time (Solano et al., 2016). Lying time can also be linked with animal welfare: cows with restricted lying time have a higher risk of aggressive behavior, decreased productivity, poor hoof health, and compromised overall health (Ito, 2009; Nechanitzky et al., 2016; Wang et al., 2016).

The Dairy Farmers of Canada and the National Farm Animal Care Council created the Canadian Dairy Code of Practice, containing recommended practices and requirements for Canadian dairy producers (Vasseur et al., 2013). To supplement this code, a cow comfort assessment was developed to help producers assess their compliance with the Canadian Dairy Code of Practice (Vasseur et al., 2013). These assessments were

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[1]Corresponding author: emily.morabito@ucalgary.ca

implemented in several Canada-wide studies (Zaffino Heyerhoff et al., 2014; Solano et al., 2015), allowing participating producers to determine how their farms compared with regulations in the Canadian Dairy Code of Practice.

Although information about cow comfort and welfare is available for Canadian dairy producers (e.g., the Canadian Dairy Code of Practice and conferences), it is not known whether they use this information to make changes that would improve cow comfort and welfare on their farm. Additionally, effects on measures of cow comfort after implementation of changes have not yet been reported. The objectives of this study were to: (1) quantify the effect of freestall area changes on lameness, leg injuries, and average lying time; and (2) compare cow comfort outcomes on farms that had never had an assessment of cow comfort to outcomes on farms that had had a previous assessment of cow comfort.

MATERIALS AND METHODS

The method of assessing cow comfort has been described in Solano et al. (2015) and Solano et al. (2016). Methods included evaluations of animal-based measures, environmental measures, and management factors (Zaffino Heyerhoff et al., 2014). Standard operating procedures used were consistent with previous studies and are reported on the Canadian Dairy Research Portal (http://www.dairyresearch.ca/animal-comfort-tool.php).

Farm Selection and Farm Visits

The 91 freestall dairy farms in Alberta, Canada, that participated in a previous evaluation of comfort and lameness (Solano et al., 2015) were invited to participate in the present study, with a target of 15 farms per study group. Thirty of these previously assessed farms were selected for participation because they met all the criteria. Remaining farms were not included because of logistic and scheduling conflicts. As well, 45 Alberta freestall dairy farms that did not participate in the Solano et al. (2015) study were also invited to participate as a contemporary control group. Fifteen of those 45 farms were selected for the present study (Figure 1), because some of the farms that met the inclusion criteria did not fit into the farm visit schedule. Inclusion criteria are presented in Table 1 and were consistent with the previous study, as described by Solano et al. (2015).

A total of 44 freestall dairy farms in Alberta were visited between April and December of 2015. Participating farms included 15 that made changes to their freestall area (change, **CHG**); 15 that did not make changes, or made changes that were not related to the freestall area (no change, **NC**); and 14 that were not enrolled in the Solano et al. (2015) study and had had no previous cow comfort assessment (new farms, **NF**). Initially, the NF group consisted of 15 farms, but 1 was excluded from the analyses because of a disruption in data collection (Figure 1). Each farm was visited twice, with an interval of 5 to 7 d between visits. During the first visit, both environmental and animal-based measures were collected. During the second visit, a face-to-face questionnaire was conducted, along with any data collection (animal-based and environmental) that had not been completed during the first visit. Data were collected by trained research personnel from the University of Calgary (AB, Canada), including 1 graduate student (EM) and 2 research assistants. All protocols and questionnaires were approved by the University of Calgary Animal Care Committee (AC14–0216) and Research Ethics Board (REB14–2120).

Cow-Based Measures

Forty cows between 10 and 120 DIM were selected on each farm, because this period is known to be a critical one for lameness (Green et al., 2002). If the farm did not have 40 lactating cows between 10 and 120 DIM, cows >120 DIM were added, reflective of the parity distribution on farm. As well, another 20 cows between 121 and 310 DIM were selected to ensure that all stages of lactation were represented. Pen was not considered in the selection process, but pens were excluded if they did not contain freestalls. This occurred on 2 farms, and cows from these pens were excluded from the study. Additional cows from alternative pens with freestalls were selected according to the selection criteria.

Selected cows were assessed for lameness, knee injuries, hock injuries, lying time, claw length, leg cleanliness, and BCS using standard operating procedures as described on the Canadian Dairy Research Portal (https://www.dairyresearch.ca/animal-comfort-tool.php). In short, cows were video-recorded for lameness as they exited the milking parlor. Recordings were subsequently viewed and cows were scored for lameness based on the presence of a head bob, asymmetrical steps, and a limp. Cows were considered lame if they had a limp (Solano et al., 2015; Vasseur et al., 2015). Knee and hock injuries, claw length, leg cleanliness, and BCS were assessed in the milking parlor or in the freestall area (if data could not reliably be collected in the milking parlor). Hock injuries were scored on a scale of 0 to 3, separately for the left and right joints (Gibbons et al., 2012). Lying time was measured using electronic data loggers (HOBO Pendant G Acceleration Data Loggers; Onset Computer Corp., Pocasset,