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Prevalence of lameness and leg lesions of lactating dairy cows housed in southern Brazil: Effects of housing systems

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ABSTRACT

Within the last few decades, the North American and European dairy industries have been collecting information about lameness and leg injury prevalence on dairy farms and have tried to develop solutions to mitigate these ailments. Few published articles report the prevalence of lameness and leg lesions in areas outside of those 2 regions, or how alternative housing systems, such as compost-bedded packs, affect the prevalence of these maladies. The objectives of this study were to compare the prevalence of lameness and leg lesions on confined dairies that used freestall, compost-bedded packs, or a combination of these 2 systems in Brazil. Data were collected in the autumn and winter of 2016 from 50 dairy farms located in Paraná state, including 12 compost-bedded pack dairies (CB), 23 freestall dairies (FS), and 15 freestall dairies that used compost-bedded packs for vulnerable cows (FS+C). A visit to the farm consisted of a management questionnaire, an inspection of the housing areas as well as the milking parlor, and an evaluation of all lactating cows as they exited the parlor for lameness (score 1–5), hygiene (score 0–2), body condition score (score 1–5), and hock and knee lesions (score 0–1). Median 1-way chi-squared test was used to compare production systems. We found no difference between farm types in management practices related to hoof health management or average daily milk production per cow [31 (29–33.9) kg/d; median (quartile 1–3)], percentage of Holstein cattle in the herd [100% (90–100%)], conception rate [35.8% (30.2–38%)], or pregnancy rate [15% (13.7–18%)]. The CB farms were smaller [85 (49.5–146.5) milking cows] than both the FS [270 (178–327.5) milking cows] and FS+C farms [360 (150–541.5) milking cows). The overall prevalence of severe lameness (score 4 and 5) across all farms was 21.2% (15.2–28.5%) but was lower on the CB farms [14.2% (8.45–15.5%)] in comparison to the FS [22.2% (16.8–26.7%)] and the FS+C farms [22.2% (17.4–32.8%)]. Less than 1% of all cows scored on CB farms were observed with swollen or wounded knees (or both), which was lower than either the FS or FS+C farms [7.4% (3.6–11.9%) and 6.4% (2.6–11.8%) of all cows scored, respectively]. The same pattern was found for hock lesions, where the farm-level prevalence within the 3 different housing types was 0.5% (0–0.9%), 9.9% (0.8–15.3%), and 5.7% (2.6–10.9%) for CB, FS, and FS+C farms, respectively. No differences between farm systems were observed for hygiene or body condition score. On average, 2.7% (0.8–10.9%) of lactating cows had a soiled side, 15.4% (2.1–37.4%) had dirty legs and 1.7% (0–9.3%) had dirty udders. The average herd-level body condition score across farms was 2.9 (2.9–3), with 0.86% of the all cows scored having a body condition score <2.5. These results indicate that lameness prevalence on confined dairies in Brazil is high and highlight the need for remedial changes in environmental design and management practices. We found that CB farms in this region had reduced lameness and lesions in relation to FS or FS+C dairies.

Key words: animal welfare, dairy cow, hock lesion, swollen knee, compost-bedded pack

INTRODUCTION

Lameness is a major animal welfare and productive challenge facing the dairy industry because it causes pain (O'Callaghan et al., 2003; Whay et al., 2003; Rushen et al., 2008; Potterton et al., 2012), reduces DMI and milk yield (Bach et al., 2007; Leach et al., 2012), and increases the risk of a cow being culled before the end of lactation (Bicalho et al., 2007). Many studies have investigated the prevalence of lameness on dairy farms across the globe, but these studies have focused on the most common confined housing systems, such as freestall and tiestall barns (Andreasen and Forkman,

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2012; von Keyserlingk et al., 2012; Metz et al., 2015; Solano et al., 2015; Westin et al., 2016; Adams et al., 2017; Bouffard et al., 2017). Little information is available on the prevalence of lameness and leg lesions on commercial farms within Brazil, or globally on dairies that use a mixture of freestall and compost-bedded packs.

Causes of lameness and leg lesions on dairy farms range from those related to the individual cow to environmental factors, and depending on particular conditions, the effect of each factor may vary (Cook and Nordlund, 2009; Chapinal et al., 2013, 2014). Due to the high prevalence of hoof problems and leg lesions found in cows housed within freestall housing across the globe (see review by Kester et al., 2014; Palmer and O'Connell, 2015), efforts have focused on identifying alternative housing and management strategies. For instance, deep-bedded stalls, improved stall maintenance, and access to pasture have all been associated with reduced lameness and hock lesions (Fulwider et al., 2007; Chapinal et al., 2013).

Compost-bedded packs consist of a large bedded area with a compostable material such as straw or sawdust that is typically aerated once or twice a day to facilitate the composting process and to mix the animals' waste with the compostable material (Janni et al., 2007). This system has gained traction in the United States (Black et al., 2013; Eckelkamp et al., 2016a,b) and in Europe (Klaas et al., 2010; Klaas and Bjerg, 2011), and is growing rapidly in Brazil. Compost-bedded packs enable animals to engage in more natural lying behaviors and permits more social interaction in comparison with the freestall housing systems (Endres and Barberg, 2007). Housing of dairy cattle on compost-bedded packs has been shown to improve health and longevity of the cow and, consequently, the productive performance of the animal (Norring et al., 2008; Fjeldaas et al., 2011; Lobeck et al., 2011). The work done to date on compost-bedded packs collectively reports benefits, such as lower prevalence of claudication and hock and knee lesions in comparison with freestall systems (Barberg et al., 2007; Fulwider et al., 2007) and increases in hoof health of dairy cows (Klaas and Bjerg, 2011; Black et al., 2013).

Recently, some freestall farms have incorporated compost-bedded pack barns as special needs housing for their vulnerable animals (Eckelkamp et al., 2016a). This management practice is based on the notion that improved comfort for vulnerable cows would lead to improved leg and overall health of dairy cows but to date no work has investigated this management practice. Providing access to a more open housing system that has less structural hardware known to impede movements associated with lying (Ceballos et al., 2004) and has less concrete flooring, such as a compost-bedded packs, may help meet the behavioral needs and other necessities of special needs animals, such as transition cows (Eckelkamp et al., 2016a,b). It has been suggested that providing a soft area where cows have ample space to lie down is an important factor that may affect the health of transition cows (Cook and Nordlund, 2004), as both environmental and physiological factors that negatively affect the cow have been shown to suppress the immune system (Chebel et al., 2016). A recent US survey provides some indirect evidence that the strategy of using compost-bedded packs for vulnerable cows will decrease bulk tank SCC (Eckelkamp et al., 2016a).

In Brazil a growing number of dairy farms temporarily house their transition cows (and sick and lame cows) on compost-bedded packs before moving them back to freestall housing. Little is known regarding the use of this blended type of housing system on the prevalence of lameness and hock and knee lesions. Thus, the objectives of this study were to compare the prevalence of lameness and hock and knee lesions on confined dairies that used freestalls, compost-bedded packs, or a combination of these 2 systems in southern Brazil.

MATERIALS AND METHODS

A convenience sample of 50 confined dairy farms distributed in 4 municipalities in the central region of the state of Paraná was used in this study. This region is one of the most important milk production clusters in Brazil with a total milk production of more than 400 million liters from 70 thousand cows on 2,200 dairy farms (IPARDES, 2009). Farms were identified through extension agents, veterinarians and other dairy industry experts working in the Castrolanda Farmers' Cooperative (Castro, PR, Brazil). Some farms were recruited using a snowball technique, whereby farmers that had agreed to participate were asked to recommend other farmers that they believed would be willing to participate. Farmers were contacted directly by a member of the research team by telephone at which time, if the farmer was in agreement, an appointment for a visit was made. Of all farmers approached, only 2 declined to participate. This sampling regimen resulted in 3 groups of farms: 12 compost-bedded pack farms (**CB**), 23 freestall dairies (**FS**), and 15 freestall dairies with compost-bedded packs (**FS+C**) for vulnerable cows (such as transition and sick cows).

The study was carried out between March and October 2016. All procedures were approved by the Ethics Committees on Research on Humans (protocol #PP1237779, 2015) and Animals of the Universidade Federal de Santa Catarina (protocol #PP00949, 2014) and by the University of British Columbia Animal Care Committee (protocol #A15–0082).