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Management characteristics, lameness, and body injuries of dairy cattle housed in high-performance dairy herds in Wisconsin

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ABSTRACT

The objective of this study was to benchmark the prevalence of lameness, hock and knee injuries, and neck and back injuries among high-performance, freestall-housed dairy herds in Wisconsin. A random selection of 66 herds with 200 or more cows was derived from herds that clustered with high performance in year 2011 Dairy Herd Improvement records for milk production, udder health, reproduction, and other health parameters. Herds were surveyed to collect information about management, facilities, and well-being. Well-being measures were obtained through direct observation of the high-producing mature cow group, surveying 9,690 cows in total. Total herd size averaged (mean \pm standard deviation) 851 ± 717 cows, ranging 203 to 2,966 cows, with an energy-corrected milk production of 40.1 ± 4.4 kg/cow per day. Prevalence of clinical lameness (5-point scale, locomotion score ≥ 3) and severe lameness (locomotion score ≥ 4) averaged 13.2 ± 7.3 and $2.5 \pm 2.7\%$, respectively. The prevalence of all hock and knee injuries, including hair loss, swelling, and ulceration, was similar at 50.3 ± 28.3 and $53.0 \pm 24.0\%$, respectively. Severe (swelling and ulceration) hock and knee injury prevalence were 12.2 ± 15.3 and $6.2 \pm 5.5\%$, respectively. The prevalence of all neck injuries (including hair loss, swelling and ulceration) was $8.6 \pm 16.3\%$; whereas the prevalence of swollen or abraded necks was low, averaging $2.0 \pm 4.1\%$. Back injuries (proportion of cows with missing or abraded spinous processes, hooks, or pins) followed a similar trend with a low mean prevalence of $3.6 \pm 3.4\%$. Overall, physical well-being characteristics of this selection of high-producing, freestall-housed dairy herds provide evidence that lameness and injury are not inevitable consequences of the confinement housing of large numbers of dairy cattle. In particular, lameness prevalence rivals that of lower-production grazing systems. However, hock and other injury risk remains a concern

that can be addressed through a choice in stall surface type. Use of deep, loose bedding yielded significant advantages over a mat or mattress type surface in terms of lameness, hock and knee injury, and proportion of cows with dirty udders (distinct demarcated to confluent plaques of manure). The performance benchmarks achieved by these herds may be used to set standards by which similarly managed herds may be judged using welfare audit tools.

Key words: lameness, injury, freestall housing, dairy herd management

INTRODUCTION

The dairy industry continues to expand and consolidate across North America, with more milk being sourced from fewer larger confinement-housed dairy herds (USDA NASS, 2012). In an effort to improve efficiency, milk production per cow has been increased through breeding, feeding, increased milking frequency, and the use of production enhancing technologies such as bST and monensin sodium. With this approach, the US dairy industry now produces more than twice as much milk from two-thirds fewer cows compared with the 1940s, reducing its carbon footprint and the consumption of food and water (Capper et al., 2009).

However, the sustainability of the industry is a complex problem that has recently received attention from a panel of experts who not only examined environmental and economic facets to their definition of sustainability, but also included a societal perspective (von Keyserlingk et al., 2013). This has relevance when one realizes that the urban shift in the US population has been coupled with increased scrutiny of many dairy practices, such as a move from grazing to confinement housing. Nonfarming respondents to a recent US survey most often indicated that animal well-being is of primary concern in considering the practice of dairy farming (Cardoso et al., 2016).

Consumers carry an expectation that cows should graze and appear to place considerable value on cattle having access to the outdoors, where they have fresh air and freedom to roam (Ellis et al., 2009; Boogaard et al.,

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2011; Cardoso et al., 2016). In stark contrast to these expectations, two-thirds of US dairy herds practice a conventional confinement-housed management strategy (USDA NASS, 2010; von Keyserlingk et al., 2012). Whereas tiestalls continue to be the main form of housing for 49% of all herds in the United States, freestalls are emerging as the dominant form of housing in larger herds, representing 68% of herds with 100 to 499 cows and 73% of herds with 500 or more cows (USDA NASS, 2010). The sustainability of the dairy industry is therefore threatened when society learns that animal welfare may be compromised in high-producing cattle, managed not on pasture, but kept in large freestall-housed dairy herds. Recent benchmarking work of such herds in North America suggests that dairy cows managed in this manner are at significant risk for injury and lameness (von Keyserlingk et al., 2012). Indeed, the United States is not alone in confronting lameness and injury issues in its dairy industry. The worldwide prevalence of lameness in dairy herds is approximately 25% across studies based in Austria, Canada, China, Finland, Germany, Italy, Netherlands, New Zealand, Norway, the United Kingdom, and the United States (e.g., Amory et al., 2006; Dippel et al., 2009; Kielland et al., 2009; Barker et al., 2010; von Keyserlingk et al., 2012; Sarjokari et al., 2013; Chapinal et al., 2014; Fabian et al., 2014; Popescu et al., 2014), with a trend toward lower prevalence in grazing or mixed housing and grazing systems (e.g., 16.5% in Amory et al., 2006; 15% in Haskell et al., 2006; and 8.3% in Fabian et al., 2014), and a higher prevalence in confinement-housed freestall herds (e.g., 54.8% in northeast US dairy herds in von Keyserlingk et al., 2013; 31% in Chapinal et al., 2014). Even more worrisome is a mean prevalence of around 48% for hock injury in a similar global range of housed dairy herds (e.g., Kielland et al., 2009; Lombard et al., 2010; Potterton et al., 2011; von Keyserlingk et al., 2012; Brenninkmeyer et al., 2013; Zaffino Heyerhoff et al., 2014).

The question has therefore been raised as to whether or not lameness, injury, and poor physical well-being are an inevitable consequence of higher milk production and herd size expansion in confinement freestall facilities, or whether they are a consequence of the decisions being made in the construction and management of these larger dairies. Poor animal welfare will be identified by the increasing number of audits and assessments that dairy farms are being exposed to, and public scrutiny will only increase. With this backdrop, it is essential that we develop science-based benchmarks for a variety of well-being outcomes that can be used to compare herd performance within the industry. Given their importance, it is surprising that to date, very few

published articles are available to describe these standards in US dairy herds (e.g., Espejo et al., 2006; von Keyserlingk et al., 2012).

The Wisconsin dairy industry is a microcosm of the changes taking place in the United States as a whole, with a shift from tiestall to freestall housing accompanied by an increase in herd size from an average of 34 cows in 1975 to 152 cows per herd in 2012 (USDA NASS, 2013). As this shift has been made in housing and management, dairy producers in the state have been the recipients of outreach and advice from numerous sources, including University of Wisconsin Extension, producer-led programs through the Professional Dairy Producers of Wisconsin and Dairy Business Association, and through The Dairyland Initiative since 2010 (a web-based program designed to promote the construction of welfare friendly facilities for dairy cattle; <https://thedairylandinitiative.vetmed.wisc.edu/index.htm>). These outreach efforts were focused on creating environments which sustain well-being in high-producing dairy cows housed in freestall facilities.

Recently, Brotzman et al. (2015a) performed a cluster analysis of freestall-housed dairy herds with more than 200 cows in the upper Midwest, using DHIA parameters to classify herds into groupings based on similar performance characteristics. The previous analysis identified herds where high production was accompanied by above average performance in other variables such as reproductive and fresh cow performance and udder health. The objective of our study was therefore to assess the prevalence of lameness and body injuries in the identified high-performance, larger freestall-housed dairy herds, to determine whether this management approach was compatible with high standards of physical well-being and provide benchmarks for animal observations included in animal welfare audits.

MATERIALS AND METHODS

Farm Selection and Description

Previously, principal component analysis and cluster analysis were successfully used to discover groups of dairy herds with similar performance characteristics on multiple DHI production and performance variables (Brotzman et al., 2015a). This process was applied to year 2011 DHI mean test day data for 557 upper Midwest dairy herds of ≥ 200 cows on test, creating 6 cluster groups. A follow-up survey of management practices revealed relationships between management practices and overall group DHI performance for milk production, udder health, reproduction, and health (Brotzman et al., 2015b). For the current survey, 66 herds from the

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