Decreasing Lameness and Increasing Cow Comfort on Alberta Dairy Farms

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Take Home Messages

- A combined approach when assessing cow comfort should be used as a tool by producers and advisors when aiming to improve cow longevity.
- For both welfare and economic reasons it is vitally important for dairy farmers to increase the lifespan of cows by enhancing comfort and reducing the prevalence of lameness.
- Early detection of lameness will result in less pain, quick return to productivity and increased longevity.
- Cow comfort programs should be tailored to the specific farm.

Importance of Cow Longevity, Lameness and Cow Comfort

Longevity can be defined as the length of time that a cow remains in the herd after the first calving, in other words, it is the length of her productive life. The survival of a cow can be influenced by many factors. Management-related factors include milk quota restrictions, availability of replacement heifers, nutrition, overstocking, management practices that influence the incidence of disease, and barn features such as stall size, bedding type and flooring. Cow-related factors include, among others, metabolic and reproductive disorders,

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conception rates, milk production efficiency, body condition, and conformation of legs, feet and udder.

The dairy industry has begun to place more emphasis on breeding for longer-lived, healthier and more productive cows, which will yield benefits for farm profitability, animal welfare and the environment. Longevity can also be seen as an indicator for welfare; improvements in farm animal welfare will increase productivity and hence lead to economic benefits. In addition, the environmental impact of dairy production is reduced when the longevity of each cow and the efficiency of milk production are high (NFU, 2010).

Lameness is a significant contributor to culling decisions; in fact, it has been identified by CanWest DHI subscribers as one of the four most common primary involuntary reasons for culling (Canwest DHI, 2011). Lameness and injuries among dairy cows can occur due to a combination of genetic and non-genetic factors (such as her surrounding environment), and they can markedly affect production and longevity, thereby reducing the overall efficiency of dairy production.

While there is a debate on different ways to increase a cow's lifespan, there is no dispute that the quality of her life remains a priority. Reduced cow comfort associated with certain management practices as well as poor flooring and stall and pen designs are important risk factors for a high prevalence of lameness and injury.

Lying time also plays an important role, as the time cows spend standing and lying may indicate problems with cow comfort that lead to lameness and injury. It has been suggested that lying behavior has potential as an electronic screening tool to identify farms with reduced cow comfort and it can potentially be used for on-farm lameness detection (Ito et al., 2010).

Many recommendations are now available to farmers about good facility design and management, but there is a lack of information on the extent that these recommendations are being adopted or on the extent that they are able to increase cow longevity. Dairy Farmers of Canada (DFC) has recently developed a Code of Practice for the Care and Handling of Dairy Cattle, which is based on scientific knowledge on cow comfort and welfare. There is a need to ensure the uptake of this knowledge and the implementation of the recommendations on individual farms. With these aspects in mind, DFC and Agriculture and Agri-Food Canada have funded a cow longevity study across Canada with the Faculty of Veterinary Medicine from the University of Calgary taking the lead in Alberta. Through the support of Alberta Milk, the Alberta Livestock and Meat Agency and The Alberta Dairy Hoof Health Project (Mason, 2009), Alberta has added a research component focusing on lameness and claw lesions. Until now, there were no data on lameness or injury prevalence available for Alberta and there was no Alberta-specific

information on management practices and housing features associated with lameness and cow comfort. Alberta's dairy producers lacked baseline data with which to compare their own herds, and did not have the science-based information that would allow them to identify and address risks on their own farms. Our research group recently conducted a study where these questions were addressed providing, for the first time, baseline measures associated with lameness and cow comfort for the Alberta dairy industry along with the development of a tool to help Alberta producers benchmark their farms.

■ Longevity and Lameness Project in Alberta

From May 2011 to July 2012, a total of 80 free-stall dairy farms were visited covering the four main dairy areas of Alberta. A total of 3,126 Holstein-Friesian cows were included in the study. The herd size ranged from 65 to 400 cows and only herds that were CanWest DHI participants were included in the study. Claw lesion data were collected through collaboration with 7 specially trained hoof trimmers who recorded the lesions with the Hoof Supervisor® lesion recording system. On each farm, information was collected in 3 main areas:

- Cow measures: a subgroup of cows was selected and measurements on hock, knee and neck injuries, lying time, lameness (assessed by gait scoring through videos), claw lesions, cleanliness, milk production and lactation number were collected.
- Environment: information on stall base, bedding, stall and pen measurements, type of flooring, slipperiness, stocking density and other barn design features.
- Management: a questionnaire captured information on management practices related to cleanliness and bedding routine, treatment and procedures related to lameness and hoof trimming, footbath measures and routine.

Cow Measures: Let the Cow Speak for Herself!

Lameness & Claw Lesions

Early detection of lameness is critical for optimizing treatment and prevention plans, minimizing impaired animal welfare and reducing economic loss. Gait scoring systems by trained observers are reliable and practical methods that have been developed to assess the number of animals lame at any one time (lameness prevalence) in a given herd. These systems are useful not only for identifying the problem animals, but also for assessing the severity of their locomotion problem and monitoring the effectiveness of lameness treatments. As the presence of hoof lesions usually becomes visible after the damage has

already been done, and are only detected during hoof trimming, (which is done only occasionally), gait scoring methods also can identify problem cows before the hoof lesion is visible (Chapinal et al., 2009). Recording hoof lesions can help producers detect problems with facility design, especially related to flooring. Gait scoring can be done more often than hoof examination and will therefore provide information to the producers more quickly. Gait scoring all the cows on a regular basis is definitely an arduous task, but is essential to get an idea of what is happening on the farm. Strategic herd scoring can be done under different scenarios. Examples of scoring options are: scoring all cows, scoring the middle third of the pen when cows are exiting the parlour, or scoring a sample of cows distributed throughout the herd (Wren, 2012).

There are large differences in the prevalence of lameness and claw lesions between farms, even with similar management and housing types and similar genetic background of the cows. These differences between farms are encouraging because they show that many dairy farmers have successfully adopted housing and management systems that keep cows from becoming lame or injured. Our study found that on average 20% (range 3 to 69%) of cows within a herd were lame. In addition, observations made by the hoof trimmers determined that digital dermatitis (DD) was the most prevalent lesion, being present on 98% of the 80 farms included in our study and affecting an average of 28% of cows per herd (range 1-81%). High prevalence levels of DD have also been observed in our large collaborative study with Alberta Milk's Dairy Hoof Health Project (www.hoofhealth.ca). Of the more than 40,000 cows included in the database and evaluated by the hoof trimmers, over half of the cows had claw lesions, with DD accounting for 43% of these lesions, followed by sole ulcers (17%), white line lesions (16%), sole hemorrhages (6%) and others (17%). These results indicate that DD is a health issue in Alberta and its prevalence is higher compared to other provinces such as Ontario with 35% and British Columbia with 38% (Mason, 2009). This was also reinforced by the Alberta dairy farmers in our study who responded in our questionnaire that DD is one of their most concerning issues.

Injuries & Cleanliness

So far most attention has focused on lameness due to claw lesions because the economic costs of this have been calculated. However, dairy cows can experience a variety of other forms of injury that can markedly reduce production and longevity. For example, severe lesions of the hock can result in some of the largest decreases in milk production and have been associated with a higher somatic cell count, higher death losses, more lameness, and higher culling rates (Bareille et al., 2003; Fulwider et al., 2007).

Condition of the hocks can be an important warning of the abrasiveness of stall bedding and cow comfort. Injury is usually the result of prolonged

exposure to an abrasive stall surface. Knee health may be a sign of the hardness of the stall floor and cow comfort. Injury in hocks and knees is usually the result of prolonged exposure to a hard stall floor leading to swelling and skin breakage which provides an opportunity for infection to occur resulting in discomfort and possibly lameness.

Neck injury is usually the result of prolonged exposure to rubbing or hitting against the neck rail/chain or feedbunk rail/chain. Neck injury can give us some information of whether the neck rail/chain in the stalls and/or at the feedbunk is at the correct height or length (chain) and that the feed is within easy reach for the animal.

Our study excluded farms where the milking cows had outdoor access, which may have had an impact on observed body injuries due to reduced exposure to stalls. Older cows more frequently had injuries than younger cows. On fewer than 10% of the farms were more than 90% of cows found to be injury-free. Twenty five percent of the farms had more than 30% of the cows with visible lesions and swelling; this is very concerning from a cow welfare perspective. Overall, the prevalence of hock, knee and neck injuries was 47, 30 and 10%, respectively.

The relationship between lying time and lameness

The relationship between lameness and the time that cows spend lying down is complicated by the fact that cows can spend more time lying down once they are lame than healthy cows, but long standing times mean more exposure to concrete flooring increasing the chance of the development of claw lesions. In research settings, it was shown that, when comfortable, cows will lie down for at least 12 hours per day. Reduced comfort is a risk factor for lameness in free-stalls which can be measured by lying behavior. A higher prevalence of lameness has been found on farms that had a low cow-comfort index (defined as the proportion of cows touching a stall that are lying down), based on a low number of cows lying down at one time (Dippel et al., 2009). There is also considerable evidence that poor stall design and management increase the risk of lameness by reducing the time that cows spend lying down (Cook and Nordlund, 2004; Chapinal et al., 2009; EFSA, 2009;). Thus, a high proportion of lameness in a herd is likely to be associated with cows that spend either an unusually long or an unusually short time lying down. In a study in British Columbia, Ito et al. (2009) measured lying durations of over 2000 lactating cows on 43 dairy farms and found that cows having extreme lying times (i.e. less than 9 or greater than 14 hours per day; h/d) were 2.5 times more likely to be lame than cows with normal resting times.

In our study we found that the average lying time of the cows was 10.4 h/d. The average lying time for non-lame cows was 10.2 h/d and for lame cows was 11.1 h/d. An association between long lying times and lameness was

also found; for every hour of increased lying time, the chances of the cow being lame were 1.2 times higher. The probability also increased as the parity of the cows increased, meaning that older cows were more prone to be lame and lay down longer than younger cows.

Environment

The profitability of a dairy herd increases when cows stay healthy. Comfort ensures that cows are less likely to get sick and that they recover faster if they do get sick. In uncomfortable situations, cows give less milk, have more issues getting pregnant and their longevity may be reduced due to a higher chance of injuries, claw lesions and lameness (Hulsen and Rodenburg, 2010).

Stall base & bedding

Providing a comfortable, soft surface cushion may be the most important factor affecting stall usage and lying time. Poor stall base, hard lying surfaces such as concrete or hard mattresses, inadequate bedding and too little or wet bedding have been identified as some of the most important risk factors affecting not only the prevalence of lameness and foot problems on a farm, but also the severity and duration of these conditions. In contrast, softer lying surfaces increase milk yield, improve udder health and reduce hock and knee injuries. Wet bedding reduces lying time more than any other feature of stall design (Cook and Nordlund, 2004; EFSA, 2009; Ito et al., 2010). Maintaining clean and dry stalls will improve cow comfort and therefore lying time, keep cows cleaner with cleaner udders and reduce the rate of environmental mastitis. All of these factors positively influence the well-being of the cows and potentially increase their lifespan. Cramer (2011) pointed out the role that a well-bedded stall plays in claw health: first, it encourages the cow to lie down, reducing manure exposure and risk for development of infectious claw lesions, and secondly, deep bedded stalls will have a cleansing action on the feet.

Compared with geotextile mattresses, deep sand bedded stalls and sawdust-bedded stalls decrease the occurrence of hock lesions and reduce lameness (Weary and Taszkun, 2000; Cook, 2003). However, the use of sand bedding is not common in Alberta, so other options such as sawdust and composted manure should be explored. In our study we found that 50% of dairy producers use wood shavings as bedding, followed by sawdust (28%) and straw (17%). Over 60% of producers provided little or no bedding but over 75% of the farms had an adequate level of bedding dryness. Geotextile mattresses were found to be the preferred stall base, accounting for 61%, followed by concrete (15%), rubber mat (11%), waterbeds (7%), and composted manure (4%). Cows lying down on mattresses, waterbeds and composted manure are less likely to be lame than cows that lie down on

concrete or rubber mats alone. In our study, there was not enough evidence to suggest a difference between waterbeds and mattresses.

Space

It is well known that cows need space to get up and lie down. A good understanding of how this works will allow a better adjustment of the stalls. Several stall features have been associated with a high prevalence of lameness and even claw lesions. Examples include short and narrow stalls, low neck rails, curbs that are too high or too low, high brisket boards and impediment to lunge space (Cook and Nordlund, 2004; Dippel et al., 2009).

In our study, eight different dimensions were measured in a number of stalls on each farm and then compared to the recommendations of stall dimensions for cows of different body weights that have been estimated for Canada (NFACC, 2009). Only 20% of the stalls were of adequate width and only 53% were of adequate length. Fifty-three percent of the farms also had obstructions in the lunge space. There was a clear discrepancy between recommendations based on scientific literature and the actual dimensions of the stalls on Alberta farms. Some of the feedback received by farmers when their opinion was asked on these proposed dimensions was that wide and long stalls would encourage cows to lie down diagonally, therefore manure contamination and dirtiness would increase; also, that wide stalls allowed more than one cow per stall and issues such as teats being stepped on would increase. This suggests that either some of the recommendations may have unexpected side effects that challenge daily farm management practices or there is simply another barrier to the transfer and adoption of the scientific recommendations on stall dimensions. A better understanding of how to integrate science and knowledge transfer to develop practical approaches that are feasible for producers is needed.

When it comes to overstocking, we found that 96% of pens on free-stall farms visited met the recommended best practice on stocking density from the Dairy Code of Practice which states that it must not exceed 1.2 cows per stall. In addition, lying time was not influenced by stocking density, which may be the result of high compliance with the requirements of the code. The same results were found in Ontario, which suggests that overstocking does not seem to be an issue on free-stall farms (Charlton et al., 2012).

Flooring & Slipperiness

The type and quality of flooring plays an important role in lameness, claw lesions and cow comfort. Flooring properties such as type, quality, traction, slipperiness and cleanliness pose serious risks for lameness, development of hoof lesions and cow comfort. The effect of flooring is likely to interact with stall design as poorly designed stalls increase the time that cows spend

standing and exposed to the effects of flooring. The chances of slipping and falling also increase as the quality and cleanliness of the floor decreases.

Research has shown that when cows are given a preference to stand on rubber or solid concrete the majority prefer the first. It has been recommended to provide soft, high traction flooring in areas where cattle stand for long periods such as the feed alley and holding pen. In addition, rubber flooring increases time spent standing at the feed bunk and eating compared to grooved or slatted concrete (EFSA, 2009; NFACC, 2009). Despite this finding, Albertan producers had a negative opinion about the use of rubber, mostly related to issues with hygiene, difficulties with the scraping system, durability and the need for more frequent hoof trimming. These opinions are supported by the results of our study, which showed that 77% of the Alberta dairy farms had solid concrete, followed by 12% with slatted concrete and only 7% with rubber. However, our study also showed that cows standing on slatted concrete were more prone to be lame than cows standing on solid concrete, whereas cows standing on rubber were less frequently lame than cows standing on solid concrete.

Slipperiness remains a difficult feature to measure easily, objectively and accurately across farms. In our study, slipperiness was assessed by observing and counting the number of cows that slipped or fell while exiting the pen on their way to the milking parlour. The presence of an external observer may have influenced the frequency of cows slipping or falling. Cows adjust their gait to the flooring they are exposed to, which indicates that cows not observed slipping or falling does not necessarily mean that the floor is not slippery. As a frequent observer the farmer is potentially the best evaluator of the slipperiness of his/her barn, and can most likely detect changes better than a one-time observer.

Management: what is done in Alberta?

Each of the participating farmers in our project was interviewed to gain insight on topics related to stall and pen management, health, lameness and welfare perception as well as claw health, hoof trimming and lameness monitoring. Over 80% of the farmers reported good lameness management procedures related to monitoring of lame cows as part of their daily routine, immediate treatment of lame cows and keeping records. All of the farms involved had a hoof trimming schedule (inclusion criterion) which varied from every 3 weeks to once a year and 76% of the farms trimmed hooves two months before calving to prevent and minimize lameness. In terms of cleanliness routines, over 80% of the farms cleaned their stalls twice a day before milking and over 85% of the farms cleaned the alleys two or more times daily.

The Foot Bath Puzzle

Our study showed that there is a wide variability in on-farm practices related to footbath management. For example, only 2.8% of the farms in the study met all the criteria from literature on footbath dimensions. There was no consistency in the frequency of use and replenishment of solutions or the type and concentration of the products. Twenty-two different product combinations were recorded, with a range of 1 to 4 products used per farm on a frequency of 0 to 7 days per week. Ninety-five percent of the farms in the study used a footbath regularly; nevertheless, not a single farm had the exact same protocol. There is a clear need to provide dairy farmers with practical, science-based recommendations for footbath management.

■ Final Thoughts

Knowledge on how to provide a cow with a comfortable, clean, dry resting area exists. The concept of cow comfort has been identified as key for preventing lameness and increasing longevity. Stall design and surface, bedding quality and quantity, flooring, space allowance and management practices are all aspects of the cow's life on the farm that play an important role in controlling lameness and enhancing the health of dairy cows, consequently increasing their longevity and ensuring their well-being. In our study we were able to see that there is a huge variability across Alberta dairy farms in terms of management practices, barn design, cow comfort features and prevalence of lameness. There is also a need of further research on how to integrate science and knowledge transfer to develop practical approaches that are feasible for producers

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