

Mobility Scoring of Finished Cattle



Lily N. Edwards-Callaway, PhD^{a,*}, Michelle S. Calvo-Lorenzo, PhD^b,
John A. Scanga, PhD^c, Temple Grandin, PhD^d

KEYWORDS

• Cattle • Fatigued cattle syndrome • Lameness • Mobility • Scoring system

KEY POINTS

- Lameness in cattle is detrimental to animal welfare and can negatively affect a variety of production parameters, leading to significant economic loss.
- Multiple locomotion scoring systems are available to assess lameness in dairy cattle, which vary in the number and type of gait attributes assessed.
- There has been little research conducted to understand, measure, and monitor mobility in finished cattle.
- The North American Meat Institute Mobility Scoring System is a useful tool to measure mobility in finished cattle.
- Recent events within the beef industry have led to increased industry efforts to monitor finished cattle mobility.

INTRODUCTION

Mobility and, more specifically, lameness, in all food animal species has been a long-term focus within the livestock industry because it has a significant impact on animal well-being and production parameters. Lameness has been identified by stakeholders in the dairy industry as the most important welfare and production issue affecting dairy cattle.^{1,2} Lameness is an abnormal gait or stance. It is normally caused by pain that can result from a myriad of pathologic conditions.³ Rather than being a disease itself, lameness is a description of abnormal behavior that is a symptom resulting from an underlying health condition.⁴ Regardless of the reasons that cattle express conditions of lameness, lameness causes pain to the animal⁵ and can negatively affect a variety

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^a Animal Welfare Specialist, Callalily Consulting LLC, 716 E Ridgcrest Road, Fort Collins, CO 80524, USA; ^b Elanco Animal Health, Division of Eli Lilly Company, 2500 Innovation Way, Greenfield, IN 46140, USA; ^c Protein Product Analytics, Elanco Knowledge Solutions, Elanco Animal Health, Division of Eli Lilly Company, 2500 Innovation Way, Greenfield, IN 46140, USA; ^d Department of Animal Sciences, Colorado State University, Campus Delivery 1171, Fort Collins, CO 80521, USA
* Corresponding author.

E-mail address: lilynedwards@gmail.com

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of production parameters, such as milk yield,^{6,7} and is often associated with reduced reproductive efficiency^{8,9} in dairy cattle that can ultimately lead to significant economic loss.^{10,11}

The occurrence of lameness in dairy cattle varies between herds because it is affected by multiple environmental and management factors. A benchmarking study on cow comfort in North American freestall dairies published by von Keyserlingk and colleagues¹² reported that the prevalence of lameness averaged from 30% to 55%, varying by geographic region. Although finished cattle can certainly suffer from lameness and it can have significant economic impacts on feedyards,¹³ impaired mobility has been relatively unstudied in finished cattle compared with dairy cattle. A recent survey of feedlot managers, consulting veterinarians, and nutritionists was conducted to assess the perception of lameness within the feedlot segment of the beef cattle industry.¹⁴ On average, survey respondents estimated that lameness incidence in the feedyard was 3.8% and contributed to less than 10% of total feedyard mortality. Prior research indicates that dairy producers usually underestimate the percentage of lame cows existent in their operations.^{15,16} A more accurate estimate of the degree of lameness or its prevalence in a herd may be achieved through the use of locomotion scoring by experienced or trained observers. Although perhaps not as prevalent in finished cattle, mobility issues in feedlot cattle can affect animal welfare and have a significant economic impact via increased costs from treatment, salvage loss, and potential performance losses.^{13,17}

GROWING AWARENESS OF FINISHED CATTLE MOBILITY ISSUES

Observation of cattle arriving at packing plants during the summer of 2013 rapidly heightened the focus on mobility issues. At that time, there were anecdotal reports within the meat processing community of increased numbers of market-ready cattle delivered to packing plants that, although ambulatory on arrival, were unable or unwilling to walk at some time during their lairage at the plant. This ranged from a few animals in a lot (usually a lot is defined as a group or pen from a specific origin) exhibiting what appeared to be stiffness and/or sore feet, to most of a lot exhibiting this type of impairment. In addition, some individual animals exhibited such extreme mobility impairment that they were described as statue-like. Cattle displaying this type of altered gait behavior were often unable to keep up with contemporaries in their respective groups; the separation of which caused additional stress to the animal but also negatively affected operational efficiencies at the packing plant. In 2006, Dr Grandin^{18,19} made similar observations in 3 different groups of cattle arriving at packing plants when temperatures were elevated above 90°F (32°C). Grandin reported that approximately 5% to 10% of cattle were panting from each truckload observed, some lying down and open-mouth breathing (ie, panting hard with their tongues extended), and some acting stiff and arthritic.

During the summer of 2013, the National Cattlemen's Beef Association (NCBA) held several industry discussions on the topic of cattle welfare, specifically highlighting perceived issues with beta-adrenergic agonist (BAA) growth promotants because this was an underlying concern with some of the impaired mobility observations. At the final NCBA meeting, video evidence of cattle with impaired mobility at packing plants was presented. This led to a cascade of events, resulting in the packing industry's voluntary refusal to purchase cattle fed with zilpaterol hydrochloride (Zilmax; Merck Animal Health; Desoto, KS, USA). This reaction was due to a perception that zilpaterol was the causative or common factor responsible for the reduced mobility of cattle observed. Unfortunately, at that time, neither the cattle nor

pharmaceutical industries had sufficient data to quantify what was happening at packing plants, or data to support that the actions taken were justified or effective in improving the mobility of cattle arriving at and being held in lairage at packing plants.

MOBILITY AND LOCOMOTION SCORING SYSTEMS

Scoring Systems Used Primarily in Dairy Cattle

In the wake of the heightened interest in understanding the prevalence and impact of mobility issues in finished cattle, it became evident that a standard tool for measuring mobility of finished cattle was needed to capture aspects of cattle lameness and the inability of the animals to keep up with the pace of their contemporary group. There are multiple locomotion scoring systems used to assess lameness in dairy cattle. Practical uses for locomotion scoring might include the assessment of lameness severity in lame animals or as a tool for the estimation of herd lameness prevalence. Locomotion scoring is also used in lameness research and is an important criterion in welfare assessment and audit programs. Selected scoring systems are listed in [Table 1](#). Established locomotion and mobility scoring systems were developed for use primarily in dairy cattle but vary in the number of categories within the scale, numerical assignment (ie, beginning with 0 vs beginning with 1), language used to describe each category, parameters used to assess locomotion, and the application of the measurement tool. Thus, a standard tool does not exist. Many of the locomotion scoring systems used in dairy cattle research assign a discrete score to an animal using a 5-point scale (eg, 1–5; 1, normal; 2, mildly lame; 3, moderately lame; 4, lame; 5, severely lame; see [Table 1](#)).^{20–24} Much of the variation in the 5-point locomotion scoring systems is in the number and combinations of attributes used to determine the locomotion score, such as gait asymmetry, reluctance to bear weight, back arch, joint flexion, tracking up, and head bobbing. Several studies have demonstrated poor repeatability and lack of agreement between scorers when using these scales to score locomotion.^{22,24} In addition, several reports indicate substantial variation in the ability of farm managers or farm owners to identify altered locomotion in dairy cattle compared with trained observers. Lameness detected by trained observers was 2.5 to 4 times higher than estimates by farm owners or managers.^{16,25,26} Training and the use of more specific terms and detailed descriptions can help reduce observer variability.²⁴ The National Milk Producers Federation Farmers Assuring Responsible Management (FARM) Program (version 3.0) requires locomotion scoring as part of their dairy farm assessment and uses a 3-point locomotion scoring system (see [Table 1](#)).²⁷ This simplified system is intended to reduce interobserver variability among farm evaluators. Similarly, the researchers for the National Animal Health Monitoring System (NAHMS) Dairy Cattle benchmarking survey created a 3-point locomotion scoring system, rather than using a 5-point scale, to reduce complexity in scoring method when using such a large number of evaluators.²⁸

Locomotion Scoring Systems Used Primarily in Finished Cattle

There does not exist an extensive body of literature on locomotion scoring in finished cattle. Terrell and colleagues,²⁹ at the Beef Cattle Institute at Kansas State University, developed a 4-point locomotion scoring system for use in finished cattle (see [Table 1](#)). Their system assesses clinical lameness using the animal's stride length, head movement, adduction or abduction of affected limb or limbs, willingness to move, and willingness to place weight on the limb. The Step-Up Locomotion Scoring program is part of the Zinpro Corporation Step-Up Management Program for Beef Cattle and was

Table 1
Selection of locomotion scoring systems used in dairy and finished cattle

| Locomotion and Mobility Numerical Score Category | | | | | | |
|---|--|---|--|---|--|---|
| Finished Cattle Locomotion Scoring Systems | | | | | | |
| | 0 | 1 | 2 | 3 | 4 | 5 |
| NAMI Mobility Scoring System ³² | — | Normal: Walks easily with no apparent lameness or change in gait. | Exhibits minor stiffness, shortness of stride or a slight limp but keeps up with normal cattle in the group. | Exhibits obvious stiffness, difficulty taking steps, an obvious limp or obvious discomfort, and lags behind normal cattle walking as a group. | Extremely reluctant to move even when encouraged by a handler. Described as statue-like. | — |
| Terrell, ²⁹ 2016 | Normal: Animal walks normally. No apparent lameness or change in gait. | Mild lameness: Animal exhibits shortened stride, may move head slightly side to side but no head bob. | Moderate lameness: Animal exhibits a limp, with an obviously identifiable limb or limbs affected and/or head bob present when walking. Limbs still bears weight. | Severe lameness: Animal applies little or no weight to affected limb while standing or walking. Animal reluctant or unable to move. While walking, animal's head dropped, back arched, with head bob and limp detected. | — | — |

| | | | | | | |
|--|--|--|---|--|---|---|
| Step-Up Locomotion Scoring System ³⁰ | Normal: Animal walks normally with no apparent lameness or change in gait. Hind feet land in a similar location to front feet. | Mild lameness: Animal exhibits short stride when walking, dropping its head slightly. Animal does not exhibit a limp when walking. | Moderate lameness: Animal exhibits obvious limp, favoring affected limbs, which still bear weight. A slight head bob is present when the animal is walking. | Severe lameness: Animal applies little or no weight to affected limb and is reluctant or unable to move. While walking, animal's head is dropped and back arched, with head bob and limp detected. | — | — |
|--|--|--|---|--|---|---|

Dairy Locomotion Scoring Systems

| | 1 | 2 | 3 | 4 | 5 | |
|--|---|--|---|--|---|---|
| Sprecher et al, ²¹ 1997 | — | Normal: The cow stands and walks with a level-back posture. Her gait is normal. | Mildly lame: The cow stands with a level-back posture but develops an arched-back posture while walking. Her gait remains normal. | Moderately lame: An arched-back posture is evident both while standing and walking. Her gait is affected and is best described as short-striding with 1 or more limbs. | Lame: An arched-back posture is always evident and gait is best described as 1 deliberate step at a time. The cow favors 1 or more limbs or feet. | Severely lame: The cow additionally demonstrates an inability or extreme reluctance to bear weight on 1 or more of her limbs or feet. |
| Zinpro Locomotion Scoring of Dairy Cattle | — | Normal: Stands and walks normally with a level back. Makes long confident strides. | Mildly lame: Stands with flat back but arches when walks. Gait is slightly abnormal. | Moderately lame: Stands and walks with an arched back and short strides with 1 or more legs. Slight sinking of dew-claws in limb opposite to the affected limb may be evident. | Lame: Arched back standing and walking. Favoring 1 or more limbs but can still bear some weight on them. Sinking of the dew-claws is evident in the limb opposite to the affected limb. | Severely lame: Pronounced arching of back. Reluctant to move, with almost complete weight transfer off the affected limb. |

(continued on next page)

Table 1
(continued)

| Locomotion and Mobility Numerical Score Category | | | | | | |
|--|---|---|---|--|---|---|
| FARM ²⁷ | — | Sound: Animal has normal posture and a normal gait. | Moderate lameness: Stands well but is noted to favor a limb when walking. | Severe lameness: Animal either unable to move or able to move but barely able to bear weight on the affected limb. Signs may also include back arch, poor body condition, head bob, and an inability to flex the lower leg joints. This cow is sore on her left rear leg, favoring it both standing and walking. | — | — |

Category descriptions are listed under the corresponding numerical category. Descriptions signifying similar levels of locomotion across scoring systems are shaded similarly. If a numerical locomotion category within a system has an em dash, it was not shared by other scoring systems.

Data from Refs. ^{21,27,29,30,32}; and Zinpro Corporation Dairy Locomotion Scoring. Zinpro Corporation. 2016. Available at: <http://www.zinpro.com/lameness/dairy/locomotion-scoring>. Accessed January 2017.

created in conjunction with the aforementioned work of Terrell and colleagues.^{29,30} A recent study by Simon and colleagues³¹ assessing welfare parameters on cow-calf operations included a 3-point system to capture locomotion scores in cows (1, acceptable; 2, moderately lame; 3, severely lame). Similar to some of the other large-scale benchmarking studies or audit programs, this study assessed in part the feasibility of cow-calf on-farm animal welfare audits and, therefore, the scoring system would need to be easily trained and repeatable across multiple observers in the long-term.

As mentioned previously, the feedlot cattle industry recognized the need for a mobility scoring system to capture and measure cattle mobility at packing plants. To address this need, industry experts met to establish a locomotion scoring system for finished cattle with the packing plant application in mind. The parameter not included in the multiple dairy cattle and the limited number of fed beef cattle locomotion scoring systems is the consideration and identification of individual animals that cannot keep pace with their contemporaries. In the groups of cattle at packing plants reported to have impaired mobility, it was evident there was a clear difference between individuals in their ability to maintain the speed of their overall group (personal observations, Edwards-Callaway, 2013). Some animals exhibiting signs of stiffness or soreness were still able to maintain a normal walking speed, whereas others were so impaired they lagged behind most cattle in their group. This was an important distinction to be able to capture in a scoring system. The North American Meat Institute (NAMI) Animal Welfare Committee in collaboration with industry experts helped facilitate and guide the process of establishing what is now referred to as the NAMI Mobility Scoring System used in the packing industry.³² This system has 4 categories of locomotion:

- Mobility score 1, normal, walks easily with no apparent lameness or change in gait
- Mobility score 2, exhibits minor stiffness, shortness of stride, or a slight limp but keeps up with normal cattle in the group
- Mobility score 3, exhibits obvious stiffness, difficulty taking steps, an obvious limp or obvious discomfort, and lags behind normal cattle walking as a group
- Mobility score 4, extremely reluctant to move even when encouraged by a handler; described as statue-like.

To enhance the use of this scoring system, NAMI developed a training video³² that provides imagery for each score and guidance on the application of the scoring system at commercial operations. Thus far, this scoring system has been effective in capturing mobility issues in finished cattle arriving at packing facilities.

CURRENT RESEARCH ON MOBILITY IN FINISHED CATTLE

Cattle mobility concerns in the beef industry that were recently reported in the summer of 2013 involved cattle that were nonambulatory; slow and difficult to move; and, in some cases, experiencing sloughed hoof walls.^{33,34} Discussions about these anecdotal reports between industry stakeholders and animal health experts revealed there was insufficient scientific evidence to determine specific causes at the time but initiated the development of industry mobility programs and scientific studies to better understand this disease-state in finished cattle. Likewise, finished cattle lameness in the United States has remained a welfare and economic loss issue for many years, with improvements needed in lameness identification, diagnosis, and treatment.³⁵ A recent survey indicated that there is still a knowledge gap on improving lameness-related issues in the feedlot industry and there continues to be increased concerns on the

impact of lameness on cattle comfort and welfare.¹⁴ Several research studies have indicated the benefits of using objective and subjective methods to improve evaluation of both mobility and lameness conditions in cattle. Objective methods include technologies used to measure the velocity of animal movement, stride length, posture, number of steps over time, and pressure or weight distribution by individual limbs when animals move across a platform (comprehensive reviews are available^{35,36}). As mentioned, subjective scoring systems are available for routine use by farm or slaughter facility employees. Some of these have application in research, whereas others are used in welfare programs to monitor and improve beef cattle mobility conditions. However, there is little research published on impaired mobility of finished beef cattle and, therefore, there is much to be learned and applied from the dairy cattle lameness literature. Altogether, objective and subjective methods are needed to monitor the prevalence of mobility issues, understand the behavioral and physiologic changes associated with poor mobility, determine and mitigate factors related to impaired mobility conditions, and help establish effective treatment outcomes.

Locomotion scoring systems that have been used extensively in dairy cattle lameness research include subjective scoring systems that are typically based on the absence, presence, and/or alteration of the following behaviors: arching of the spine, limb favoring, altered stride lengths, tenderness, reduced speed, head bobbing, changes in placement of the claw, abduction or adduction in rotation of the feet, and reluctance to move.^{20,21,23,24,37–39} Although many locomotion scoring systems are used in research to noninvasively quantify lameness and grade severity, the behaviors evaluated across these scoring systems will vary across investigators, may be prone to poor reliability and reproducibility, are influenced by the scorer's skill and perception, and little work has validated such systems in relation to pain and other welfare outcomes.^{22,35,40,41} To overcome some of these limitations, several research groups have investigated quantitative measures of posture and gait in dairy cattle to detect painful lameness. These measures include assessing image analyses of back posture,⁴² force per weighing platforms,^{43–49} pressure mats,⁵⁰ kinematic gait variables,^{39,51,52} electromyography,⁵³ accelerometers or pedometers,^{23,54} nociceptive thresholds,^{55,56} heart rate,⁵⁰ and cortisol concentrations.⁵⁰ Collectively, these exploratory studies emphasize that, although quantitative gait measures can be collected with a high degree of consistency, they do not necessarily provide a better measure of pain than the subjective scoring systems. This is because either approach, subjective or objective, will depend on the degree of pain experienced by the animal, the sensitivity and specificity of the measures, the efficacy and practicality of real-time measures on farms and slaughter facilities, and the training of the observer.⁴⁰ With regard to monitoring and studying finished cattle mobility, these aspects will need to be considered and emphasized as research progresses in understanding the disease-state of finished cattle experiencing mobility issues.

Many factors are hypothesized to be associated with poor mobility and research has been progressing over the last few years to investigate more of these factors. One factor that has been studied in relationship to cattle mobility is BAAs, which are fed to improve feed efficiency and increase lean muscle mass in finishing cattle.⁵⁷ BAAs have been challenged by welfare experts¹⁹ and questioned when impaired mobility of BAA-fed cattle at slaughter facilities were coupled with clinical symptoms and serum biochemical abnormalities, now known as the fatigued cattle syndrome (FCS).⁵⁸ Therefore, mobility scoring systems have been used to help determine the impacts of BAA on mobility and other welfare concerns in cattle. For instance, a mobility scoring system (Tyson Foods mobility scoring system: 0, normal, through 4, nonambulatory or severe distress) was used to determine if zilpaterol hydrochloride (Zilmax;

Merck Animal Health; Desoto, KS, USA) and shade provision affected cattle mobility and other measures of performance, physiology, and carcass quality of finishing steers.⁵⁹ Overall, the investigators found that feeding zilpaterol hydrochloride (8.33 mg/kg dry matter for the last 21 days on feed [DOF] with a 3-day withdrawal period) had minimal impact on cattle mobility and suggested that mobility may be exacerbated as cattle gain weight, are transported, and stand on concrete at the packing plant, regardless of feeding zilpaterol hydrochloride. Similarly, other unpublished studies found minimal impacts on feedlot cattle mobility when BAAs were fed (BAA treatment diet included zilpaterol hydrochloride at 6.76 g/ton for the last 20 DOF with a 3-day to 4-day withdrawal period).^{60,61} Another study by Woiwode and Grandin⁶² assessed the welfare of cattle fed zilpaterol hydrochloride (81.6 mg/head/day for 20 days with a 4 to 6 day withdrawal period) at the feedyard and found no differences in mobility. However, cattle were not observed at the packing plant. Two studies by Hagenmaier and colleagues^{63,64} used physiologic measures and the NAMI Mobility Scoring System³⁰ to investigate if high-stress handling and ractopamine hydrochloride (Optaflexx; Elanco Animal Health, Greenfield, IN, USA) negatively affected fed cattle mobility, FCS, and physiologic responses. Collectively, these studies found that ractopamine (fed at 400 mg/head/day for 35 to 36 days⁶³ or 28 days⁶⁴) did not adversely affect mobility at the feedlot. However, abnormal mobility scores increased across all treatment groups following transport and lairage at the slaughter facility. The investigators also reported that, although hormonal responses were altered in ractopamine-fed cattle following high-stress handling and transportation, metabolic acidosis (a precursor for FCS) can be developed in cattle exposed to high-stress handling regardless of ractopamine inclusion, emphasizing the importance of handling intensity on cattle welfare. Other factors to consider that may contribute to impaired mobility and FCS include breed, extreme weather conditions, sorting cattle by mixed body weights before transport, higher body weights, handling practices during loading and unloading, distances cattle have to walk before loading or after unloading, and transport duration and conditions, as well as cattle footing throughout the feedyard, slaughter facility, and on trucks.^{58,62,65} Altogether, it is apparent that cattle mobility is a multifactorial issue that warrants further research to evaluate multiple factors and mitigate their potential effects on mobility.

The mobility scoring systems used in the aforementioned studies have helped establish new knowledge of the complex nature of impaired mobility in finished cattle. The limitations in using these scoring systems, however, include the subjective nature of how observers apply the scores and the large number of animals required to detect differences among a population. Thus, future research evaluating factors potentially associated with impaired mobility will need to assess large populations and/or couple mobility welfare tools with objective measures, many that have already been studied extensively in the dairy cattle lameness literature and developed with FCS research. Furthermore, additional data on mobility conditions across the industry are needed to better understand and monitor the prevalence of this disease-state industry-wide. These collective approaches may help overcome limitations and provide a systematic approach to identifying and managing mobility problems.

INDUSTRY EFFORTS TO IMPROVE AND MONITOR FINISHED CATTLE MOBILITY

Immediately following the events in 2013, it became evident that there was an instantaneous vacuum of information regarding finished cattle mobility and this created a sense of urgency among industry stakeholders to work toward understanding and appropriately measuring finished cattle mobility. Within weeks of the NCBA industry

meetings, data gathering efforts across the industry were launched. As previously discussed, the first step taken in gathering this data was developing and standardizing a system for mobility scoring of finished cattle that could be disseminated across the industry. There was then a need to develop programs in which this information could be captured, analyzed, and shared across the North American beef industry. One approach is the Full Value Beef Cattle Mobility Assessment program launched by Elanco Animal Health in August of 2013. In this program, trained mobility evaluators score individual cattle during the process of unloading, antemortem inspection, or lairage at packing plants using the NAMI Mobility Scoring System. Evaluators are trained to observe and identify cattle that exhibit an abnormal mobility score. Although individual cattle are evaluated, all information in this program is accumulated back to a slaughter lot level. If available, additional information is obtained on each lot of cattle, such as gender, breed type, weight, head count, transportation distance, truck wait time before unloading at the plant, and weather conditions at the feedlot of origin and packing plant. This information is then used to identify issues and trends that are observed in cattle at slaughter. Risk assessments are also conducted to determine if specific factors (eg, gender, breed, temperature, and slaughter weight) are significant and to calculate odds ratios on significant effects. As with any population data-based program, sampling rates and volume of information are important in determining what inferences and conclusions can be drawn from the information. As of December 2016, this program has collected data over the past 3.5 years on approximately 6.3 million cattle from more than 61,000 individual slaughter lots across 12 plants in 7 states and 1 Canadian province. Across all cattle evaluated in this program, 92.1% of cattle scored walked with normal mobility (mobility Score 1) and 0.5% were identified as mobility score 3 or 4. At a high level, there is a seasonal trend with the number of cattle identified as a mobility score 2 or higher increasing during the warmer months of the year and being at their lowest levels from November through March (Fig. 1).

In the wake of the events in 2013, large packing companies also initiated internal mobility monitoring programs at their beef processing facilities to ensure that each lot of cattle processed received a score. Thus if repetitive or severe situations of cattle immobility are observed, feedback and interaction with the supply chain could be initiated. One individual company implemented a program in which lots (ie, groups or pens) of cattle are scored using a 4-point scale (0–4), which is similar to the NAMI Mobility Scoring system and subsequently assigned a categorical score for the movement of the group: movement codes A or B. Movement code A (desirable) is assigned to lots of cattle that include individuals with a mobility score similar to that of the NAMI Mobility Scoring system of 1 or 2. Movement code B (undesirable) is assigned to groups of cattle in which 50% or more of the observed individuals within the lot are identified as NAMI mobility score 3, any instance of a NAMI mobility score 4, or a non-ambulatory animal. In this program, producers receive feedback on their lot settlement sheets, which creates an opportunity for communication and engagement between the production and packing sectors in addressing issues of cattle welfare and mobility. Currently, a universal standard for an acceptable level of mobility impairment within a lot of finished cattle at the packing facilities does not exist and thus packing companies may apply slightly different rules of reporting than those discussed in this scenario. That being said, it was recognized in the packing industry that a standardized method for mobility scoring was needed and most of internal company programs are likely based on the NAMI Mobility Scoring System.

In any process in which industry-wide data are being collected, it is important to recognize and address data collection challenges. Some of the challenges associated

with large-scale cattle mobility scoring efforts are consistency and subjectivity of mobility scoring, the environment in which cattle are evaluated, and the speed at which cattle must be evaluated in commercial environments. Ongoing evaluator training and correlation is important in any subjective evaluation system, as is a thorough evaluation of the processes occurring during the handling and lairage of cattle at the location of scoring. Identifying the proper locations that are safe for the evaluator and cattle, does not affect the flow of cattle through the process, and provides an unobstructed vantage point to view individual cattle in motion is crucial to obtaining useful and reliable information. Even when all of these factors are addressed, it has become apparent through data collection experience that comparisons of cattle mobility scores across environments (eg, plants, handling facilities) can be misleading and more appropriate benchmarks focus on evaluations at common locations, under similar environmental conditions, when scored by a single evaluator.

Analysis of these data has not identified a single causative factor but rather emphasizes (1) that this is a multifactorial issue and (2) that, although individual cattle may be identified as having the same mobility score, they are likely to be exhibiting symptoms of different maladies. Thus, drawing conclusions from single day, plant, or lot events will likely lead to erroneous findings. However, these data allow the beef industry to understand trends and shifts in cattle movement at packing plants and help identify

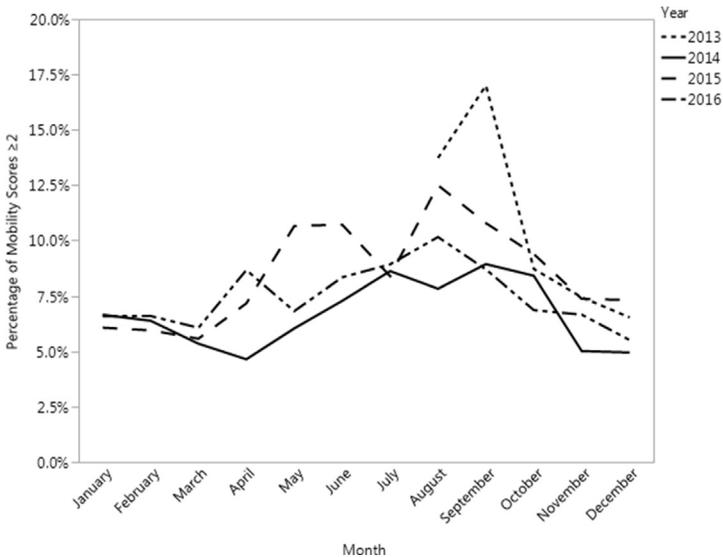


Fig. 1. Monthly averages of cattle identified as having a mobility score greater than or equal to 2 per the NAMI Mobility Scoring System (1, normal, walks easily with no apparent lameness or change in gait; 2, exhibits minor stiffness, shortness of stride, or a slight limp but keeps up with normal cattle in the group; 3, exhibits obvious stiffness, difficulty taking steps, an obvious limp or obvious discomfort and lags behind normal cattle walking as a group; 4, extremely reluctant to move even when encouraged by a handler, statue-like). The data represent information from approximately 6.3 million fed cattle from up to 12 commercial packing plants in 7 states and 1 Canadian province from August 2013 through December 2016. During the collection of the data presented, zilpaterol hydrochloride was available on the market until October 2013. BAA use cannot be tracked in this database, thus cattle observed in the data presented may or may not have been fed BAA. (Courtesy of and with permission from Elanco Animal Health, Greenfield, Indiana, 2017).

and address repetitive outcomes with the supply chain. This has led to conversations with feedyards, nutritionists, veterinarians, and processors working together to collaboratively identify root causes and implement changes that ultimately improve the welfare of cattle entering the food supply.

SUMMARY

Lameness is an important issue in both dairy and finished cattle because it negatively affects animal welfare and can be costly due to its impact on animal production and performance. Additionally, lameness (locomotion) scoring has become a component of on-farm assessment programs such as the FARM Program and this area is likely to grow in other cattle sectors. Although finished cattle lameness may not have been a top priority for the industry in the past, its relationship to the use of new technologies used in the industry will likely make it a focus and, therefore, area of needed research in the future.⁶⁶ The NAMI Mobility Scoring System provides an opportunity for the beef industry to use a standardized method for locomotion scoring in finished cattle as additional data collection, monitoring, analytics, and benchmarking activities are performed. The use of the NAMI system has helped establish new knowledge in the complex nature of impaired mobility in finished cattle. Future research evaluating impaired mobility will need to assess large populations and/or couple mobility scoring programs with objective measures such as those used in lameness and FCS research. Furthermore, additional data on finished cattle mobility across the industry are needed to better understand the multifactorial nature of impaired mobility, and to effectively monitor the prevalence of this disease-state industry-wide. Collectively, these efforts may help provide further insight to the welfare of finished cattle and provide a systematic approach to identifying and managing mobility problems.

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