Lameness Scoring in Dairy Cattle

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Introduction

Lameness is an important economic problem resulting in loss of milk production, reproductive failure and premature culling. Herdsmen often underestimate lameness prevalence because they become desensitized to lameness or fail to understand its production consequences (Wells, 1993). Ward 1994, found herdsmen and farmers are generally unable to identify early lameness but that on the other hand knowledgeable farmers had significantly less lameness. Lameness scoring is yet to become a widely used management tool in the US dairy industry. One of the reasons is that many dairy operations lack good facilities to adequately deal with lameness problems. Another reason is that lameness-scoring systems in general are subjective based on biomechanical alterations in posture and gait and behavioral changes causing interobserver variation.

Lameness scoring systems

Limb posture

Rear view hind limb posture (Toussaint Raven, 1989)

Posture and gait

Manson and Lever locomotion score (MLLS) (Manson & Lever 1988)

Modification of MLLS (Wells 1993)

Six point numerical rating scale (Whay 1997)

Five point lameness score based on back posture and gait (Sprecher 1996)

Modification of the Sprecher lameness score (Gabarino 2004)

Weight bearing

Lameness score based on alterations in weight bearing (ground reaction forces) of all four limbs measured by single axis load cell system (Dyer 2004)

Locomotion activity

Pedometers. Decreased activity used as indicator for presence of lameness.

Description of lameness scoring systems

Rear view hind limb posture (Leg Score System (LS)).

The system identifies the need for whole herd trimming.

Research demonstrated a correlation between hind limb posture seen from the rear and condition of the claws. In normal non-lame cows without horn overgrown the back legs are straight and parallel. As the outer claw of the rear leg becomes more overgrown particularly at the heel and sole the cow becomes progressively more cow-hocked in an attempt to displace more weight on the inner claw.

Leg score is determined by the angle of the spine in relation to the interdigital space and graded as $1 = \text{normal}$ (no deviation) $2 = 17 – 240$ deviation and $3 = > 240$ deviation.

Application of the leg score system is as follows:

Whole herd trimming is indicated if: Less that 40% of the herd attains a 1 score; More than 20% of cows attain a score 3; and more than 50% of cows attain scores 2 or 3.

Holtzhauer, 2004 examined leg score reproducibility and inter-rater repeatability. In that study the score was performed twice within 30minutes on 2 dairy farms with 62 and 50 cows respectively by 11 observers. Only 11% of the cows were assigned the same score by all observers. However observer interaction with the cows and period of restraint were not taken into account.

Lameness scoring based on posture and stride

Normal locomotion.

The animal should have a flat back, even gait and normal stride, which consists of lifting and swinging (hanging phase) and heel strike and push off (supporting phase) each of which should represent 50% of the stride. Some abduction and adduction of the limbs is present during normal locomotion. Hind foot placement follows fore feet (tracking) and feet point in the direction of travel. During turning the limbs on the outside are abducted and those on the inside adducted.

The following factors should be taken into account when systems based on posture and stride are used:

- A flat surface with adequate traction properties should be used.
- Clear view from the side and behind for at least ten paces is necessary to evaluate back and leg posture and gait abnormalities.
- Cows should be allowed to walk at their own pace (speed comfort zone = 0.6 – 1.0 m/sec)
- In general concrete floors do not provide enough friction to allow normal locomotion (van der Tol, 2005) and floor surface can cause significant alterations in stride and pressure exerted on individual claws.
On smooth floors cows tend to walk rapidly with short steps. The upper limb is held more vertical with a reduced joint arch. On large aggregate there is a decreased speed and step frequency. Limbs are placed more vertical to reduce the supporting limb phase (Phillips & Morris, 2000).

(Neveux et. al., 2006) found that discomfort of weight bearing on one of the rear legs resulted in redistribution of the majority of the weight onto the contralateral back foot without changing the weight distribution on their front feet. With discomfort in one of the front feet, weight is shifted to the contralateral front and ipsilateral back foot.

Older cows (4+) lactations have higher lameness score
• Horn lesions and pain

Logue 1994 found a significant correlation between lameness scoring and claw horn lesions such as sole ulcer. However many lesions lack sufficient pain to generate lameness resulting in poor correlation between lameness scoring and lesion by type and or location.

• Biomechanical and behavioral changes associated with lameness

Spinal arching; head carriage; rotation of limb or digit; abduction; uneven gait; changes in stride length and stride angle

Supporting limb lameness – shortened supporting and swinging phases

Manson & Lever nine-point scale
This system allows for a wide spread in the assessment to accommodate subjectivity:

1.0 Minimal abduction/adduction, no unevenness of gait, no tenderness
1.5 Slight abduction/adduction present, no unevenness or tenderness
2.0 Abduction/adduction present, uneven gait, perhaps tenderness of feet
2.5 Abduction/adduction present, uneven gait and tenderness of feet
3.0 Slight lameness not affecting behavior
3.5 Obvious lameness, some difficulty in turning, behavior not affected
4.0 Obvious lameness, some difficulty in turning, behavior affected
4.5 Some difficulty in rising, difficulty in walking, behavior affected
5.0 Extreme difficulty in rising, difficulty in walking, adverse affects on behavior pattern

Numerical Rating System (NRS)

More suitable for on farm use:
1.0 Sound
2.0 Imperfect locomotion
3.0 Mildly lame
4.0 Moderate lameness
5.0 Severe lameness
6.0 As lame as possible while remaining upright

Both the Manson and Lever and NMR systems showed high inter- and intraobserver repeatability. Lameness scoring using back posture and gait

1. Lameness scoring system with emphasis on back posture (Sprecher, 1997)
Description:
Score 1 Normal
Stands and walks normally. All feet placed with purpose
Score 2 Mildly lame
Stands with flat back but arches when walks. Slightly abnormal gait
Score 3 Moderately lame
Stands and walks with an arched back. Short strides with one or more legs
Score 4. Lame
Arched back standing and walking. One or more limbs favored but at least partially weight bearing
Score 5. Severely lame
Arched back. Refuses to bear weight on one limb. May refuse or have great difficulty moving from lying position

This system might be more convenient for larger dairies where close observation of the gait is not practical. However the correlation between actual lameness, or the presence of a claw lesion is 69% and 52% respectively. This may lead to increased pressure on claw health personnel due to oversupply of “lame” cows. It may also play a role in the over trimming of cows, which appears to become more of a problem.

2. Lameness scoring with emphasis on back posture (Gabarino 2004).
Gabarino, 2004, used the above system to investigate the effect of lameness on reproductive failure. Results of this investigation found that 32% of cows had an arched back during standing and walking but no gait abnormalities. Based on these findings he proposed the introduction of an additional score (Score 2) which will fit between Scores 1 & 2 on the above system (Sprecher, 1997)

Load cell system

A lameness scoring system based on alterations in weight bearing of all four limbs measured by single axis load cell system has been developed for on farm application but not ready for general use.

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The Relationship between Locomotion scores and Lameness Lesions in dairy cattle.

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Currently, a variety of locomotion scoring systems are used to assess lameness, few of these systems have correlated the score assigned to a cow with lesions in her hooves. The objective of this project was to evaluate the association between locomotion scoring and lesions found at the time of hoof trimming.

A sample of 5 hoof trimmers were trained and asked to record lesions on a standardized form for all cows they trimmed in 38 herds. In these herds, locomotion scoring was carried out 1-2 weeks prior to the hoof-trimming visit. Locomotion scoring was done using a 4-point scale. In tie stall herds, cows were given a leg score that evaluates the angle between the spine and the interdigital space. A total of 2420 cows were scored in 21 tie stall and 17 free stall herds.

Mean prevalence of cows with a severe leg score was 13%. Overall, 28% of the locomotion scored cows were either moderately or severely lame. Only for infectious lesions was there a significant association between leg score and lesions. For the locomotion scoring system there was increased likelihood of lesion presence in both moderate and severe cows. Cows with either a moderate or severe score were 2.7 and 8.7 times as likely to have a severe non-infectious lesion than normal or mildly lame cows. Locomotion scores did not accurately predict the presence of infectious lesions.

These results show that locomotion scoring systems do not accurately identify all lesions and this should be considered when implementing lameness detection programs.