

Scoring Lesions Considered Associated with Subclinical Laminitis in First Lactation Cows from High Production Ohio Holstein Herds: A Method of Comparison of Herds

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Abstract

Subclinical laminitis was studied in 203 first lactation cows and bred heifers in thirteen high producing Ohio Holstein herds. A cross-sectional observational investigation was conducted to develop and validate a scoring system for evaluation of subclinical laminitis. For purposes of this study, observable lesions considered associated with subclinical laminitis included yellow waxy discoloration of the sole, hemorrhage of the sole, separation of the white line, and erosion of the heel. The objectives of our study were to 1) evaluate the prevalence of sole and heel lesions associated with subclinical laminitis across and among cows, feet, claws, and zones, and 2) validate a scoring system which can be used to compare herds with regard to lesions considered associated with subclinical laminitis. Differences in the occurrence of lesions among herds were found to be significant in a pairwise comparison. The difference in the occurrence of lesions among herds appeared to facilitate classification of certain herds as being either better or worse than others according to lesion and anatomic location.

Introduction

The third most common reason given for culling dairy cattle are feet and leg problems. Considering only the differences in value between culled cows and replacement heifers likely underestimates total economic losses resulting from lameness. For example, cattle with sore feet may limit the time they stand at the feed bunk which may subsequently result in lowered milk production. Although lameness in cows may result from a variety of causes, subclinical laminitis is considered the major underlying cause in many herds.

The exact pathogenesis of subclinical laminitis is not completely understood. It is important, however, to realize that although the condition is observed in the hoof horn, the underlying changes in tissue function are essentially thought to be related to inflammation of the lamellar soft tissues of the digit. Release of vasoactive

substances is believed to result in circulatory changes which results in defects in hoof tissue formation. Repetitive bouts of subclinical laminitis have been postulated to be common in dairy replacement heifers. Usually cattle are not visibly lame at the time of initial vascular damage; thus, the term that has been used to describe the syndrome is "subclinical laminitis".

Materials and Methods

Herds were selected in our study to have uniformity of environment and management. Each herd consisted of greater than 100 cows and all were producing over 18,700 pounds of milk per cow on a rolling herd average basis. Lactating cows in all herds were housed in freestalls and maintained in confinement on concrete. Animals examined in each herd included first lactation cows in their first 100 days of lactation and heifers 30-60 days prior to calving. The cows were placed in lateral recumbency on a foot-trimmer's table for visual examination and photography of their feet. Both a front and a rear foot were examined in each animal. For purposes of scoring, the medial and lateral claws of each foot were divided into 6 zones according to the Liverpool system, 1990. Observable lesions considered associated with subclinical laminitis included hemorrhage of the sole, yellow waxy discoloration of the sole, separation of the white line, and erosion of the heel. Lesions were scored according to the method described by Greenough in 1991. Lesions were also scored by a proposed alternative scoring system hereafter referred to as the Ohio method. Discoloration of the sole observed in our study ranged from barely perceptible discoloration to severe yellow waxy discoloration. Likewise, hemorrhage of the sole observed varied from barely perceptible areas of red discoloration to severe hemorrhage. Hemorrhage of

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the sole in its most severe form was manifest as exposed corium and ulceration of the sole (pododermatitis circumscripta). In Greenough's system the severity of discoloration and hemorrhage in each zone was scored on a five point scale: 0=normal, 1=slight discoloration, 2=moderate hemorrhage, 3=severe hemorrhage, and 4=exposed corium or a sole ulcer. In addition to using Greenough's method, lesions were also scored by the Ohio method. In the Ohio method, the occurrence of hemorrhage and discoloration was recorded in each zone as being either present or absent. In addition to scoring hemorrhage and discoloration of the sole, the Ohio method was used to evaluate separation of the white line and erosion of the heel. Separation of the white line varied in severity from slight to severe. In the Ohio method, separation of the white line was scored on a 5 point scale: 0 = no separation, 1 = white line had striated appearance but was not visibly separated, 2 = slight separation, 3 = severe separation, 4 = complete separation of the white line. Likewise, erosion of the heel observed in our study varied in severity. Erosion of the heel ranged from a few shallow irregular depressions to deeper depressions which progressed to form deep oblique "V" shaped grooves. Therefore, erosion of the heel in the Ohio method was scored on a 5 point scale: 0 = normal heel, 1 = multiple shallow irregular depressions, 2 = multiple deep irregular depressions, 3 = shallow oblique grooves, and 4 = deep oblique grooves.

Statistical Analysis

Mantel Haenszel multiple pairwise comparisons and Quade's rank analysis were used to compare herds with respect to lesion type and anatomic location. Repeated measures analysis of variance were used to compare the distribution of lesions with respect to anatomic location. Mantel Haenszel multiple comparisons and Quade's rank analysis differences were considered significant if $p < 0.01$. Analysis of variance were considered significant if $p < 0.05$. Days in milk for each animal was treated as a covariate in the analysis.

Results

The prevalence of observed lesions, in each of the 4 categories of lesions considered associated with subclinical laminitis, was determined across all 13 herds, 203 animals, 406 feet, 812 claws, and 4,872 zones examined in our study. Lesions considered associated with subclinical laminitis were found in all 13 herds. Prevalence of hemorrhage of the sole, separation of the white line, and erosion of the heel were observed in all 13 herds (100%). All 4 types of lesions were observed in 11 herds (85%). In the remaining 2 herds (15%), discoloration of the sole was not observed. A high prevalence of hemor-

rhages in the sole and erosion of the heel were found in first lactation cows in certain herds. For example, across all herds, 34.5% of animals had hemorrhage at the medial front position with a range of 0% to 100% when individual herds were considered.

The distribution of lesions observed on each cow examined was analyzed according to anatomic location with respect to foot (front versus rear), claw (medial versus lateral), and zone (6 per claw). Differences in the occurrence of lesions among claws were found. Hemorrhage of the sole was found to occur significantly more frequently in the rear lateral claw than in other claws.

Across herds the occurrence of lesions appeared to be related to days in milk. The distribution of lesions among the 203 animals was analyzed by plotting the prevalence of lesions by days in milk. Data were analyzed by stratifying lactating cows into 3 intervals; 1 to 30 days, 31 to 60 days, and 61 + days in milk, and non-lactating bred heifers between -60 to 0 days in milk. The occurrence of separation of the white line, and erosion of the heel appeared to be related positively to days in milk.

Differences in the occurrence of lesions among herds was found using the Ohio scoring system. Differences in the occurrence of lesions among herds appeared to facilitate a ranking by lesions of the 13 herds. For example, the percentage of feet unsatisfactory with respect to hemorrhage of the sole ranged from 13% to 100% among the herds. Herds were listed in ascending rank order by the occurrence of individual lesions. Herds were also ranked based according to the occurrence of lesions with respect to their severity scores by the Ohio method. Herds could then be categorized as better or worse by pairwise comparison using Mantel Haenszel's multiple pairwise comparisons and Quade's rank analysis.

Conclusions

The prevalence and severity of lesions associated with subclinical laminitis in first lactation cows were significantly different among the 13 high producing Ohio Holstein herds. All herds selected were volunteers from a list of high producing Ohio herds with greater than 100 lactating cows maintained in freestall confinement on concrete. Herds in the study were representative of the upper half in milk production of all herds enrolled on DHIA testing in Ohio. However, herds were volunteers and were not selected randomly. Therefore, care must be exercised before results are generalized to all Ohio herds.

In our study, the occurrence of each of the 4 categories of lesions considered associated with subclinical laminitis was not found to be consistent among herds with respect to lesion and anatomic location. For this reason, we believe that it may be important to evaluate

herds by the occurrence of each category of individual lesion. Ranking herds enabled us to propose goals for Ohio herds. Significantly better herds in our study had < 25% of cows or < 15% of claws with observable hemorrhage of the sole. The upper 50th percentile of herds in our study had < 10% of claws with erosion of the heel considered unsatisfactory with a score of 3 or 4 in the Ohio method.

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