

# RISK FACTORS FOR CLINICAL LAMENESS IN LACTATING DAIRY COWS IN THE MIDWESTERN UNITED STATES

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## Introduction

The importance of clinical lameness in dairy cows is receiving increasing recognition. In addition to treatment and prevention costs, culling, milk production, and reproduction losses may occur due to lameness. The moral cost of animal suffering during severe lameness episodes must also be considered. Despite this, recommended management practices for the purpose of lameness prevention at the cow and herd level are often based upon trial and error rather than sound research-based knowledge of causal mechanisms of lameness. This has been due in part to the scarcity of lameness research in cattle. In addition, much of the available literature on lameness has been based upon a subjective diagnosis of lameness without a standard case definition, and often using multiple observers (producers) leading to difficulty in interpretation. The result has been a scarcity of useful information for veterinarians and producers.

The objective of this study included evaluation of within herd risk factors (bodyweight, body condition score, dorsal claw angles, visible and palpable limb lesions, and antibody to *Borrelia burgdorferi*) and between herd risk factors (housing, flooring, dietary, and management practice) for clinical lameness in lactating dairy cows.

## Materials and Methods

Observational studies were performed on 17 Minnesota and Wisconsin dairy herds to assess within and between herd risk factors for clinical lameness. Two observers utilized a standardized technique to score the locomotion of each lactating cow in the herds at visits during the summer and late winter/spring.

A matched case-control study was utilized to evaluate within-herd risk factors for clinical lameness including bodyweight (estimated by heart girth), body condition score, dorsal claw angles, visible and palpable limb lesions, and antibody to *Borrelia burgdorferi* using an enzyme-linked immunosorbant assay (ELISA). Cases were defined as those cows classified as lame. A nonlame cow matched by herd, season, parity, and stage of lactation was selected as a control for each case. The matched lame and nonlame dairy cows were also followed through time using Dairy Herd Improvement Association (DHIA) and DairyCHAMP health and management records to evaluate milk production, reproduction, and culling effects associated with clinical lameness.

In addition, a questionnaire was administered at each herd visit as part of an ecologic study to assess herd management and environmental factors and their association with clinical lameness prevalence in the herds.

## Results

The prevalence of clinical lameness in lactating dairy cows was 13.7% in the summer and 16.7% in the spring. Lamé cows were found to have higher bodyweights, lower body condition scores, and shallower rear lateral dorsal claw angles than their nonlamé herdmates. Claw angle, measured over the entire dorsal claw surface, was found to be associated with normal hoof overgrowth. This indicates an association between clinical lameness and hoof overgrowth, suggesting that maintaining steeper claw angles by preventing hoof overgrowth may prevent lameness occurrence. Lesions associated with clinical lameness included abnormal hoof overgrowth, limb lacerations or abrasions, and nontarsal rear limb superficial swelling (i.e. stifle, tibia, metatarsus, or metatarsophalangeal joint). These factors suggest potential benefits through avoiding the development of abnormal (e.g. corkscrew) claws through genetic selection and hoof trimming and preventing injuries which may cause lacerations or abrasions. While nontarsal rear limb superficial swellings were associated with clinical lameness, tarsal or carpal swellings, although commonly identified, were not. Further research is needed to evaluate the time sequence of these associations.

Lamé cows were found to have higher antibody levels to *B. burgdorferi*, the causative agent of Lyme disease, than their nonlamé herdmates. This association, while not proving causation, supports the existence of bovine Lyme disease. The time sequence of this association needs to be determined in future research.

Herd factors associated with an increased prevalence of clinical lameness in the summer included stall moisture and small exercise areas for lactating cows. Nutritional factors associated with low lameness prevalence in the summer included feeding high amounts of dry concentrates and forages other than haylage, corn silage, or hay to lactating cows at the highest production level. In the spring, high lactating cow ration balancing frequency and the use of parlor milking facilities were associated with an increased prevalence of lameness. Identification of herd risk factors for lameness is extremely important to dairy producers since these factors may involve management practices that may be altered to prevent lameness. Future studies with an increased sample size are needed for a full evaluation of herd risk factors for clinical lameness.

Detrimental milk production, reproduction, or culling effects due to lameness could not be demonstrated. Failure to identify negative effects may have occurred since lameness was evaluated at only one point during the lactation. In cows evaluated in early lactation, peak milk yield was higher in lamé than nonlamé cows, suggesting that high early lactation milk production may be a risk factor for clinical lameness.

## Summary

Observational studies were performed on 18 Minnesota and Wisconsin dairy herds to assess within and between-herd risk factors for clinical lameness. Utilizing a standardized technique to score the locomotion of each lactating cow in the herds, the prevalence of clinical lameness was 13.7% in the summer and 16.7% in the spring.

In a matched case-control study, lamé cows were found to have higher bodyweights, lower condition scores, and shallower rear lateral claw angles than nonlamé herdmates. Other risk factors for clinical lameness included abnormal hoof overgrowth,

lacerations, and superficial swelling of the stifle, tibia, metatarsus, or metatarsophalangeal joint. In addition, an association was found between elevated antibody level to *B. burgdorferi* and clinical lameness.

An questionnaire was administered at the herd visits to assess herd management and environmental factors in an ecologic study. Herd factors associated with the prevalence of clinical lameness in the summer included evidence of stall moisture, small lactating cow exercise areas, and the amount of dry concentrates and forages other than haylage, corn silage, or hay fed to lactating cows. In spring, factors associated with lameness included the use of parlor milking facilities and ration balancing frequency.

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## FACTORES DE RIESGO EN LAS CLAUDICACIONES (COJERAS) CLINICAS DE LAS VACAS LECHERAS LACTANTES EN EL MEDIO OESTE DE LOS ESTADOS UNIDOS.

Estudios de observación fueron llevados a cabo en 18 establecimientos lecheros en Minnesota y Wisconsin para evaluar factores de riesgo para cojeras, tanto internos como externos al establecimiento. Utilizando una técnica estándar de ponderación del aparato locomotor de cada vaca dentro del rodeo se determinó que la prevalencia de las claudicaciones clínicas era 13.7% en el verano y 16.7% en la primavera.

En un estudio apareado de casos y controles se encontró que las vacas cojas tenían mayor peso corporal, menor puntaje para estado y menor ángulo lateral trasero que sus pares no cojas. Otros factores de riesgo para las cojeras clínicas incluyeron crecimiento anormal de la pezuña, laceraciones e inflamaciones de la rodilla, de la tibia, del metatarso o de la articulación metatarso-falángica. Además se encontró una asociación positiva entre el nivel de anticuerpos para *B. burgdorferi* y las cojeras clínicas.

Cuando se visitó el establecimiento se utilizó un cuestionario para evaluar el manejo y los factores ambientales a través de un estudio ecológico. Los factores asociados con la prevalencia de las cojeras clínicas de las vacas lactantes en el rodeo durante el verano incluyeron: evidente humedad del establo, área reducida de ejercicio para las vacas lactantes y la cantidad de concentrados secos y forrajes en contraste con el uso de silo de heno o maíz y heno. Durante la primavera los factores asociados con las cojeras incluyeron: el uso de la sala de ordeño y la frecuencia con que la ración fue balanceada.

## LES FACTEURS DE RISQUE DE LA BOÎTERIE CLINIQUE CHEZ VACHES EN LACTATION DANS LE CENTRE OUEST DES ETATS UNIS

Des études basées sur l'observation ont été effectuées sur 18 troupeaux laitiers de Minnesota et de Wisconsin pour évaluer les facteurs du risque de boiterie à l'intérieur d'un même troupeau et au sein de plusieurs troupeaux. Avec l'utilisation de technique standard pour évaluer la locomotion de chaque vache en lactation, la prévalence de cas de boiterie clinique était de 13.7% en Ete et de 16.7% au Printemps.

Les vaches avec boiterie étaient plus lourdes, avaient de faible point pour l'appréciation extérieure, et l'angle d'inclinaison de l'onglon était plus bas que pour les non boîteuses et cela après une étude de type combiné t-statistic. D'autres facteurs de risque de boiterie clinique comportaient le développement anormal des onglons, de lésions de la partie inférieure du membre et de tuméfaction superficielle du canon, du tibia, du métatarse, ou de l'articulation métatarsophalangienne. En plus, il y a eu une relation entre le niveau élevé d'anticorps anti-*Borrelia burgdorferi* et la boiterie clinique.

Des renseignements sur la gestion du troupeau et les facteurs environnementaux ont été collectés à l'aide de questionnaire. Les facteurs liés à la prévalence de la boiterie clinique en Ete comportaient l'humidité de la litière, les petites surfaces pour l'exercice physique des vaches en lactation et la quantité de concentrés et de fourrage autre que l'ensilage de foin et de maïs, ou de foin distribué aux vaches en lactation. Au Printemps, les facteurs liés à la boiterie comportaient l'emploi des installations pour la traite et de la fréquence de l'équilibration des rations.