J. Dairy Sci. 89:2519–2528

Bovine Claw and Limb Disorders Related to Reproductive Performance and Production Diseases

Å. M. Sogstad,*†[1] O. Østerås,*† and T. Fjeldaas*
*Department of Production Animal Medicine, Norwegian School of Veterinary Science, 0033 Oslo, Norway
†Department of Norwegian Cattle Health Services, TINE Norwegian Dairies BA, 1431 Ås, Norway

ABSTRACT

As part of a cross-sectional study of Norwegian Red Cattle, associations of lameness, lesions at the tarsus, claw shapes, and claw lesions with reproductive performance and production diseases were examined. Fifty-five tiestall herds and 57 freestall herds were sampled by computerized systematic selection and 2,665 cows were trimmed and limb and claw disorders recorded by 13 specifically trained claw trimmers during the late winter and spring of 2002. After exclusions, 2,583 cows were included in this study. Most claw lesions were mild (score 1). Prevalence of moderate and severe lesions (score 2 + 3) did not exceed 5% for any of the lesions. Hazard ratios for independent variables were identified using Cox regression analyses incorporating herd as a random effect in a positive stable frailty model. Wounds and swellings at the tarsus were associated with more clinical mastitis [hazard ratio (HR) = 4.0] and teat injuries (HR = 2.5). Moderate and severe heel-horn erosions in first-lactation cows were associated with increased calving interval (HR = 0.60). Moderate and severe hemorrhages of the sole in first-lactation cows were associated with decreased interval from calving to first service (HR = 1.6) and moderate and severe hemorrhages of the sole were associated with more milk fever (HR = 8.6). All hemorrhages of the sole (scores = 1, 2, and 3) were associated with more reproductive hormonal treatments (HR = 2.3). All sole ulcers in first-lactation cows were associated with longer interval from calving to last service (HR = 0.59) and longer calving interval (HR = 0.61), whereas sole ulcers in older cows were associated with longer calving interval (HR = 0.62). All sole ulcers also were associated with more milk fever (HR = 4.8) in all cows. Moderate and severe sole ulcers in older cows were associated with increased interval from calving to first (HR = 0.35) and last (HR = 0.37) service. Moderate and severe white-line fissures in older cows were associated with increased return rate from previous insemination (HR = 2.4). Our study shows that claw disorders are associated with poorer reproductive performance and some production diseases.

Key words: claw disorder, reproduction, mastitis, milk fever

INTRODUCTION

Lameness is an important cause of reduced animal welfare and, along with mastitis and infertility, is an important constraint to the dairy industry (Kossaibati and Esslemont, 1997). Losses are primarily due to prolonged calving intervals, costs of premature culling, reduced yield and quality of milk, and other veterinary costs and treatments by the dairy producer (Enting et al., 1997). Claw disorders cause approximately 90% of lameness in dairy cattle (Logue et al., 1993; Murray et al., 1996). Cow-level factors thought to be involved in the pathogenesis of claw lesions include parity, stage of lactation, BW, and genetics (Vermunt and Greenough, 1994), whereas herd factors include housing environment, management, and nutrition.

Calving to conception interval, as well as number of services per conception, increased in lame cows (Hernandez et al., 2001). Enting et al. (1997) found that cows with clinical digital disease had greater risk for metabolic disorders. In contrast, Alban (1995) detected no associations between lameness and diseases associated with reproduction, udder, metabolism, or digestion, and others. Fleischer et al. (2001) found no association between any production and claw disease. Furthermore, Hultgren et al. (2004) found no association between mastitis and sole ulcers.

In summary, numerous factors are related to lameness and claw lesions and it is difficult to determine exact cause-and-effect relationships when assessing these disorders and their relation to infertility and disease. Estimating the effect of lesions without any visible lameness is particularly difficult and is rarely described in the literature.

The present study was performed to reveal possible consequences of disorders of the claw and limb to emphasize the importance of preventive measures. The

Received April 19, 2005.
Accepted February 3, 2006.
[1]Corresponding author: aase.sogstad@veths.no

aim, therefore, was to identify possible associations of the presence of lameness, lesions at the tarsus, claw shape, and severities of claw lesions recorded at claw trimming with reproductive performance and production diseases such as mastitis, teat injuries, milk fever, clinical ketosis, metritis, and more reproductive hormonal treatments.

MATERIALS AND METHODS

Selection Procedure

Herds were stratified based on the 3 most animal-dense regions of Norway. Approximately 500 herds with ≥15 cow-years were sampled by computerized systematic assignment from each region by using the Norwegian Dairy Herd Recording System (**NDHRS**; Østerås, 2003). The total number of herds with ≥15 cow-years within the 3 regions was 4,960. The present study was part of a claw health project using Norwegian cattle in which the main aim was to compare claw health of cows housed in tie stalls and free stalls. Consequently, herds were categorized in 2 housing groups: tie stalls or free stalls. In region 1, 91 herds had freestalls and every third was included. In region 2, only 25 had free stalls and all were included. In region 3, 84 herds had free stalls and every third was included. One tie stall for every free stall was randomly sampled. One hundred and ninety-three dairy producers were invited to participate in the study. After negative responses, exclusions, and dropouts, 55 tie stalls and 57 free stalls were included. Claw lesions of cows and heifers more than 18 mo of age and of the Norwegian Red cattle breed were recorded. Only females that had calved or were less than 30 d from first calving were included in this study.

Study Population

Average (mean ± SD) number of cows per herd was 25 ± 10 and milk production per cow was 6,286 ± 844 kg. Approximately 37% of the energy in the diets came from concentrates, 40% from grass-silage, 18% from grass at pasture, and the remainder from other sources. Feeding, housing, and management are described elsewhere in detail (Sogstad et al., 2005b).

Prevalence of lameness and claw lesions in hind claws was: 1.2% lameness, 26.4% heel-horn erosions, 16.3% sole hemorrhages, 10.9% white line hemorrhages, 2.8% sole ulcers, and 7.8% white-line fissures. Most lesions were mild. Prevalence of moderate and severe lesions did not exceed 5% for any of the lesion categories (Sogstad et al., 2005a).

The original study population contained 2,665 cows. Eighty-two cows were excluded because of missing parity (n = 8), missing identity (n = 1), missing calving date (n = 11), or missing peak milk yield (n = 62) in the NDHRS database. Of the remaining cows, 1,016 were in their first lactation and 1,567 in second or greater lactation.

Recording of Data

Thirteen professional claw trimmers attended 2 courses covering claw trimming procedures, diagnosis, recording, and treatment of claw lesions. Individual training was given to each claw trimmer at the initiation of the practical work.

The cows were trimmed and examined once during the period from January 1, 2002 until cows were turned out to pasture during summer. The last herd was visited on June 28. Presence (1) or absence (0) of lameness was assessed when the cow was moved to the trimming chute (Table 1). Peritarsal swellings and wounds were recorded as not present (0), swelling (1), wounded (2), or both swelling and wounded (3). Claw shapes were recorded as normal (0), asymmetric (1), or corkscrewed (2). Claw lesions were diagnosed based on macroscopic examination before and after trimming to the correct claw shape. Trimming technique included leveling the 2 claws, aiming for symmetric bulbs. The axial and abaxial walls were both intended to be parts of the bearing surface and the 2 claws were trimmed flat and balanced with each other. The caudal two-thirds of the axial sole of both claws was dished out. Dermatitis, heel-horn erosions, hemorrhages of the white line and the sole, sole ulcers, and white-line fissures were scored as not present (0), mild (1), moderate (2), or severe (3). Definitions in Table 1 were adapted from Bergsten (2000). The cluster effect within claw trimmer was significant only for heel-horn erosions (Sogstad et al., 2005a).

Artificial insemination and disease events were extracted from the NDHRS. Every cow in Norway has a health card stored at the farm. If diseased, the diagnosis is recorded by the local veterinarian and reported regularly by the farmer or the local advisor, together with all reproductive events, composition and yield of milk, and culling.

Clinical mastitis was defined according to IDF terminology (International Dairy Federation, 1999). Teat injury was defined as any injury or wound affecting the skin or milking procedure. Milk fever was defined as the clinical manifestation of hypocalcemia, characterized by reduced appetite, cold body skin, weakness, and lack of coordination. Most of these cows were recumbent and unable to stand. Reproductive hormonal treatments were defined as single cow therapy of one or more of the following conditions: anestrus (lack of estrus), cystic ovaries, or silent estrus. Clinical ketosis was re-