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Short communication: Prevalence, risk factors, and a field scoring system for udder cleft dermatitis in Dutch dairy herds

R. G. M. Olde Riekerink,*‡[1] K. van Amersfort,*† O. C. Sampimon,*§ G. A. Hooijer,† and T. J. G. M. Lam*†
*GD Animal Health Services, PO Box 9, 7400AA Deventer, the Netherlands
†Department of Farm Animal Health, Institute of Ruminant Health Care, Faculty of Veterinary Medicine, Utrecht University, Yalelaan 7, 3584CL Utrecht, the Netherlands
‡Bayer New Zealand Ltd., PO Box 2825, Auckland 1140, New Zealand
§Zoetis, PO Box 81055, 3009 GB Rotterdam, the Netherlands

ABSTRACT

Udder cleft dermatitis (UCD) is a well-known disorder in dairy cows. Veterinary literature about this subject, however, is scarce. The objectives of this study were to define a clinical scoring system for UCD, estimate the within-herd prevalence of UCD, and identify potential risk factors of UCD at cow and herd level. On 20 randomly selected dairy farms in the Netherlands, each lactating cow was photographed from a ventral, lateral, and caudal position. A scoring system with 6 categories of severity of UCD was proposed based on the ventral photographs. Cow measures such as udder width and depth, and front quarter attachment were determined from the lateral and caudal photographs. A questionnaire was conducted on each farm during farm visits. Udder cleft dermatitis, defined as a score 3 or higher, was detected in 5.2% of the 948 cows involved in this study. Within-herd prevalences of UCD ranged between 0 and 15% and UCD was found in 16 (80%) of the participating farms. Cows with a deep udder (relative to the hock), large front quarters, and a small angle between udder and abdominal wall were more likely to develop UCD. Production level and use of a footbath were identified as being positively associated with herd-level UCD prevalence. Herd size and average bulk milk somatic cell count did not seem to be associated with UCD prevalence. Because of the small herd sample size, no firm conclusions were drawn on herd-level risk factors. However, results from this study can be used in designing a future longitudinal UCD study. The prevalences of UCD found in the present study illustrate the current UCD situation in the Netherlands. Our results demonstrate that multiple potential risk factors of UCD could be identified at both the cow and herd level.

Key words: udder cleft dermatitis, prevalence, risk factor, classification

Short Communication

Udder cleft dermatitis (**UCD**), also known as bovine ulcerative mammary dermatitis or foul udder, is an inflammation of the skin and is most often located between the front quarters and at the transition of the front quarters and the abdominal wall. Characteristic features of UCD are a moist appearance, skin necrosis, and a foul odor, which is caused by opportunistic anaerobic bacteria that colonize beneath the scabs and necrotizing skin (George et al., 2008). In untreated cases, deep lesions can be found (Boyer and Singleton, 1998). Field reports exist of erosion into subcutaneous veins resulting in severe hemorrhage and even death (R. G. M. Olde Riekerink, unpublished data). The deep lesions can also impair animal welfare, milk production, and milk quality, and can lead to premature culling. Necrotic dermatitis of the udder skin of the hindquarters or the skin of the thighs of heifers or young cows (Blowey and Weaver, 1990) is probably not the same as UCD, occurs in anatomically distinct areas, and may have different etiology and risk factors, and is therefore not considered in this study.

Udder cleft dermatitis is a well-known disorder in dairy cows, but is scarcely described in veterinary literature. To date, the etiology and an effective therapy for UCD are unknown. Stamm et al. (2009) suggested that several *Treponema* phylotypes present in UCD lesions were associated with those cultured from bovine digital dermatitis (**BDD**). Other authors also identified spirochetes in samples from UCD lesions (Beattie and Taylor, 2000; Evans et al., 2010; Keil et al., 2002; Stamm and Trott, 2006).

Udder cleft dermatitis has been reported before in Scotland (Beattie and Taylor, 2000), the United Kingdom (Boyer and Singleton, 1998), the United States (Keil et al., 2002; Warnick et al., 2002; Stamm et al. 2009), and more recently in Sweden (Persson Waller

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[1]Corresponding author: richard.olderiekerink@bayer.com

et al., 2014). Reported prevalences were 18% in the United States (Warnick et al., 2002), 22% in 1 Scottish farm and 1.4% in an abattoir survey of 331 culled cows (Beattie and Taylor, 2000), and up to 39% within herd and 18.5% average in Sweden (Persson Waller et al., 2014).

The objectives of this study were to define UCD on a clinical score, estimate the prevalence in Dutch dairy farms, and identify potential risk factors at both the cow and herd level.

Farms were randomly selected from a list containing all milk-supplying farms in the Netherlands, using the following inclusion criteria: the predominant breed was Holstein-Friesian, herd size was at least 40 and no more than 120 lactating and nonlactating cows, and cows were housed in freestall barns with sufficient headlock facilities and milk recording. A total of 13,992 dairy herds fit the herd size selection criteria. To enroll 20 farms, 57 randomly selected farms were approached. Nine farms did not meet the inclusion criteria. Twenty-eight were not interested in participating. The 20 participating farms were visited between June and November 2010.

A total of 1,083 lactating cows on each participating farm were photographed from a ventral, lateral, and caudal positions, of which 948 resulted in usable and complete data. Animals were fixed in headlocks during this process. Cow identification cards were clipped on a folding ruler and were photographed with every cow. Ventral photographs were taken using a mirror on a stick and a digital camera attached to the stick. Lateral and caudal photographs were taken as consistently as possible with respect to the craniocaudal line of the cow (90° respectively 0°). On each farm, a survey was conducted containing questions about herd size, production level, bulk milk SCC, ventilation, alley floor type and cleaning frequency, use of a footbath, presence of BDD, presence of sarcoptic mange (farmer reported), bedding type, bedding replacement frequency, stall cleaning frequency, and the use of lime in the bedding material.

Based on the ventral photographs, 6 categories were proposed: 0 = no trace of UCD; 1 = discoloration or moist appearance in the area mediocranial of the front quarters; 2 = hair loss or skin abrasion; 3 = closed skin crusts; 4 = open wound, no skin; and 5 = open wound and bloody, serous, or purulent exudate (Figure 1). A classification score of 3 or higher was considered positive for UCD. A farm was considered positive if at least 1 animal scored 3 or higher.

Lateral photographs were used to determine the angle between udder and abdominal wall, front quarter size, lower leg size (measured as the distance between *os calcaneus* and dew claws), and lateral hygiene scores. Caudal photographs were used to determine the udder depth (vertical distance between the udder floor and the hock), udder width, udder cleft (strength of median suspensory ligament), distance between the tuber ischiae, and hygiene scores. Relative udder width was calculated as the udder width divided by distance between the tuber ischiae. Additionally, hygiene scores of udders, thighs, and legs were recorded from these photographs (range of 1 to 4: clean to very dirty, respectively; Schreiner and Ruegg, 2002). Photo-editing software was used to measure distances and angles (Adobe Photoshop CS5 extended version 12.0; Adobe Systems Inc., San Jose, CA). The fore udder attachment was measured on lateral view as the angle between the line of the fore udder skin and the line of the abdominal wall on the transition of both. Measures were adjusted using the pixel distance of the photographed folding ruler, after determining for each photograph how many centimeters on the folding ruler corresponded to the number of pixels in the photograph.

Statistical analyses were done using Stata 13 (Stata/IC 13.0 for Windows; Stata Corp., College Station, TX). Independent variables were the potential risk factors and the dependent variable was presence in a cow (cow-level analyses) or proportion of cows with clinical UCD in a herd (herd-level analyses). Univariable logistic regression analyses were used to determine the association between the potential risk factors at cow level and the presence of UCD. Regression analyses were used to determine the association between the potential risk factors at herd level and the presence of UCD. For both cow- and herd-level analyses, a significance level of $P \leq 0.05$ was used.

In total, 1,106 lactating cows were presented for the study, but because of aggressive and unsafe behavior, 23 were not photographed. From the 1,083 that were photographed, 135 had insufficient photo quality (dirt, blurring, or light) and were excluded from data analyses. In the remaining 948 lactating cows, 49 (5.2%) cows were considered positive for UCD (Table 1). Herd-level prevalences ranged from 0 to 15%. Udder cleft dermatitis was found in 80% (95% binomial CI: 56–94%) of the herds.

Only lactating cows were included in analyses of potential risk factors for UCD at the cow level. Out of 12 examined cow-level potential risk factors, 3 were associated with clinical UCD (Table 2). Small angles (smallest quartile was between 49 and 97°) between udder and abdominal wall increased the odds of clinical UCD ($P = 0.02$) as well as larger front quarter sizes ($P < 0.01$) and deeper udders ($P = 0.01$; Table 2).

Out of the 10 tested potential risk factors at the herd level, 2 seemed to be positively associated with the prevalence of UCD in the herd (Table 3), herd mean production level ($P = 0.04$), and presence of footbaths