



Can digital dermatitis be detected in the milking parlor without washing cows' feet?



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ABSTRACT

Scoring digital dermatitis (DD) in the milking parlor after washing the hind feet of cows has been recommended. However, farmers might be reluctant to perform this washing due to compromised udder hygiene. The objective of this study was to evaluate if DD prevalence can be determined without the washing procedure. A total of 4510 cows from 22 dairy herds were scored for DD in the milking parlor without and with washing their hind feet. In all DD infected herds, DD prevalence was higher when scored with washing. The two methods were highly correlated ($r = 0.987$, $P < 0.001$). Scoring with washing resulted in a median of 32% more detected DD cases with a large variation between herds. Overall, DD measurements without washing the feet of cows should be interpreted with caution.

Digital dermatitis (DD) is an infectious hoof disease of bovines. *Treponema* spp. bacteria are primarily associated with DD lesions (Evans et al., 2009; Krull et al., 2016; Zinicola et al., 2015). Nowadays, DD has a worldwide distribution and is considered endemic in dairy herds of Denmark, France, Germany, the Netherlands, the UK, and the USA (Evans et al., 2016). Up to 74% of cows in a herd having DD has been reported (Solano et al., 2016) with several cases being painful and an important cause of lameness (Bruijnjs et al., 2012). Losses for dairy farmers include costs associated with therapeutic and preventive measures against DD as well as a decreased milk production (Cha et al., 2010).

Approximately 90% of DD lesions are located on the hind feet (Murray et al., 2002; Relun et al., 2011; Solano et al., 2016). The different lesion stages are characterized by ulcerative, healing, and proliferative alterations of the skin, which can be distinguished by visual inspection. A clinical evaluation of cows' feet in a trimming chute is considered the reference method for diagnosing DD and determining the disease prevalence in a herd. In herds with conventional or carousel milking parlors, evaluations of DD in cows during milking have been considered adequate if the purpose is to score disease presence or absence in a foot (Relun et al., 2011; Solano et al., 2017; Stokes et al., 2012; Thomsen et al., 2008). A drawback of this method is that heifers, which can also be affected by DD (Laven and Logue, 2007), are not included in the assessment. Furthermore, the feet of cows need to be washed before the assessment, and farmers may be unwilling to perform this intervention, since it can require extra labor, cause discomfort to cows, and potential udder hygiene problems. Our objective was to

evaluate if the method for detection of DD in the milking parlor can be performed without prior washing of the feet of cows.

The study population comprised herds participating in another study to investigate the relationship between biosecurity and DD in Danish dairy herds (Oliveira et al., unpublished data) which took place from January 2015 until August 2016. Two methods to evaluate prevalence of DD in lactating cows in the milking parlor were compared: without washing and with washing their hind feet before visual inspection. Herds in which these two methods could be performed by a single observer (first author) during the same milking were included. The observer was trained to score DD in the milking parlor in two dairy herds (not included) by a researcher (last author) with experience in recording DD. First, evaluations were performed without washing the feet in a group formed according to the order of entry of cows into the parlor. Thereafter, the cows had their hind feet washed using a water hose. Finally, the group of cows was examined again in a random order (i.e. every second cow and subsequently the remaining cows) to minimize the risk of the observer remembering the first DD scoring of the individual cows (Thomsen et al., 2008).

To avoid splashing of water contaminated with feces onto the teats, cows had the milking equipment attached before washing, and the water hose was kept in a downward angle during washing. For both detection methods, a flashlight was used in every foot examination as a supporting material. Hand tally counters were used to record the number of DD affected cows. Each of the recordings (without and with washing) lasted approximately 15 s per cow. Digital dermatitis positive cows were defined as cows that presented lesions indicative of any of

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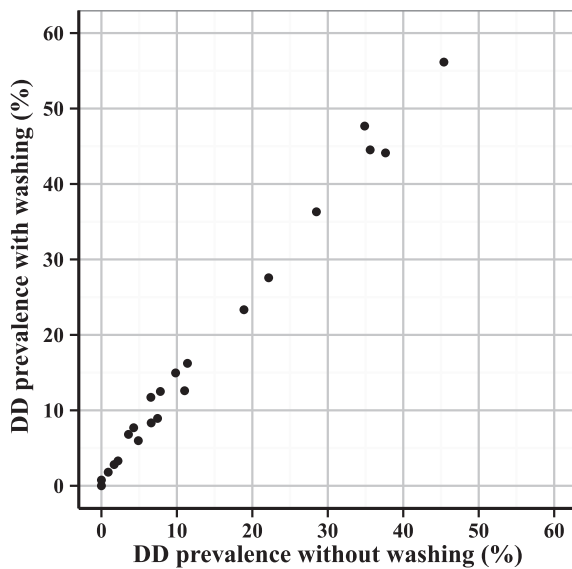


Fig. 1. Scatter plot showing digital dermatitis (DD) prevalence in 22 Danish dairy herds determined in the milking parlor without and with washing of the hind feet of cows.

the M-stages (M1–M4.1: erosive, crusty, or proliferative lesions) defined by Berry et al. (2012) in at least one hind foot, while negative cows had normal hind feet skin. Prevalence of DD was determined as the proportion of positive cows out of the total number of evaluated cows.

Statistical analysis was conducted using the R software version 3.1.2 (R Core Team, 2014). Correlations between DD prevalences determined without and with washing were tested by Spearman's rank correlation statistics. The ratios of these prevalences were calculated dividing DD prevalence with washing by DD prevalence without washing to evaluate a potential underestimation of DD cases if recorded without washing. We used the Wilcoxon's signed rank test for a comparison between the recording methods. Statistical significance was set as $P < 0.05$.

This study involved 4510 cows from 22 free-stall herds. The number of lactating cows in each herd ranged from 91 to 356 with a median of 185. In one herd, DD cases were not observed either without or with washing the feet. In the 21 herds where at least one case of DD was observed, scoring cows without washing underestimated DD prevalence compared to with washing. The prevalences determined without washing ranged from 0% to 45.4% and with washing from 0% to 56.2% (Fig. 1). The two methods were highly correlated ($r = 0.987$, $P < 0.001$). The median value of prevalence ratios was 1.32 (minimum = 1.14 and maximum = 2.0). In other words, recording cows with washing the feet resulted in a median of 32% more DD cases being detected. The difference between the methods was significant ($P < 0.001$).

Routine screening for DD is encouraged in dairy herds as the spread of associated pathogens may be reduced by adopting prompt preventive and curative measures against it (Döpfer et al., 2012). Scoring in the milking parlor is suitable for this purpose and has inherent advantages in practicality to farmers and in avoiding distress of cows (Relun et al., 2011; Stokes et al., 2012; Thomsen et al., 2008). Considering our results that fewer cases were recorded without washing, the detection of DD may have been impaired by poor leg cleanliness of cows. Although we found a high correlation between the DD prevalence without and with washing, the ratios of these had a wide range. Some herds had 10–20% more DD positive cows with washing, whereas other herds had twice as many cows diagnosed with DD with washing. This may be due to exposure of cows in different herds to several herd and cow level factors associated with hind leg cleanliness (Nielsen et al., 2011). Furthermore, the size of the lesions may possibly have influenced our results, because the larger the lesion, the higher the sensitivity of DD detection in the

milking parlor (Thomsen et al., 2008). Thus, a better agreement between the two methods may have occurred in herds where the cows had larger lesions.

The adopted washing procedure of cows' feet minimized splashing of water contaminated with feces onto the teats. Washing the hind feet of cows possibly stimulates their defecation. This increased defecation might be related to cows not accustomed to having their feet washed. Previously, no effect of spraying cows' feet with water on the number of defecation episodes was detected compared to cows not exposed to a washing regimen (Robichaud et al., 2013). Thus, concerns regarding the washing might be overcome with a frequent adoption of the procedure.

In conclusion, scoring DD in the milking parlor without washing the hind feet of cows before the examination was inappropriate, as it can lead to a substantial (and varying) underestimation of the DD prevalence.

Conflict of interest

None.

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