Control of bovine digital dermatitis in a dairy herd: a herd case report

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SUMMARY

Digital dermatitis (DD) is an infectious disease of cattle causing lameness and economic losses. The control of DD is based on the treatment of the active lesions and the use of collective footbathing; however, in the field conditions, the control of this disease could be difficult. This herd-level case report describes the experience made in a commercial dairy herd controlling the DD. Eighty Canadian Holstein milking cows were present in this herd. The management of the DD in the farm was evaluated through an interview of the farmer regarding the management of the DD in the farm and the assessment of the prevalence. The prevalence of DD was estimated using the direct observation of the heel bulbs of the hind limbs in the milking parlor. This assessment shows the presence of a high prevalence of active DD lesions in the farm (68%). Moreover, the interview with the farmer and the herd visit indicated the presence of an inadequate measure of the footbath, inadequate frequency of use, and inadequate concentration of the disinfectants in the solution used to control DD, as well as the absence of regular hoof trimming. A plan to control the DD was implemented based on the treatment of the active lesions in the milking parlor using the chlortetracycline HCl spray for three days. In addition, one more rational use of the footbath (increment of the dimension of the footbath, use of the 10% Cu_2SO_4 solution be-weekly as a disinfectant in the footbath) was applied. At the follow-up made through a monthly assessment in the milking parlor, the inactivation of the DD lesions, as well as after the reduction of the prevalence of these lesions, was shown. Because of this inactivation of the DD lesions and the reduction of their prevalence (from the 64.4% to 34.0%), the concentration of the Cu_2SO_4 in the footbathing solution was reduced from 10% to 5%. In a second moment, also the frequency of foot bathing was reduced weekly at once. This experience performed on the herd level confirms that the control of the DD is based on the early treatment of the active lesions and rational use of foot bathing, based on the adequate dimension of the footbath, an adequate concentration of the disinfectant in the solution used and adequate frequency of the foot bathing.

KEY WORDS

Bovine digital dermatitis, lameness, herd health, footbath.

INTRODUCTION

Digital dermatitis (DD) is a worldwide infectious disease of the bovine foot[1]. It is causing lameness, pain, and discomfort, as well as economic losses deriving from milk losses and treatment costs[1-3]. Because of its high incidence and long-lasting clinical signs, DD has a great impact on cattle welfare[4].
A client of the Bovine Ambulatory Clinic complained about the difficulty of controlling active DD lesions in his herd.

Herd history

The herd was closed and composed of 83 Canadian Holstein milking cows (29% first lactation, 31% second lactation, 40% third and more lactations), 10 dry cows and 63 heifers (0-24 months old). Each year 35.6% of lactating cows and 11.1% of heifers below 24 months were culled. The main reason for culling lactating cows was "reproduction". Dairy cows and heifers between 12-24 months old were housed in free-stall facilities, equipped with individual cubicles (one for each animal). The cubicles were bedded with sawdust, changed be-weekly. The alleys were scraped every 2 hours. At the dry-off, cows were moved in pens with permanent bedding of wheat straw. Straw was added daily, and alleys were cleaned every day. Cows were fed two times/day with a total mixed ration. Cows were milked twice a day, in a herringbone-milking parlor. Mean daily production was 35.4 kg/day. The owner or his employee performed the hoof trimming at dry-off or in case of lameness. Lameness prevalence (cows with a locomotion score 4 or 5) was 6.7%. During the last 12 months, only 6 cows were considered lame (2 sole ulcers, 1 interdigital dermatitis, 2 'high lameness').

Herd assessment

The assessment of the herd was made in three stages. At first, the farmer was interviewed to understand the herd's practices

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Table 1 - Results of hoof and leg cleanness score in the herd at the moment of the first assessment. The sum of the cleanness score 3 and 4 is used to decide the frequency of the footbathing in the herd.

Score	N cows	Prevalence
Score 1	0/89	0%
Score 2	49/89	55%
Score 3	33/89	37%
Score 4	7/89	8%
Score 3+4	45/89	45%

concerning DD. It became clear that DD had always been a problem, but with increasing prevalence in the last months. At the time of the interview the owner treated around 15-20 cows with actives lesions of DD each week. Cows were examined in a trimming chute when considered lame (arched back, bear weight, ankle) or when a reddish lesion was seen at the plantar aspect of the foot in the milking parlor. DD lesions were treated applying 10 g of tetracycline HCL powder[5,6] (Onycin 250®, Vetoquinol, Canada) and a light bandage (removed after 48 hours). A gel containing chelated Cu and Zn was used to treat lesions having a diameter ≤1 cm (Intra hoof-fit gel®, Intracare, Canada). A collective footbath was also used once a week. The footbath was positioned at the exit of the milking parlor and all the cows were obliged to walk through it. The footbath solution was made alternating two products: 2% PediCuRX® (GEA, Canada) and 1% Tymox® (Tymox technology, Canada). The solution was changed every week. Heifers and dry cows were not exposed to the footbath but examined in the trimming chute when considered lame.

Later on, assessment of DD management was performed in order to verify if the dimensions and the frequency of the footbath were adequate. Therefore, the data that was collected were dimensions of the footbath[7] and hoof and leg cleanness score[8]. The footbath (DeLaval PVC footbath®, DeLaval, Canada) used at the farm had the following dimensions: length 1.95cm, width 78 cm and depth 14 cm. The hoof and leg cleanness score were performed as described by Cook[8]. The sum of scores 3 and 4 was 45% (described in table 1).

Lastly, DD lesions prevalence was assessed. DD prevalence was assessed for milking cows during the daily milking operations, using direct observation[9]. Only the plantar aspect of the hind limb feet was scored[10,11]. The prevalence was calculated at cow level (presence of DD lesion = case). The feet were not cleaned before the examination. Lesions were scored as described by Döpfer and modified by Berry[12,13].

To compute the prevalence, lesions were grouped in three categories:

Active lesions: presence of ulcerative red to gray lesions (M1, M2, M4.1).

Chronic lesions: presence of a proliferative grey lesion (M3, M4)

Absence of the lesions (M0)[11].

The prevalence of the DD in milking cows was 68%. All the lesions were considered active. The initial problem list and the action plan are reported in table 2.

Follow up

Active lesions observed in the milking parlor were treated with chlortetracycline (Cyclospray 211®, Vetoquinol, Canada). The owner bought a second footbath. The solution used for the footbath was 10% Cu_2SO_4 and it was changed every day[14]. The author of this case report monthly assessed the lesions prevalence. Heifers and dry cows were not exposed to the footbath and heifers were checked only when recognized lame. The owner refused to make a regular hoof trimming, preferring to trim the cows at the drying off and when detected lame. The prevalence of the DD lesions and the date of the assessment in milking parlor are reported in the table 3. After the implementation of the action plan, practically all the DD lesions were inactive but the prevalence was unchanged. It was decided to continue to use the footbath two times/week, with 10% Cu_2SO_4 solution. At the third assessment, it was decided to continue to use the footbath twice a week and to reduce the concentration of Cu_2SO_4 to 5%[1]. One month after this assessment, it was decided to use the footbath just once a week, seeing the reduction of the DD prevalence and the absence of active lesions.

DISCUSSION

This experience shows that the individual treatment of DD active lesions, coupled with a rational use of the footbath, is effective for the control of active lesions of DD in a dairy herd and is able to reduce its prevalence.

When studying DD, it is important to consider three points: the etiology, diagnostic tools for prevalence monitoring, and control. DD is a polymicrobial disease, where bacteria of the genus *Treponema spp.* play a critical role[15]. However, the exact

Table 2 - Initial list of the problems produces after the first assessment of the herd and the initial prevention plan implemented to control the digital dermatitis in the farm.

Problems list	Prevention plan
• High prevalence of DD active lesions • Inadequate dimensions of the footbath • Inadequate frequency of footbath • Inadequate frequency of the change of footbath solution • Inadequate concentration of Cu_2SO_4 in footbath solution • Lack of monitoring of BDD in dry cows and heifers • Absence of regular hoof trimming	• Treatment of active lesion in the milking parlor using a spray containing Chlortetracycline HCl (Cyclospray 211®, Vetoquinol, Canada). • Purchase of another footbath to extend the one already available at the farm • Use of collective treatment with footbath two times a week • Use of a 10% Cu_2SO_4 solution in the footbath • Change of the footbath solution each 200 passages • Regular hoof trimming of all animals of the herd • Record hoof lesions observed in the milking parlor and at hoof trimming to document the prevalence

Figure 1 - View of the hind limbs during scoring in the milking parlor. On the left lesions M0, on the right DD lesion M4 (white arrow).

Table 3 - The prevalence of the cows having the absence or the presence of an active or an inactive lesion of digital dermatitis during the follow-up made after the implementation of the control plan in the farm.

Data of the assessment	Nr. of cows scored	Nr. of cows with an M 0	Nr. of cows with an inactive lesion	Nr. of cows with an active lesion
28/06/2018	65	24 (34.0%)	42 (64.6%)	1 (1.5%)
27/07/2018	79	50 (63.0%)	29 (37.0%)	0 (0.0%)
31/08/2018	77	51 (66.0%)	26 (34.0%)	0 (0.0%)

etiology remains unclear. This makes the development of effective programs for control and eradication of this disease difficult[16].

The diagnostic tool considered as the 'golden standard' for DD diagnosis is direct observation of the lesions in the trimming chute[10,11]. This diagnostic method is not easy to use for monitoring DD prevalence daily, as well as for early detection of the lesions[10,11]. For this reason, in the last years, alternative methods have been tested to find an alternative diagnostic tool to use during the daily milking operations. Among these, direct observation of the lesion in the milking parlor[9,17] was chosen by the author of this case-report, because the structure of the milking parlor allowed him to score lesions easily (Figure 1) and record lesions at the same time.

DD control is based on individual treatment of lesions and collective use of footbath[4]. Tetracyclines are the most used antibiotics for DD treatment[1,4]. Tetracyclines are not less effective than beta lactams or erythromycin, but have the advantage to be sold as powder or aerosol for topical use[18]. The other cornerstone for DD lesions control is the use of footbaths. The effectiveness of a collective treatment for DD control is uncertain[19]. A product widely used in footbaths is Cu_2SO_4[1], but there is no evidence of its effectiveness[20]. It is also important to consider that Cu_2SO_4 is a pollutant[21]. Because of this, the author decided to decrease progressively the high concentration described at the beginning of the treatment[14]. The concentration was adjusted to find the lowest concentration that allowed reaching the equilibrium between the risk of inactivation by the organic matter and the effective concentration. DD is present in 70-94% of the North American herds and its prevalence in freestall facilities is around 20%[22]. At the beginning of this experience, the prevalence was estimated to 68% and declined to 34%. At the end of this experience, no animals had an active lesion, but DD prevalence was still higher than what is considered acceptable. It is important to consider that no regular hoof trimming of all animals was performed in the herd and that the screening in the milking parlor was done without prior washing of the feet. For this reason, the apparent prevalence may be different from the true prevalence. It is possible that at the beginning of this experience the real DD lesions prevalence was higher because of missed lesions in the interdigital space and in the front feet that can account for 10-20 % of DD lesions[1]. It is also important to consider the lack of accuracy of the diagnostic method used and the fact that the feet were not washed before the exam, which may have caused the loss of some lesions[23]. Literature reports conflicting results regarding the accuracy of the visual observation in milking parlor. Stokes reports a sensitivity of 100% and a specificity 99%[15]; instead Thomsen reports a sensitivity of 65% and a specificity 84%[9]. As stated before, the author chose this method because it is a simple and fast method, which can be easily done by the owner during the milking operations. Likely, not washing the feet before scoring may have had an impact on the accuracy of the scoring, but this choice was made to avoid the possible risk of contamination of the milking machine with feces as anecdotally reported[21]. Another factor that may have had an impact on DD prevalence is the misclassification of M0 stage as M4[10], because of the possibility to confuse dirty with a scab (overestimation). The locomotion score was not used in this case report as only 39% of cows with DD are usually lame[4] and there is no agreement between locomotion score and DD prevalence. In this experience, the limiting factor for DD control was the absence of a regular hoof trimming in the herd. This action could allow treating all the affected animals at the same time, estimating the true prevalence of DD and investigating if the heifers are the DD reservoir of the herd. However, this action was refused by the owner that preferred to continue to trim the animal only at dry-off and when seen lame.

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