USE OF BANDAGING IN THE TREATMENT OF DIGITAL DERMATITIS

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ABSTRACT

The aim of this study was to compare two different methods for the treatment of digital dermatitis (DD) in dairy cows. Moreover, both treatment methods were tested if they could stop the recurrences of DD in the same patient. For this study, data were collected on two separate occasions across a six-month period (spring and the following autumn). During these two periods, 280 and 232 Holstein Friesian dairy cows were examined respectively in the crush. The following two treatment methods were compared:

1. Scarification of the lesion surface and antibiotic spray;
2. Resection of the lesion, antibiotic spray and powder, and covering with a bandage.

A first control 3 weeks after the initial trimming period was carried out to check the condition of the lesions. The recurrence rate of DD was assessed during the second hoof trimming (autumn). In this study, no differences between two treatment methods could be observed as all treated animals have shown a 100 % healing. The assessment of a recurrence rate showed no new

cases of acute DD in the group 1 (non-bandaging) and in the group 2; however, there was a 28.6 % recurrence rate in the group 1 (non-bandaging). The material costs and treatment time were also several times higher in the bandaging group. In conclusion, the tested methods did not differ in healing success rate, however, there are other important factors like time and costs that play an important role in the decision of a farmer or manager as to which treatment to use for their dairy cows.

Key words: dairy cow; digital dermatitis, lameness; treatment

INTRODUCTION

Digital dermatitis (DD) can be described as a one of the major global problems in dairy cattle, not only through the incurred financial losses due to its main symptom of lameness but also in terms of the welfare of the animals [3, 13], therefore treatment and prevention have an important role worldwide. Described as the “leading cause of lameness in

dairy cattle in North America and Europe” [18], it develops typically as a moist, light grey-brown area with erect hairs bordering the lesion, it can be found on the plantar aspect of the foot, just between the bulbs of the heels. The characteristic lesions are most commonly found on the rear foot but can appear on the front foot and if present are found on the border of the interdigital cleft. The diagnosis of the DD lesion was based on the classification of its different stages that was formulated by [4]. Another way of classifying DD was into acute or chronic, where acute lesions were typically described as a moist, light grey-brown exuding area with erect hairs typically surrounding the lesion, when it was cleaned you may visualise the typical red, strawberry-like lesion. The chronic lesion also known as the “hairy wart” stage were neglected lesions that develop hypertrophy of the dermis and epidermis that make conical projections [15].

Treponema bacteria were thought to be a possible cause due to them being isolated from DD lesions [7]. These bacteria are spiral micro-organisms that grow best in anaerobic conditions and can be inhabitants in the GIT tract and genital tracts of both humans and other animals [6]. Treponemas were also difficult to culture mainly due to the fact that they are anaerobic bacteria and therefore are hard to isolate from lesions. The study in the UK found that 23 spirochete strains with only two of the results from two of the cows with more than one treponema was isolated from the same lesion which casted serious doubts on previous thoughts that DD was a polyspirochetal infection. The study did confirm that all the isolates were from the genus *Treponema* and from 3 distinctive groups [5]. Those isolated were *Treponema phagenesis*, *T. vincetti* and *T. denticola*. Most interestingly, a further study undertaken to identify *Treponema*’s from the bovine GIT tract, using 16S rRNA gene sequences, to try to see if they are the same or similar to those isolated from DD lesions recently. This can help to try and distinguish the source of the bacteria. The study found and isolated seven treponemas from the GIT tract and compared them to those isolated from DD lesions; they found them to be different in certain clusters [5].

The management of DD and its prevention are very important and a lot can be done to help reduce the incidence of DD and other claw diseases from occurring. The infectious nature of DD results in the spread of lesions after an infected cow is introduced to the herd and is extremely difficult to eradicate once present [14]. Treatments vary

on: labour involved, products available and upon the setup of the farm. Topical treatments such as the use of antibiotics in a spray that can be applied after cleaning of the DD lesions is one of the most commonly used methods on dairy farms. The use of bandaging is not a common practice worldwide for DD lesions, as less costly methods are preferred. Bandaging requires a higher labour and material input as the process takes longer than a simple spray method and requires the animals to be caught in a crush and restrained adequately for the process of bandaging to occur.

The goal of this study was to see if the bandaging of digital dermatitis treats the lesion as well as or better than a simpler technique of scarification and then an antibiotic spray. The second goal was to see if this technique stopped the recurrence of DD in the same patient.

MATERIALS AND METHODS

For this study, data were collected on two separate full hoof trimmings across a six-month period (spring and the following autumn). During these 2 periods, 280 and 232 Holstein Friesian dairy cows were examined respectively in the crush and then treated if needed. A further “control” three weeks after the initial trimming was carried out to check the progress of the lesions. The animals were kept in a free stall system with manure solid bedding and were fed a total mix ration (TMR). Diagnosis of DD occurred during the orthopaedic hoof trimming and animals with Acute DD lesion has been randomly assigned to 1 of 2 treatment groups: 1—control group; 2—bandage group. If manure presence prevented observation of the lesions, this was removed with a towel. For all the lesions, the lesion was first cleaned using a scrubbing brush and water to take away any faeces or contamination from the lesion and also for clarification of the extent of the lesion. The foot was then also dried using disposable paper and the foot was then trimmed using a grinder to standard length and any disparities were removed before forming two slopes on the inner surfaces.

For the control group, the DD lesion was initially disinfected with a simple betadine solution spray and allowed to dry before using a simple hoof knife (also disinfected beforehand) to scarify the lesion that takes away the surface. Then a chlortetracycline spray was sprayed onto the lesion and left for two minutes to dry. For the test group, the DD

lesion the top layer of skin was removed using a simple hoof knife after cleaning and disinfection of both the lesion and the knife. The lesion was then also sprayed with a chlortetracycline spray and allowed to dry before starting the bandaging. A square piece of sterile gauze was then covered with tetracycline powder and placed on the area of the lesion, in as sterile a manner as possible. Then the foot and lesion were covered in a layer of cotton wool, this layer must go above that of the lesion. Once a sufficient padded layer was encasing the foot, the wound would be dressed using a roll of wound dressing; this part of the bandaging must be kept as tight as possible and all areas of the cotton wool must be covered only leaving a ring above the top of the bandage. Black tar tape was then used to provide protection to the bandage. A control of both groups followed after 3 weeks and a transition from active to non-active stage was recorded as “good healing”. The animals other legs were also checked to see if the DD had spread to any of the other legs. The treatment of the lesions, if any, could then take place. The second control was done during the next trimming session in the autumn.

The statistical analysis of the prevalence differences were performed by running a chi-squared test using the statistical software StatSoft, version 8.0. A P value of < 0.05 was considered significant. The time differences were tested by the t-test. To test a recurrence rate the patients used were divided into 4 groups, according to what trimming session they were in and what treatment was used. Groups 1 and 2 were those from the spring session, group 1 being bandaged and group 2 non-bandaged. Groups 3 and 4 were those cows from the autumn session and group 3 being bandaged and group 4 being non-bandaged.

Ethical statement

The research was approved by the UVLF Ethics Committee in accordance with applicable national and international animal welfare legislation.

The authors declare that there is no conflict of interest.

RESULTS

The occurrence of DD in this study during the two trimming sessions were not high, however the data were calculated only concerning the acute lesions (Table 1). There was a significant increase in the number of cases in

Table 1. Prevalence of acute digital dermatitis (DD) lesions in dairy cows

Trimming session	Total number of cows	Cows with acute DD	Acute DD [%]
Spring	280	11	3.93
Autumn	232	29*	12.50

*—Significant at $P < 0.05$

Table 2. Percentage of cows with good healing

Group	Number of cows	Treatment Type	Cows with good healing [%]
1	4	Bandaged	100
2	7	Non-bandaged	100
3	11	Bandaged	100
4	18	Non-bandaged	100

Table 3. Average cost of material per treatment per head

Treatment type	Material cost per cow [€]
Bandaging	2.03
Non-bandaging	0.03

the autumn. In this study, we could not demonstrate that the bandaging technique was better than the non-bandaging technique as all groups have shown a 100 % success rate (Table 2).

The assessment of a recurrence rate showed no new cases of acute DD in the group 1 (bandaging) and in the group 2, however, there was a 28.6 % recurrence rate. Two cows that had been treated using the non-bandaging method of scarification and spray in the spring had new cases on a different leg in the autumn and were subsequently treated in group 3 and 4, respectively.

This study also included a calculation of the average material cost for each treatment to help in the evaluation of the treatments. The total costs as outlined in Table 3 showed a clear difference in the costs between the two treatment types. This is especially significant when the non-bandaging groups had over double the amount of patients in

Table 4. Total costs of each treatment for each treatment group

Group	Treatment type	Number of cows	Total treatment cost [€]
1	Bandaging	4	8.20
2	Non-bandaging	11	0.33
3	Bandaging	7	14.35
4	Non-bandaging	18	0.54

Table 5. Average time per treatment per cow in minutes

Treatment option	Number of treatment	Time per cow [min]
Bandaging	11	2.52 ± 0.13
Non-bandaging	29	0.33 ± 0.01*

*—Significant at $P < 0.05$

Table 6. Total times for both treatment options in all groups

Group	Treatment type	Number of cows	Total time [min]
1	Bandaging	4	10.0
2	Non-bandaging	11	3.66
3	Bandaging	7	17.5
4	Non-bandaging	18	9.0

both non-bandaging groups and where completed with the same results at a significantly smaller cost (Table 4).

As shown in Table 5, there is yet another significant difference in the time taken per cow to administer the treatment options. The non-bandaging techniques takes a third of a minute (twenty seconds), compared to the bandaging technique taking two and a half minutes.

DISCUSSION

The occurrence of DD in the herd over the two trimming sessions should ideally be below 12 % and if they were this would mean that the farmer or manager was managing the environment and dairy cows well. The incidence of DD in other countries such as the Netherlands has

been studied and a percentage of 20 % and over for a herd of over 100 dairy cows was seen to be common with some herds reaching an almost 60 % incidence [9]. It is generally considered that once a herd has DD, it is extremely hard to decrease the incidence. In this study, the incidence was fairly low, however these data were calculated only with acute lesions as those with chronic lesions were not treated in this study. The incidence was low which was good and was probably achieved through good management practices by both the manager and the orthopaedic specialist, over successive years of routine foot trimmings and treatments. There was a significant increase in the number of cases in the autumn and this may be due to more humid conditions at that particular time of year and was more expected in the autumnal period.

Unfortunately, infectious claw disorders are less efficiently prevented by foot trimming than disorders affecting the claw horn. Thus, in combination with footcare/trimming, infectious lesions like digital dermatitis and foot rot preferably need a short-term and long-term biosecurity strategy. Cattle develop immunity to foot rot, but digital dermatitis can recur in the same animal over time [1]. The use of bandaging in DD lesion healing has not been widely studied as a treatment option due to the extra time and costs involved in applying the bandage compared to footbaths or a simple spray method. In a study in Germany, the use of bandaging was tested to see if it accelerated the healing of DD lesions with both an antibiotic and non-antibiotic; the results showed that by bandaging the lesion, no matter the treatment option, it helped increase the rate of healing [11]. This suggested that there was an advantage to using a bandage for treatment. In this study, no difference in the treatment success between the bandaging and the non-bandaging technique could be seen as all groups have shown a 100 % success rate. The clinical cure rate, defined as transitioning from active to nonactive stages, was used as an outcome as opposed to “healing,” as the latter implies that a foot would return to an unaffected state, which is unlikely in 3 weeks [12]. Tetracyclines are commonly used as a treatment for DD by farmers, veterinarians, and hoof trimmers [16] and are often used as a positive control in DD treatment studies using various application methods with varying results. This heterogeneity in treatment regimens has resulted in clinical cure rates reaching around 70 % over 3 to 30 days [10]. In the study with the testing of two different methods, it was demonstrated that the treat-

ment of digital dermatitis with a tetracycline hydrochloride paste was as therapeutically effective as the application of tetracycline hydrochloride held in place with a bandage for two days and would eliminate the necessity of bandage removal [8]. Consequently, transition and recurrence should be considered the most relevant in terms of on-farm DD control. A significant difference in a recurrence of DD could suggest that bandaging is a good technique for ensuring less recurrence of DD, possibly due to allowing less of the aetiological agent to have the ability to spread to other legs of the cow as the bandage seals the lesion with the treatment. However, it could be argued that these particular cows may have a predisposition to the disease and as a coincidence were both treated in the non-bandaging group to start with and may have shown a recurrence even if they had originally been treated with a bandage [17].

Many dairy units worldwide are struggling with the increasing costs and the falling price of milk, therefore, every cent count when it comes to deciding what preventive strategies and treatment plans to be used for the dairy unit. In a recent study, it was calculated that the average cost of lameness caused by DD in the US is \$132.96 per cow [2]. Among treated foot disorder cases over the past year, a recent study estimated that digital dermatitis was most prevalent (43.9 %) with the mean total treatment costs of \$7.5 per case of digital dermatitis [3]. The average cost per cow is considerably larger for the bandaging option and therefore with the treatments showing no difference in healing potential, then there is every reason for a farmer to opt for the cheaper option of scarification and spraying. The total costs analysis demonstrated the significant difference in costs for the two treatment types. This is especially significant when the non-bandaging groups had over double the amount of patients in both non-bandaging groups; and were completed with the same results at a significantly lower cost. This is, however, not surprising when you consider how more materials are needed compared to the non-bandaging technique. It is also worth pointing out that although the non-bandaging technique requires the use of a hoof knife for the scarification of the lesion, it has not been factored into the costs as the orthopaedic specialist that undertakes the treatment will already have a hoof knife as part of their equipment. When considering the study results, there was no doubt that the non-bandaging technique would be preferable as the cost per animal is 68 times less than the alternative bandaging technique.

The time constraints of completing the two treatment types when undertaking a routine orthopaedic and foot trim of many dairy cows are limited due to cost. Therefore the more dairy cows that are able to be seen and if needed treated in one day has a positive effect on the dairy farms profit. Labour is costly to farmers and when a study was done on the costs of lameness, the treatment was one of the biggest costs for DD at 42 % and this would be a factor in the labour involved in treating these cases [2]. Therefore in this study the desired treatment would take the least amount of time possible and still provide good healing results. The results of this study demonstrate a significant difference in the time taken per cow to administer the treatment options. When the significantly shorter non—bandaging method is factored into the orthopaedic and trimming schedule for a day, there would be a much higher work rate achieved if you were using the non-bandaging option. This is also an extremely important consideration when you take into account how much less time the dairy cow has one of her legs elevated and therefore there is a decreased risk of muscle or nerve damage that can be acquired through prolonged restraint techniques.

When taking both treatments into account, the bandaging technique still has the slight advantage, in that there were no cases recurring in this study. However, when taking into account the time and cost of both treatments, there will be no doubt that farmers would prefer the non-bandaging treatment. As this also requires far less in terms of supplies, with only a hoof knife for the scarification and an antibiotic spray, this means that there is the potential for many more cases to be treated in a smaller time constraint and at a far lower cost.

It is fair to say that from this study there was no conclusive evidence to suggest that either treatment is better at healing DD lesions than the other. There are other important factors that come into the consideration when a farmer or manager brings into consideration when deciding what treatment to use for their dairy cows.

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