Prevalences of Udder Cleft Dermatitis and Dermatitis Digitalis in Five Dutch Dairy Herds

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Abstract

Udder cleft dermatitis (UCD) and Dermatitis Digitalis (DD) are both common on Dutch dairy farms. Udder cleft dermatitis is a disease of the skin which causes foul-smelling and moist udder sores. Dermatitis Digitalis is an infectious disease which gives an ulcerative lesion on the transition of skin and hoof. The diseases both cause a decrease in animal welfare and economic losses. Previous research found *Treponema* species in both UCD and DD lesions and suggest it might be the causal agent of both diseases. For this study, farms with a high prevalence of DD were visited. The purpose of this study is to investigate if there is a connection between the prevalences of DD and UCD. In previous studies a prevalence of 21.2% DD and a prevalence of 6% UCD was found on farms in the Netherlands. The hypothesis is to find a higher prevalence of both DD and UCD on these farms.

Five herds were selected with a known problem with DD. Other selection criteria stated that the predominant breed should be Holstein Friesian and only lactating cows, cows in dry period or cows short of having a first calf are used. The claws and udder were inspected while standing in a hoof trimming chute. Cow identification numbers and the presence of DD and UCD were listed. A two-sample T-test was performed to compare the prevalences with prevalences found in literature.

On the five farms, 426 cows were checked for UCD and DD. Cases of UCD were only found on two farms, while DD lesions were found on all farms. In the five herds visited, average prevalences of 0.9% UCD and 34.5% DD were found. The prevalence of DD is significantly higher and the prevalence of UCD is significantly lower than prevalences found in previous researches in the Netherlands. Future research has to focus on the pathogens involved in both DD and UCD to determine whether there is a common causal agent in both diseases.

1. Introduction

Udder cleft dermatitis (UCD) occurs on dairy farms and can cause lameness and a decrease of milk yield (1). Previous research suggests there might be a connection between pathogens involved in UCD en Dermatitis Digitalis (DD) (2,3). In this study five dairy farms with a known problem with DD are visited and the prevalence of DD and UCD was recorded. The purpose of this study is to investigate if there is a connection between the prevalences of DD and UCD. Dairy farms with a relatively high percentage of DD are visited. If there is a connection between the prevalence of DD and UCD, a high prevalence of UCD is expected on these farms. The prevalence of DD on Dutch dairy farms was found to be 21,2% by Holzhauer *et al.* (2006) (4). The prevalence of UCD on Dutch dairy farms was 6%, found by the GD Animal Health Service in 2011 (5). The hypothesis is to find higher prevalences of DD and UCD in this study.

1.1 Clinical Trial

Four students participated in a clinical trial designed by Intracare BV, a company which develops innovative solutions for the agribusiness sector. Intracare BV developed a spray with zinc and copper chelates (Repiderma®, Intracare BV, the Netherlands) which can improve the healing of the skin and has an antibacterial function. The effect on the healing of DD is studied for Repiderma® spray and chlortetracycline spray (CTC®, Eurovet Animal Health BV, the Netherlands). Only the hind claws are used in the clinical trial. All students have to answer their own research question during this trial. Nine herds were used for the clinical trial and herds 3 to 7 were used in this study.

1.2 Udder Cleft Dermatitis

Udder cleft dermatitis (UCD) is a disease of the skin which causes foul-smelling and moist udder sores. The moist, exudative dermatitis looks and smells almost similar to DD lesions (2). The lesions are present mostly between the medial thigh and dorsal attachment of the lateral udder, but can also be seen on the ventral midline or on the medial septum. Skin necrosis is present and the lesions can be up to 30 cm long. In severe cases lameness may occur and in warm weather myiasis may occur in the wounds (1). Examples of different UCD lesions are shown in Figure 1.

Figure 1: Mild (left) and severe (right) cases of UCD found in this study (own photographs)

Udder cleft dermatitis is a multifactorial disease. The factors involved in this disease are not all known and their role in developing the disease is often unclear. Some researchers suggest udder

edema can be a factor, because folds are formed between the udder and abdominal wall and between the udder halves. Pressure necrosis may occur and opportunistic bacteria can invade the wound (1). The hygiene of housing can also be a great influence. While the cows are lying down, the udder is in close contact with the floor of the cubicles and the hind claws, which can foul the udder. A dirty udder cleft can form an even better environment for bacteria. Sarcoptic and chorioptic mange was found in some UCD lesions and could be a risk factor for developing UCD (1,6).

On many farms UCD can be found and it can become a real problem when high prevalences occur. It can cause lameness and a decrease of the milk yield. Different prevalences of UCD have been found in previous researches. In a research on a single farm, 18% of the 1.597 cows had UCD (6). In a study of the GD on 10 dairy herds in The Netherlands a prevalence of 6% was found (5).

Different pathogens are found in UCD wounds, but it is not clear which pathogens are the main cause of UCD. In a study of Beattie *et al*. (2000) different bacteria were isolated from UCD lesions, but no single causal agent was defined. The bacteria found included *Corynebacterium minutissimum*, *C. jeikeium*, *Prevotella melaninogenica* and the opportunist fungus, *Geotrichum* sp. *Spirochaetes* (7). In a study of Stamm *et al*. (2009) Spirochetes were found in UCD lesions and *Treponema* species closely related with human- and DD-associated *Treponema* species were found (3).

There is no effective treatment for UCD. The most important therapy is to keep the wounds dry and clean and protect it from pathogens. Antibiotic sprays are used, but the effectiveness is not clear. When severe udder edema is present, diuretics could be given to reduce the edema and thereby reduce the pressure on the skin in the udder cleft (1).

1.3 Dermatitis Digitalis

Dermatitis digitalis is a contagious diseases that presents at the skin around the hoofs of cattle. The lesions are most common on the skin just caudal of the hoofs, but can also be found in the interdigital cleft or even in de sole or coronet. In most cases, the hind limbs are affected. The lesions can be found in 4 stages, M1 to M4 (8). M1 is an early stage, with a circumscribed granulomatous area. The lesion can be 0.5 to 4 cm in length. M2 is the classical ulcerative stage of DD, with a red and moist surface. It can be 2 to 7 cm in size. M3 is the healing stage, were crusting appears. M4 is a chronic stage in which proliferative skin is seen. M4 lesions are most common on farms where DD is present or has given problems in the near past. M1 and M2 lesions are often very painful on palpation and cows can show moderate to severe lameness. The DD lesions have a typical foul smell, especially the M1 and M2 stages. The lesions can be bordered with a white border and hairs which can be up to 3 times longer than normal hairs (9). Two new stages have been added in a recent study. Stage M4.1 is a M4 lesion with a small painful active M1 lesion and M5 is the stage where there is no sign of DD and the skin is normal (10). In Figure , examples of the four stages are presented.

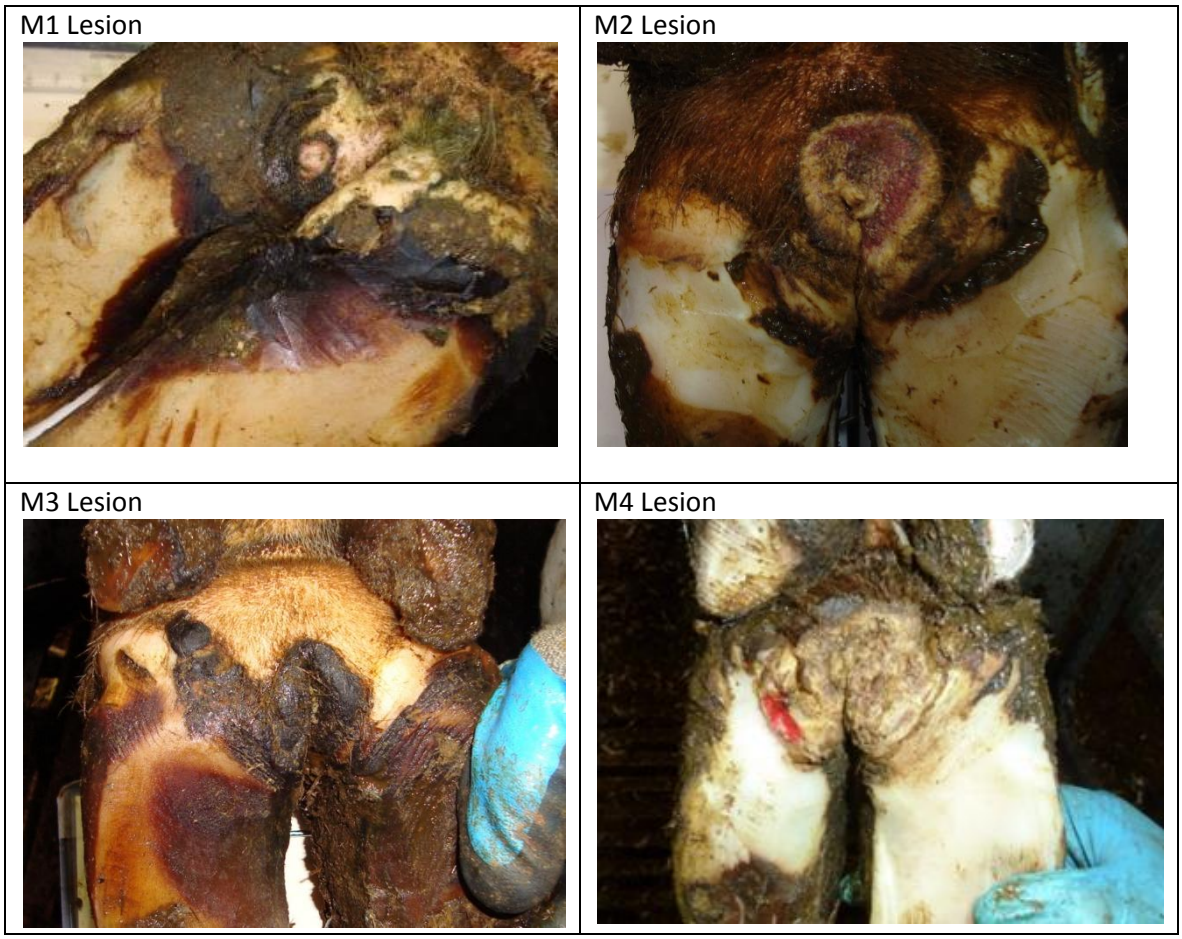

Figure 2: Examples of M1, M2, M3 and M4 lesions (own photographs)

The prevalence of DD in 2006 in the Netherlands was 21.2% with a herd prevalence which varied from 0% to 83% (4). It is the most important claw disorder in the Netherlands, but also in other countries in Western Europe and North America, especially in dairy herds (4,11). Claw disorders can cause great economic losses, especially when severe lameness occurs. Food intake, milk yield, body weight and fertility rates reduce, which can also lead to culling. This can therefore mean a loss of profits (12).

The cause of DD is multifactorial and depends on multiple risk factors. On animal level parity, milk production, lactation stage and genetics seem of influence. On herd level foot hygiene and claw trimming, flooring system, nutrition, housing calves and heifers within the dairy cows accommodation and heifer buying policy are risk factors (4,13). The problem of DD is thus based on multiple factors and is therefore not easy to resolve.

There are different pathogens involved in DD lesions, but *Treponema* species are thought to be of great influence. *Treponema* species found in DD lesions are: *Treponema medium/Treponema vincentii*-like, *Treponema phagedenis*-like and *Treponema denticola/Treponemaputidum*-like (14). *Treponema denticola* is also found in periodontitis lesions in humans. *Dichelobacter nodosus* was also found in DD lesions and Rasmussen *et al*. (2012) hypothesize that *D. nodosus* may break the epidermal barrier, which gives *Treponema* spp. the chance to invade the skin (15).

Treatment of DD can consist of topical treatment or footbaths. Footbath solutions are mostly used in herd treatment or prevention, whereas topical treatments are used to treat individual cows. Topical

treatment can consist of antibiotics, such as chlortetracyclinespray, or of a gel containing activated copper and zinc chelate (16). Footbaths can contain activated copper and zinc chelates, but a formaline solution is also used in the field (13,17,18).

1.4 Treponema

Treponema is a genus in the order of *Spirochaetales*. Spirochetes are spiral bacteria which are motile by use of endoflagella (19). There are pathogenic bacteria in the *Treponema* genera. Culture of pathogenic spirochetes is difficult, what makes the identification of UCD and DD associated *Treponema* difficult. *Treponema* species have been isolated from DD and UCD lesions, but not all have yet been identified. From DD lesions *Treponema medium/Treponema vincentii*-like, *Treponema phagedenis*-like and *Treponema denticola/Treponema putidum*-like are isolated (14). Previous research suggests that the *Treponema* spp. responsible for DD are also responsible for UCD lesions. In a study by Evens *et al*. (2010) a *Treponema medium*-like was isolated from one UCD sample (2). Also a study by Stamm *et al*. (2009) found two *Treponema* isolates which are related closely to DD associated *Treponema* (3). There are UCD samples where no *Treponema* spp. were isolated, however this could be because of the difficulty of isolating *Treponema*.

2. Materials and Methods

2.1 Herd selection

Herds were selected for the clinical trial for Intracare BV. The herds were selected by the five participating hoof trimmers. Due to the working area of the hoof trimmers, all farms were in the province Friesland, The Netherlands. Other selection criteria for this study were:

- Predominant breed should be Holstein Friesian,
- There should be a probable DD percentage of at least 20% to 25% and
- Cows should be lactating, in dry period or short of having a first calf.

The farms were visited between 15 October 2013 and 12 November 2013. All herds were housed indoors, with different concrete flooring systems.

2.2 Identification of Udder Cleft Dermatitis

All stages and sizes of UCD were included in the study. The cows were inspected while standing in a hoof trimming chute. A hand mirror and a small flashlight were used to look between the udder halves. When the udder could not be properly inspected through the mirror, palpation was used to determine presence of a lesion.

2.3 Identification of Dermatitis Digitalis

All cows were inspected while standing in a hoof trimming chute. The claws were inspected after trimming by the professional claw trimmers, the front and hind claws were both included in this research. The claws were cleaned properly to determine the stage of DD. All stages of DD are included in this study (M1 to M4). Cows were positive for DD if there was at least one lesion present. Multiple lesions on one or more claws were not specified, because the prevalence in cows and not just claws was researched.

2.4 Data processing and analysis

Cow identification numbers and the presence of DD and UCD were listed for every herd. The percentages of DD and UCD are calculated per herd and in total. A two-sample T-test is performed to determine whether there is a significant difference between the percentages of DD and UCD found in this study and percentages found in previous researches.

3. Results

In total, 426 cows on five Dutch dairy farms have been checked for DD and UCD. Dermatitis Digitalis was found in all five herds and had prevalences from 4.8% in herd 6 to 57.5% in herd 4. The mean prevalence of DD was 34.5% over 426 cows. Udder cleft dermatitis was only found in herd 3 and 4 with prevalences of 1.1% in herd 3 and 2.2% in herd 4. The mean prevalence of UCD over the 426 cows was 0.9%. (Table 1 and Figure 3)

	Number of cows	Number of cows with DD	Number of cows with UCD	DD%	UCD%
Herd 3	95	28	1	29.5%	1.1%
Herd 4	134	77	3	57.5%	2.2%
Herd 5	61	22	0	36.1%	0.0%
Herd 6	84	4	0	4.8%	0.0%
Herd 7	52	16	0	30.8%	0.0%
Total	**426**	**147**	**4**	**34.5%**	**0.9%**

Table 1: Prevalence of DD and UCD for the different herds and overall

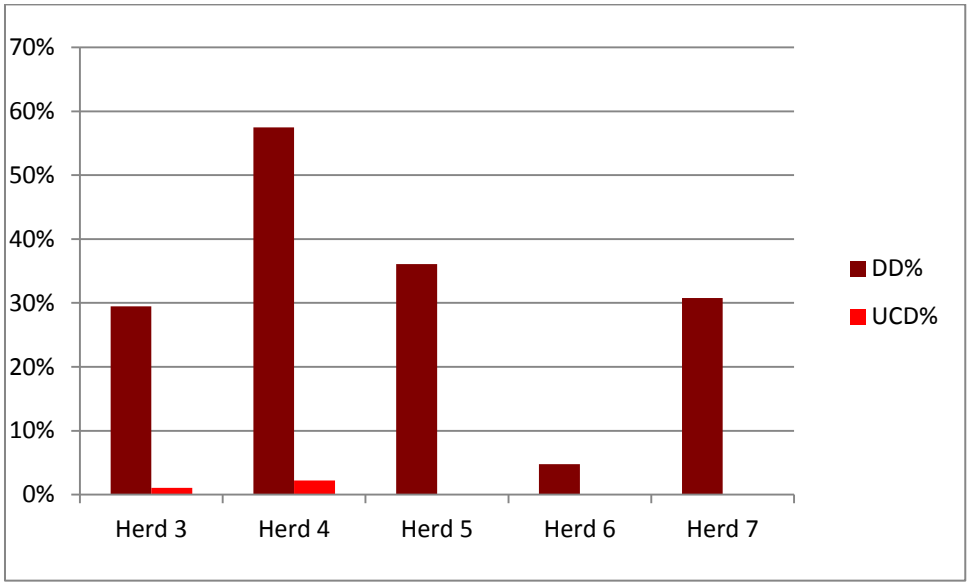

Figure 3: Bar chart representing the prevalences of DD and UCD in herds 3 to 7 (in %)

The prevalence of DD is higher in this study than found in an earlier study in the Netherlands ($p<0.01$), while the prevalence of UCD is significantly lower ($P<0.01$) than the prevalence found in the study of the GD in the Netherlands.

4. Conclusion

The results show a significantly higher percentage of DD in comparison to the data found in literature. Farms with a high prevalence of DD were selected for this study and therefore these results were expected. The prevalence of UCD was significantly lower than found in a previous research.

The hypothesis stated to find a higher prevalence of DD and UCD than found in previous researches. The results show that only the prevalence of DD was significantly higher and the prevalence of UCD was significantly lower.

5. Discussion

There are some disadvantages to this study. The results are based on only 426 cows, which is a rather small population for a prevalence study. The results are collected on five farms, where different farm-bound factors could be of influence on the results. Farms with a high prevalence of DD were chosen for the clinical trial of Intracare BV, this is not a random selection of Dutch dairy farms and the results are therefore not applicable on all farms in the Netherlands.

The hypothesis was based on previous studies which suggest both UCD and DD are caused by *Treponema* and maybe even by the same *Treponema* subspecies (2,3,20). However, both diseases do not have one single causal agent and environmental factors are also very important (2,15). A connection between the prevalences of DD and UCD is therefore not easy to discover.

The farmers of the farms visited were asked if they have a problem with UCD in the present, but also if they have had UCD on their farm in the past. All of the farmers stated they have had some cases in the past and on one farm there has been a problem with UCD in the past. In this study only on two farms UCD was found and only 4 cases of UCD were found in total. If the study was performed on another time or on another farm, maybe more cases of UCD could be found.

There are not many studies that investigated the prevalence of UCD. Only one published study was found, but this study was performed in the USA. A prevalence of 18% in the article of Warnick *et al.* (2002) was found on only one farm with 1597 cows, this is not representative for the population in The Netherlands. The study of the GD was performed on Dutch dairy herds. Therefore the study of the GD is chosen to compare the results of this study with.

Future research on the prevalences of DD and UCD could be performed on randomly selected farms in the Netherlands. It should include a bigger population, which could make the results more reliable. Also more factors could be included, such as environmental and cow factors, to find a probable cause of DD and UCD. The pathogens involved in both diseases should also be further investigated to determine whether UCD and DD are caused by the same pathogens.

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