DIGITAL DERMATITIS : REPORT OF AN OUTBREAK

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ABSTRACT
An outbreak of digital dermatitis in a dairy herd in the Gauteng province of South Africa is described in which 72% of the lactating herd was affected. Many of the affected cows showed a severe lameness and a drop in milk production. Other complications included heel horn erosion, under-running of heel horn and boxy claws. The diagnosis was made on the typical clinical appearance of the condition and the presence of spirochaetes on histopathological sections from biopsy material. The condition responded to spraying affected feet with an oxytetetracycline mixture after cleaning with water using a high pressure hose. The prevalence was reduced to 28% after one month of therapy. A repeat outbreak occurred on the same farm 7 months later during which time 37% of the lactating herd was affected. Of the cows affected, 48% represented new cases, whereas the rest were reinfections.


INTRODUCTION
Morphologically the lesions associated with digital dermatitis are described as erosive or ulcerative, reactive ("strawberry-like") and proliferative (papillomatous)*. This variation has led to differences in terminologies of the condition. Apart from the term digital dermatitis or "Mortellaro's disease" as it has become known, it has also been termed "interdigital papillomatosis", "heel warts" and "hairy foot warts". Some controversy also exists as to whether it is a separate condition or part of interdigital dermatitis. Both digital and interdigital dermatitis have a number of similar characteristics. They are both epidermitides and do not extend into the dermis or deeper soft tissues1. Both have the same characteristic pungent odour (interdigital dermatitis is also known as "stinkpoot" in Dutch) 10. Although Dichelobacter (Bacteroides) nodosus has until now been regarded as the aetiological agent responsible for interdigital dermatitis, this is being questioned. In one study Blowey was unable to culture this organism from 10 typical cases each of digital and interdigital dermatitis1. However, an invasive spirochaete has been demonstrated in both digital and interdigital dermatitis2. Both conditions respond to topical treatment with oxytetracycline (Terramycin soluble powder, Pfizer Laboratories SA Pty Ltd)11.

The digital dermatitis only rarely occurs on the interdigital skin. The anatomic locations of 129 papillo­matous digital dermatitis lesions in 67 cows were described by Read and Walker1. They found that 82% were situated proximal and adjacent to the plantar/palmar interdigital space, 9% were proximal and adjacent to the bulb of the heel, 8% involved the plantar pastern and 2% exclusively involved the interdigital space3.

Digital dermatitis has now been reported from many countries including Italy, Holland, Czechoslo­vakia, France, UK, USA, Japan, Iran, Germany, Austria and Israel4. Digital skin lesions resembling digital dermatitis have been observed in South Africa (Van Amstel, unpublished records) but never reported in outbreak form. This is the first reported outbreak of the condition in dairy cattle in South Africa.

HISTORY
Lameness of approximately 18 months duration was reported in a group of 189 Friesland cows in various stages of lactation. The lactating cows were kept in camps between milkings where they were being fed. A moderate, although not excessive, amount of dung was present. At the time of the initial examination (August, 1994), the camps were dry. However, during the rainy season, conditions within the camps became very wet. A foot bath had been used intermittently but had not made any difference to the incidence of the condition, which was increasing at the time.

CLINICAL EXAMINATION
During observation of the herd, lameness was the main presenting sign, varying from mild to severe (locomotion score 3 - 5). No obvious lesions or swelling of the affected limbs were noticed during observation. However, a few of the grade 5,0 lame cows had boxy claws. Such claws were almost non-
weightbearing and during locomotion took weight on the tip of the claw only. Continuous lifting of the affected leg was also seen. Many of the cows had overgrown claws and also showed signs of subclinical laminitis e.g. dull horn, prominent rugae, sand cracks and flat claws.

On closer inspection of the affected limbs the following was found in the majority of cows. The skin above the heels adjacent to the interdigital space appeared thickened and was crusted over with what appeared to be a brown exudate. Faecal material further contributed to soiling of the area (Fig. 1).

Palpation of the affected area resulted in signs of extreme discomfort.

Many of the lesions had a strong pungent odour. There was, however, no swelling of any of the soft tissue structures proximal to the claw capsule. After cleansing of the affected skin, two main types of lesions were seen (Figs. 2 and 3). The lesion shown in Fig. 2 appeared red, granular ("strawberry-like") and slightly raised. It was surrounded by a thin white epithelial margin. The lesion shown in Fig. 3 was greyish-white and covered with many filamentous, hair-like protrusions. This lesion appeared to be proliferative in nature.

Both the lesions shown in Figs. 2 and 3 were associated with heel horn erosion and under-running of heel horn.

The prevalence of the condition (total and per lactation group) and the percentage of affected feet at the initial examination are shown in Table 1.

In 95% of affected cows lesions were restricted to the plantar/palmar aspect of the feet, whereas in the remaining 5% lesions were also present on the dorsal digital skin adjacent to the interdigital cleft. Lesions on the interdigital skin were not assessed, as observations were carried out during milking, which took place on a rotating platform so that the feet were clearly visible, but not the interdigital space. A repeat outbreak occurred on the same farm 7 months later involving 37% of the lactating herd. Of the cows affected, 48% represented new cases, whereas the remaining 52% were reinfections.

**DIAGNOSIS**

A diagnosis of digital dermatitis was made based on the clinical signs. Biopsy material was taken from a proliferative lesion for histopathology, impression smears and culture. Silver staining of a histopathological section showed a large number of filamentous to spiral shaped bacteria of the spirochaete group. Aerobic culture yielded a heavy mixed bacterial growth. Attempts to isolate *Dichelobacter nodosus*, *Fusobacterium necrophorum* or spirochaetes were unsuccessful. Histopathology of the lesion showed that it consisted of a hyperplastic, acanthotic epidermis containing connective tissue stroma. Superficial epidermal necrosis was present and was associated with a purulent inflammation. Connective tissue stroma contained a large number of neutrophils.

**TREATMENT**

Using a high pressure water hose, the feet of all cattle were cleaned upon entering the milking parlour. Milking took place on a rotating platform which was elevated above floor level. A tetracycline solution (8 g/l) was applied with a knapsack sprayer directly onto the heels, including the coronet, during milking. Affected animals were treated for 4 weeks as follows: twice daily for the first week, then 2 treatments during each of weeks 2 and 3 and only once during week 4.

Lesions were evaluated in the milking parlour for the first 3 days after initiation of treatment and again on day 3 after initiation of treatment, 14 of the affected cows (10%) had either

<table>
<thead>
<tr>
<th>Prevalence</th>
<th>Distribution between feet</th>
<th>Distribution between lactations</th>
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<tbody>
<tr>
<td><strong>Total number of cows</strong></td>
<td><strong>Number of cows affected</strong></td>
<td><strong>% of Total</strong></td>
</tr>
<tr>
<td>189</td>
<td>136</td>
<td>72%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feet affected</th>
<th>As % of cows affected</th>
<th>Number of lactations</th>
<th>% Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hind only</td>
<td>27%</td>
<td>1</td>
<td>57%</td>
</tr>
<tr>
<td>Left hind only</td>
<td>22%</td>
<td>2</td>
<td>82%</td>
</tr>
<tr>
<td>Both hind only</td>
<td>30%</td>
<td>3</td>
<td>80%</td>
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<tr>
<td>Front and hind</td>
<td>11%</td>
<td>4</td>
<td>86%</td>
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<tr>
<td>All four</td>
<td>3%</td>
<td>More</td>
<td>74%</td>
</tr>
<tr>
<td>Front only</td>
<td>7%</td>
<td>than 4</td>
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Digital dermatitis lesion with a brown crusted appearance due to the presence of exudate and soiling with faecal material. Observations one month after the initiation of treatment (total of 12 treatments) showed that 98 or 72% of the initial 136 affected cows had completely recovered. The remaining 38 cows (28%) required further treatment. Of these, 11 cases (8%) were still regarded as being active, resulting in pain and lameness, while 27 cases (20%) seemed to be "dormant" and not causing pain or lameness. Of the 136 cows treated, 6 developed new lesions during the treatment period. The condition remained under control for 6 months after completion of the initial treatment but during routine claw care some digital dermatitis lesions were still being noticed. Most of these, however, did not appear to be associated with any form of lameness. During this time the owner was advised to maintain once a month treatment using a tetracycline solution at 8 g/l in the form of a spray. The same treatment approach was used during the repeat outbreak.

**DISCUSSION**

The reasons for the high prevalence of digital dermatitis in this particular herd is unknown. The prevalence had slowly increased over approximately 18 months and had become a real problem during the late winter of 1994 when conditions were very dry. The absence of routine claw care resulted in many of the cows, including the affected ones, having overgrown claws. This may have played a role in initiating the condition, as it shifts weight-bearing more onto the heels. Poor quality horn associated with subclinical laminitis may perhaps also be tied in with the pathogenesis of the condition, as it predisposes to heel horn erosion, which in turn may allow colonisation by the causative pathogens. However, it seems that heel horn erosion and under-running may be an extension of the digital dermatitis induced necrosis of the epidermis of the adjacent skin.

One factor which could facilitate the spread of digital dermatitis is improper footbath management. In this case the footbath was only infrequently cleaned, and it is speculated that this may result in the build up of the causative organism in the bath, thus facilitating spread between cows.

The prevalence and clinical picture of the condition in this herd is similar to what has been reported previously. Seventy two percent of lactating cows had one or more feet affected during the initial examination.

In addition, this study found that 27% of cattle had lesions on the right hind foot only versus 22% on the left hind foot while 30% had lesions on both hind feet. Only 5% of cattle had lesions on the dorsal aspect of the front feet. The presence of lesions on
Fig. 3: Proliferative (papillomatous) digital dermatitis lesion

the interdigital skin was not evaluated, as the examination did not allow a clear view of the interdigital space.

Immunity did not seem to play a role in this outbreak, as the prevalence seemed to have increased after the first lactation. One of the reasons for the lowered prevalence among first lactation cows may have been linked to reduced exposure to both infected animals and the environment.

Two main types of lesions were present: Red granular (strawberry-like) and proliferative (papillomatous). The latter may evolve from the former, thus representing a more chronic form of the condition. This may be substantiated by the histopathological examination of biopsy material in this outbreak, which indicated well developed connective tissue stroma in the proliferative form and the fact that the proliferative lesions were usually associated with boxy claws.

Other clinical signs present in this outbreak also resemble those reported in other outbreaks, including severe lameness, decreased body weight and milk production, boxy claws, minimal to no digital swelling and response to tetracycline treatment.

Microbiological investigation of the possible causative agent proved to be problematical, as bacteriological overgrowth of contaminants made identification impossible even on specific culture media. However, silver staining of histopathological sections showed the presence of very large numbers of spirochaetes within the keratin layers of the epidermis.

Spirochaetes have been associated with digital dermatitis (Mortellaro's disease) and the so-called interdigital papillomatosis form described from the United States of America. Ultrastructurally the spirochaete involved with interdigital papillomatosis was observed to resemble a treponeme. However, results from group antisera for Treponema, Leptospira, Serpulina and Borrelia were negative. There is some evidence that Borrelia burgdorferi may play a role, as 71% of 38 affected cows in one study seroconverted to this organism.

It has been reported that digital dermatitis can be successfully controlled by a single passage through a footbath containing 5-6 g/l oxytetracycline. The condition in the outbreak reported here proved more resistant. Treatment consisted of cleaning the feet of cows on their way into the parlour using a high pressure water hose. This was followed by spraying of feet using an 8 g/l solution of oxytetracycline in a knapsack sprayer.

After 12 such treatments, which took place over a one month period, the prevalence of foot lesions was reduced from 72% to 28%. Six percent of cows developed new lesions during the treatment period. A low incidence has persisted in the herd during the 7 month follow-up period. This was followed by an outbreak involving 37% of the lactating herd. Of the cows affected 48% were new cases, whereas the remaining 52% were as a result of reinfections.

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