Bovine Digital Dermatitis

A. Brizzi
Veterinary Practitioner
Gorizia 16, Parma, Italy

© Copyright American Association of Bovine Practitioners; open access distribution.

Introduction

Digital dermatitis, first described in Italy by Cheli and Mortellaro,[9] has reached a wide diffusion and is actually a problem in many dairy herds in Italy and other countries such as The Netherlands,[10] France,[12] Great Britain,[2] U.S.A.,[18] Czechoslovakia,[14] Germany,[6] EIRE,[1] and Japan.[13]

The disease was seen last summer[15] in Denmark, where it has not yet been described, and was overlooked for four years in a German herd,[6] so it is probably much more diffused than commonly thought.

Pathology

The typical lesion (Photo 1) is a superficial loss of tissue in the skin of the coronary band of claws and dewclaws; it is prone to bleeding and is generally so painful that affected animals suffer considerable distress.

The process may undermine or erode contiguous horn sometimes causing permanent damage to the claws.

Spontaneous healing of this lesion is said to be possible but not probable.[10]

Another type of lesion, reported by American and Japanese authors, appears to have a distinctive proliferative nature, for this reason a different denomination: digital papillomatosis, was proposed.

Various degrees of proliferative reaction, from velvet like appearance to clearly papilliform with hypercheratosic papillae (which can be 2 cm long or more) (Photo 2), are commonly seen in Italian infected herds; composite lesions, which show continuity between an erosive and a proliferative type, are not rare (Photo 3).

Photo 1. *Classic digital dermatitis lesion, note location at the caudal end of interdigital cleft, whitish necrotic tissue surrounding the erosion and peculiar aspect of hair.*

Photo 2. *Proliferative type of lesion, note hyperkeratosic papillae and overall proliferative aspect of the lesion.*

Photo 3. *Mixed lesion, two anatomo pathological aspects are present in a single lesion and no clear separation is eivdent between them.*

According to Read[16] an erosion is the initial stage of the papilliform lesion which evolves through the following phases: erosion, intermediate cutaneous plaque with peripheric papilliform reaction, and raised mature plaque with evident hypercheratosic papillae.

We didn't observe this evolution in Italy: typical erosive lesions remain apparently unchanged, unless they are treated, for indefinite time.

Reported histopathological changes in classic lesions include acanthosis and pseudoepitheliomatous hyperplasia of the basal layer, great increase in thickness of external epidermis and infiltration of inflammatory cells. Heavy congestion of blood vessels and margination of neutrophiles are also commonly reported.

The basal layer histological modifications of proliferative lesions are identical to those of erosive ones, both showing numerous mitoses.

Hyperkeratosis is a frequent additional feature.[1,2]

Etiology

Though apparently contagious, the disease has not yet a recognized causative agent. Experimental transmission of the condition, with inoculation of the homogenate in healthy skin at the typical site, was unsuccessful.[1]

No viral agents have been isolated or detected by means of electron microscopy.[1]

Several authors report presence of Gram- anaerobes belonging to genus Bacteroides, and typified as *B. capillosus* and *B. fragilis*,[3] while initial research revealed consistent presence of *Campylobacter sp.*[11]

Read[17] and Blowey[4] have observed, in histological preparations, the presence of spirochetes among the cells of stratum spinosum and inside blood vessels, other authors have seen similar microorganisms in Gram stained preparations of the debris that commonly covers the lesion.

Those findings, whose significance is not clear, have stimulated serological investigations in order to evaluate eventual antibody responses against spirochetes in affected animals.[4]

Italian studies indicate a possible role of zinc deficiency as predisposing or even as ethiologic factor.[5]

According to those authors zinc supplementation in the administered rations has significantly improved healing of treated soft tissue lesions[5] or at least[16] exerted a positive effect on their evolution.

Epidemiology

The disease is clearly transmissible under field conditions and, though experimental transmission never succeeded, we know that it has been introduced in dermatitis-free herds together with clinically sound animals coming from infected farms.

The diffusion of the disease among dermatitis-free cows is rapid and morbidity rates may be very high.

In Italian infected herds the disease is a common cause of lameness in heifers which join for the first time adult cows and may occur also among calves.

Morbidity rates apparently increase during fall and winter, showing some relationship with moist and cool weather.

Lack of suitable bedding material and excessive moisture on floors are clearly associated with outbreaks of digital dermatitis. The condition is also common among animals housed on slatted floors, suggesting that microtraumas are an important predisposing factor.

Therapy and Prevention

Treatment of digital dermatitis has developed from surgical removal of altered tissue,[9,18] to topical intensive administration of oxytetracycline[10] and thiamphenicol[7] together with gentian violet, after cleansing or curetting of the lesion.

Parenteral administration of antibiotics is claimed

© Copyright American Association of Bovine Practitioners; open access distribution.

to be effective in the papillomatous forms,[17] but has little or no efficacy in treating typical lesions.

Correct procedure is essential for good results with topical treatment, good cleaning of the lesion, with complete removal of all the dirt and exudate eventually present, is essential. Very important is an intensive application of the drug, usually an oxytetracycline spray with gentian violet, this means that a second layer of it should be applied on the dried first one. During field trials[7] the double application increased first treatment healings from 55% to 89% of the treated lesions.

Recent field trials[8] indicate the oxytetracycline is effective also without gentian violet in local treatment.

Research of residues of oxytetracycline, in blood and milk, made with High Performance Liquid Chromatography (sensitivity 5 ng/ml), failed to detect any presence of the antibiotic after individual treatment as described above.

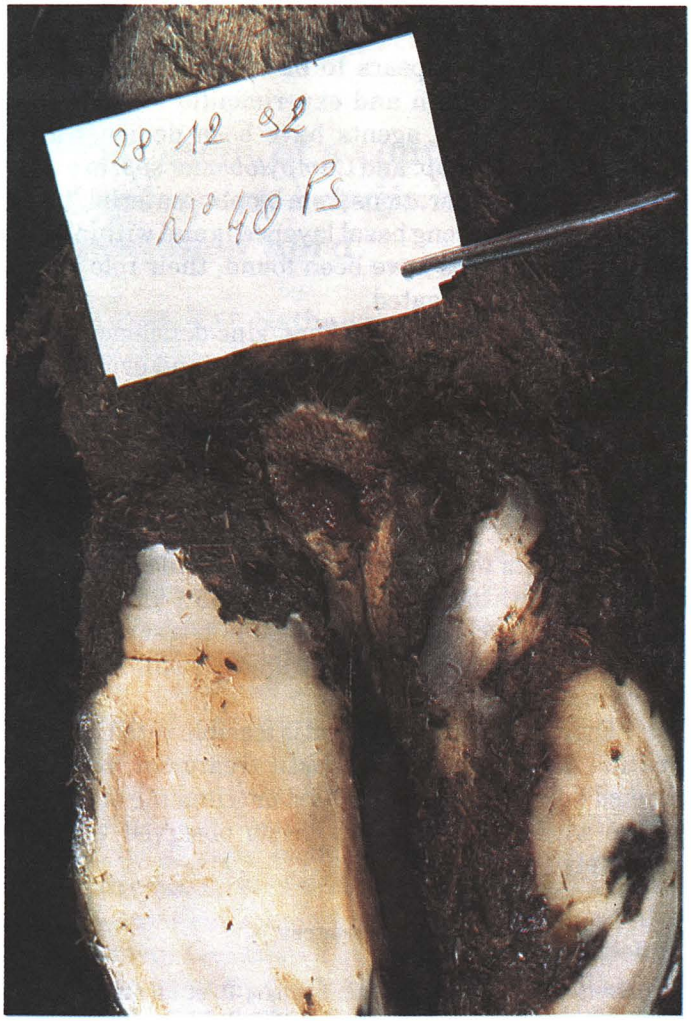

Photo 4. *Typical lesion as it appears after cleaning and before topical treatment.*

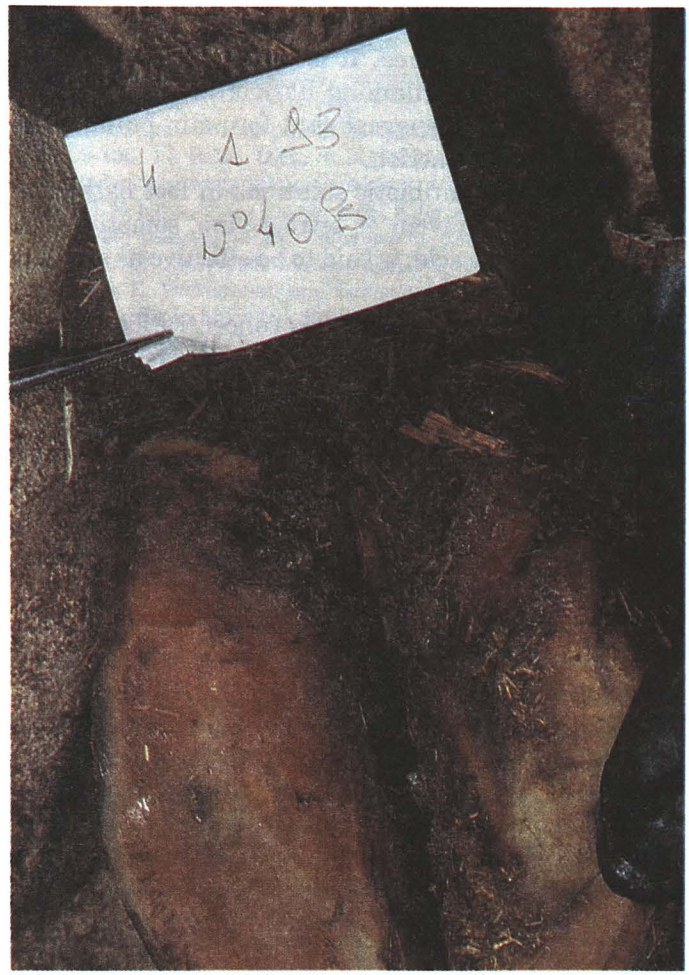

Photo 5. *Typical lesion, the same as in photo 4, four days after topical intensive administration of an oxytetracycline based spray preparation without gentian violet.*

A dark brown insensitive "scab" develops within a few days after treatment (Photo 4 & 5), its subsequent elimination requires a longer period.

Lesions situated on the top of interdigital hyperplasias are fastidious, they usually need a longer time to heal and sometimes do not respond to conservative treatment or relapse within a short time.

Bad weather conditions have a negative influence on healing, which takes longer and may require a second therapeutic session.

High morbidity rates, which lead to large numbers of animals being affected at the same time, together with the laboriousness of individual treatment, have stimulated research on the use of foot baths for group treatments.

Collective therapy of digital dermatitis with formalin baths was successful, according to Roztocil,[19] with the cows standing for at least on hour in a 5% solution. Length of bathing time and rehearsal of application were critical for good results.

© Copyright American Association of Bovine Practitioners; open access distribution.

In farms where walk-through formalin footbaths are correctly performed, it is not exceptional to see, during routine foot trimming, dark brown "scabs" at the typical site, which suggest that formalin bathing has had some curative action.

The use of antibiotic solutions in foot baths prepared with lyncomycin or tetracycline, sometimes together with citric acid, is said to be effective as single or repeated measure.[4]

Recommended lyncomycin concentrations are 1-3 g/l.[12,4] Reported concentrations of tetracycline in foot bathing solutions have been increased from 1 g/l, through 2-4 g/l, up to 8-10 g/l, in case of a single treatment.[4]

Recent studies with lyncomycin and tetracycline[21] show that contamination of foot bathing solutions causes a remarkable decrease in antibiotic concentration. This is apparently caused by absorption of antibiotic molecules to particles of mud and faeces.

Eradication of the disease has not yet been accomplished, collective control measures are only capable of reducing the incidence and gravity of the lesions.[4]

It has however been possible to gain control of the situation by individually treating, within a reasonably short time, all the lesions, and later having all the animals regularly walking through a 5% formalin solution.

Footbathing is of paramount importance and must be used regularly, on a permanent basis, as a routine control measure.

Italian experiences with walk-through baths indicate that underestimation of foot bath capacity, resulting in insufficient concentration of formalin, and excessive numbers of animals passing through the same solution are common causes of ineffectiveness.

Perseverance is the key to success, in one herd of 185 milking cows clinical cases occur mainly in the dry cows, and only three milking cows in two years required individual therapy for digital dermatitis lesions.

Conclusions

Bovine digital dermatitis is an emerging problem in intensive bovine farming. The possibility of introducing the disease together with apparently sound animals makes preventive measures, like quarantine and accurate foot inspection and disinfection of new animals, highly recommendable.

Once the disease appears in a herd, eradication is not likely and routine control measures, like foot bathing and individual treatment of affected animals, must be established on a permanent basis in the attempt to gain a durable control of the situation.

Topical treatment of all the affected animals should be carried out within a short time, preferably together with expert foot trimming of the whole herd. Though very laborious, this measure enables to check and treat properly also the less symptomatic lesions, with great benefits on morbidity rates.

Footbathing with antimicrobial solutions, although possibly subject to local regulations, is fundamental. Formalin solutions have proven effective in Italy; other authors recommend the use of tetracycline and lyncomycin.

All those measures must be part of a continuing control program which should follow the epidemiologic evolution in order to optimize costs and results.

Summary

Digital dermatitis is an emerging disease commonly observed where intensive bovine farming is carried out.

The typical erosive lesions are sometimes accompanied by proliferative hyperkeratosic ones which appear, however, to be caused by the same disease; there are considerable histological similarities between the two types of lesion.

The disease appears to be transmissible but its ethiology is unknown and experimental transmission has failed. No viral agents have been demonstrated, while *Bacteroides spp.* and *Campylobacter spp.* are commonly seen in preparations from bioptic material. In the same material, among basal layer cells and within blood vessels, spirochetes have been found, their role is currently being investigated.

According to some authors, zinc deficiency in the ration may play a role in the diffusion and evolution of the disease.

Topical treatment of digital dermatitis is performed with surgical removal of altered tissue or, more commonly, with intensive application of tetracyclines or thiamphenicol.

Attempts towards collective treatment have been performed with footbaths containing 3-5% formalin or 1-3 g/l of lyncomycin and up to 10 g/l of tetracyclines.

Eradication of the disease appears still not a realistic possibility.

Digital dermatitis control is feasible with the use of routine footbathing after topical treatment, best performed during a close inspection or trimming of the feet of the whole herd, of every lesion observed within a relatively short time.

References

1. Basset, H.F., Monaghan, M.L., Lenhan, P. et al. (1990) Bovine digital dermatitis Vet. Rec. 126, 164-165. 2. Blowey, R.W. (1987) Digital dermatitis in dairy cattle Vet. Rec. 121, 311. 3. Blowey, R.W. (1988) Digital dermatitis in dairy cattle Vet. Rec. 122, 505-508. 4. Blowey, R.W. (1992) Disease of the bovine digit. Part 1 Description of common lesions. In Practice, 14, 85-90. 5. Bonomi, A., Bosticco, A., Quarantelli, A., Sabbioni, A., Superchi, P. (1988) [Contribution to the study of the relationship between zinc deficiency in feeds and foot

© Copyright American Association of Bovine Practitioners; open access distribution.

disease in dairy cows]. Zoot, Nutr. Anim. 14, 21-34. 6. Brentrup, H., Adams, W. (1990) Klinische Aspekte der Dermatitis digitalis beim Rind. Tieraertzl. Umsch., 45, 311-316. 7. Brizzi, A. (1990) Esperienze di terapia della dermatite digitale del bovino. Documenti Veterinari, 11, 51-54. 8. Brizzi, A., e Salomoni, G. (1992) Il trattamento della dermatite digitale del bovino senza l'impiego del violetto di genziana. Atti SIB, XXV in press. 9. Cheli, R. Mortellaro, C.M. (1974) La dermatite digitale del bovino. Atti SIB VIII, 208-213. 10. Cornelisse, J.L., Peterse, D.J., Toussaint, Raven E. (1981) Een nieuwe aandoening aan de ondervoet van het rund. Dermatitis digitalis? Tijdschr. Diergeneesk., 106, 452-455. 11. Cornelisse, J.L., Van Asten, A.J.A.M., Peterse, D.J. and Toussaint, Raven E. (1982) Campylobacter fecalis as a participant of the bacterial flora of Dermatitis digitalis in cows. Proc. 4th Int. Symp. on Disorders of the Ruminant Digit. Paris, (1982). 12. Gourreau, J.M., Scott, D.W., Rousseau, J.F. (1992) La dermatite digitée des bovins. Point Vet., 24, 49-57. 13. Kimura, Y., Takahashi, M., Ogawara, K., Sato, M., Aoki, O., Hataya, H., Goto, N. (1992) Verrucose dermatitis and papillomata in dairy cows in Japan. Proc. VII Int. Symp. on Disorders of the Ruminant Digit. Rebild, Denmark 1992, in press. 14. Kyllar, V., Roztocil, V. (1983) Dermatitis digitalis-onemocneni prstu skotu. Veterinarsvi (Praha), 33, 323-325. 15. Lezzerini, R. (1992) personal communication. 16. Polidori, F., Salimei, E., Savoini, G., Mortellaro, C.M., Dell'Orto, V. (1988) [Influence of zinc sulphate supplementation on digital dermatitis in heifers]. Atti SIB XXV, 99-106. 17. Read, D.H., et al. (1992) An invasive spirochete associated with interdigital papilomatosis of dairy cows. Vet. Rec. 130, 59-60. 18. Rebhun, W.C., Payne, R.M., King, J.M., Wolfe, M., Beggs, S.N. 1(1980) Interdigital papillomatosis in dairy cattle. J. Am. Vet. Med. Ass., 177, 437-440. 19. Roztocil, V., Ulman, L., Rusek, T., Berankova, E. Vorkommen und Bekaempfung von Dermatitis digitalis des Rindes in Milchkuh Grossanlagen. Mh. Vet. Med., 43, 536-539. 20. Schrank, D., Grunner, J. (1989) Dermatitis digitalis (Foot-Rot) beim Rind. Mh. Vet. Med., 44, 104-106. 21. Van Keulen, K.A.S., Spaans, J., Pijpers, A. The antimicrobial activity of two tetracyclines and lincomycin in walk-through footbaths for dairy cattle: a longitudinal study. Proc. VII Int. Symp. on Disorders of the Ruminant Digit. Rebild, Denmark 1992, in press.

Abstracts:

Development of a control strategy for *Leptospira hardjo* infection in a closed beef herd

T.W.A. Little, S.C. Hathaway, E.S. Boughton, D. Seawright

Veterinary Record (1992) **131,** 383-386

Serological evidence of infection with a leptospire belonging to the Sejroe serogroup was identified in a closed population of Luing cattle in the west of Scotland, and the geographical isolation of the population presented an opportunity to control and possibly eradicate the infection in a large beef herd farmed under extensive conditions. Serological and bacteriological studies revealed that infection was present at a high level throughout the herd, and that the infecting serovar was *hardjo*. Unlike endemic *hardjo* infection in dairy herds, new infections were still occurring in older age-groups. Investigations of other domestic and free-living species sharing the habitat demonstrated that the maintenance of an endemic focus of *hardjo* was restricted to the cattle. Changes in management to prevent the transmission of infection to successive cohorts of young animals were impractical and risky, and antibiotic treatment followed by removal to clean pasture failed to prevent new cases. Thus vaccination offered the only means of control and possible eradication, and the epidemiological characteristics of the infection dictated that the program be applied to the whole herd.

Duration of urinary excretion of leptospires by cattle naturally or experimentally infected with *Leptospira interrogans* serovar *hardjo*

F.C. Leonard, P.J. Quinn, W.A. Ellis, K. O'Farrell

Veterinary Record (1992) **131,** 435-439

The excretion of *Leptospira interrogans* serovar *hardjo* in the urine of cattle was studied in naturally and experimentally infected animals. Five of 15 naturally infected animals with microscopic agglutination test titres of ≥1:300 shed leptospires for between 28 and 40 weeks. Twenty yearling heifers, experimentally infected by either the supraconjunctival or intrauterine routes, shed leptospires for from eight to 60 weeks; the 10 infected via the uterus shed *L interrogans* serovar *hardjo* for a mean of 26 weeks (range eight to 54 weeks) and the 10 infected by the supraconjunctival route shed the organism for a mean of 32 weeks (range 12 to 60 weeks). The results suggest that natural infection results in more prolonged excretion than experimental infection. No intermittent or seasonal excretion of the organism was observed. After the initial experimental infection, large numbers of leptospires were shed in the urine for several weeks, and thereafter there was a progressive decline in the number of organisms shed.

© Copyright American Association of Bovine Practitioners; open access distribution.