

EFFECTIVENESS OF THE GEL CONTAINING CHELATED COPPER AND ZINC FOR TREATING DIGITAL DERMATITIS IN DAIRY COWS

Plamen Marutsov

Faculty of Veterinary Medicine, Trakia University, Stara Zagora, Bulgaria

E-mail: plamen_marutsov@yahoo.com

ABSTRACT

The aim of this study was to evaluate the benefit of topical treatment of copper and zinc chelates to cure digital dermatitis (DD) in dairy cows. The study was conducted between December 2016 and February 2017 and involved 38 dairy cows from a dairy farm on which DD was endemic. Lesions were scored in the milking parlor on both hind feet using M0 to M4 scoring system using Relun's method with a headlamp and a mirror on a spatula. The cows were divided into two experimental groups and one control group. Group 1 received topical treatment with gel containing copper and zinc, on the zero, second and fifth days with bandaging. Group 2 received the same treatment without bandaging. Control group was used to assess the possible effects of surgical debridement and bandaging. The percentage of the lesions recovered from DD in experimental groups was 86.4% and 46.1%. In control group the percentage of the recovered animals was 16.7%. The cure rate of gel containing chelated copper and zinc and bandaging is an excellent option to treat DD.

Key words: digital dermatitis, copper and zinc gel, dairy cows.

Introduction

Digital dermatitis (DD) is a contagious, multifactorial disease involving environmental, management and microbial factors. Clinically, it is manifested with lameness, as well as with restricted or diffuse painful skin lesions in the region of the digit, particularly just above the heel. The disease was first described in 1974 in Italy by Cheli and Mortellaro. Nowadays digital dermatitis has spread all over the world and affects intensively managed dairy cows (Blowey and Sharp, 1988). In our country Lyutskanov and Marutsov (2010) reported prevalence of 18.3% (from 10.3 to 34.0%).

DD is associated with huge economic losses due to decreased reproductive performance, milk production, increased risk for culling in addition to high treatment costs (Bruijnjs et al., 2010; Ettema et al., 2010). In addition untreated lesions are very painful and erode hoof and digital skin (Read et al., 1992).

At present etiology is associated with a number of different microbial agents – *Bacteroides spp.*, *Prevotella spp.*, *Fusobacterium spp.*, *Treponema spp.*, *Campylobacter spp.* etc. The infectious factor only is not however sufficient to trigger a clinical disease, but a combination of microbial agent and risk factors must exist (Blowey and Sharp, 1988; Bassett et al., 1990; Frankena et al., 1991; Lyutskanov and Marutsov, 2010). Risk factors related to a high prevalence of DD lameness are cleanliness of the environment, wet floors, replacement stock purchase, restricted grazing, parity, early lactation, heel horn erosion, regular hoof trimming and use of hoof bathing (Rodriguez-Lainz et al., 1996; Wells et al., 1999; Toholj et al., 2008; Barker et al., 2009).

Classical therapy involves treatment with topical antibiotics, which supports the hypothesis of a bacterial etiology (Brizzi, 1993; Graham, 1994; Guard, 1995; Guterbock and Borelli, 1995). Non-antibiotic products have been also reported to be efficacious (Britt and McClure, 1998; Hernandez et al., 1999).

The purpose of this study was to evaluate the benefit of topical treatment of copper and zinc chelates to cure digital dermatitis (DD) in dairy cows.

Materials and methods

Animals. The study was conducted on a dairy farm located in Southern Bulgaria between December 2016 and Februari 2017. The farm was chosen because of its history of digital dermatitis related lameness. Dairy cows of the Holstein-Friesian breed were housed in a concrete floor, free stall barns that were bedded with straw. Concrete alleyway floors were cleaned by automatic scrapers at least five times daily. Cows were milked two times daily using 2 x 12 side-by-side milking parlor. All lactating cows were fed a Total Mixed Ration (TMR) delivered twice daily. Water was freely available at all times. Hoof trimming are conducted biannual on a regular six monthly basis at dry off and around 120 -160 days in milk (DIM).

Foot examination. At the beginning of the study the rear feet were flushed with medium-pressure tap water in the milking parlor and scored for digital dermatitis using Relun's method with sensitivity of 0.90 and specificity of 0.80 (Relun et al., 2011). Lesions were scored after milking on both hind feet using M0 to M4 scoring system (Döpfer et al., 1997), where M0 is claw free or DD lesion; M1 is a lesion up to 2 cm, generally not painful; M2 is classical ulcerative stage, with diameter > 2 cm and painful to digital pressure; M3 is healing stage covered by a scab; M4 is the chronic stage and is characterized by dyskeratosis or proliferation of the surface that is generally not painful. Further, a new variant of M4 lesions is described by Berry (2012) as stages M4.1 characterized as a chronic lesion with a new M1 lesion within its perimeter.

Study design and treatments. All cows with erosive M2 lesions were included in the trial and randomly divided into two treatment groups (G1 and G2, each group with an equal number of 13 cows) and a control group (CG with 12 cows). Cows that received antibiotic treatment for other reasons like metritis or mastitis were excluded from the trial.

All DD lesions were evaluated in a hoof trimming chute. The data recorded were the affected claw, the size, type and location of ulcers, and the level of pain in response to firm pressure with a finger. All lesions were cleaned with water and brush and then dried with a paper towel. Surgical treatment involved removal of all necrotic tissue and if necessary prophylactic functional hoof trimming was done. In group G1, 5g of the gel was applied with a brush on the zero, second and fifth days followed by bandaging in the first two treatments. Group G2 received the same treatment without bandaging, while the control group surgical debridement and bandaging. The gel used for the treatment was Intra Hoof fit gel® (IntraCare), with active ingredients copper chelate (40 mg/g) and zinc chelate (40 mg/g), aloe vera and alcohol.

Cows from different groups were restrained in a hoof-trimming chute and examined 18 days after the beginning of treatment. The degree of healing was determined as transition of DD lesions from M2 to M3 stage.

Statistical analysis. Statistical analysis was performed using Statistica 5.0 (StatSoft, USA). Significances were tested using the T-test of dependent samples, with confidence intervals 95 and 99%.

Results

In Group 1 the combination of cleaning the hoof and surrounding skin, treatment with gel containing chelated copper and zinc and bandage resulted in the most significant recovery of DD

lesions 86.4% (Table 1). The recovery in Group 2 was significantly lower 46.1%. In control group the percentage of the recovered animals was the lowest with 16.7%.

Table 1: Efficiency of treatment protocols for digital dermatitis.

Groups	Treatment	№ of the cows	% of recovered cows	% of non recovered cows	Significance P
G1	gel + bandaging	13	86.4	13.6	<0.01
G2	gel	13	46.1	53.9	<0.05
CG	bandaging	12	16.7	83.3	>0.05

Discussion

Measures implemented to control DD in dairy farms are related to management of risk factors, using regular footbaths and individual treatment of affected animals. Treatment is one of the ways to control DD in dairy herds it is because M2 lesions are proven to be highly contagious. Various treatment schedules often applied empirical mainly rely on antibiotics (Hernandez et al., 1999; Laven, 2006). Classical treatment relies on oxytetracycline in the form of a topical spray with different types of dressing (Berry et al., 1996; Hernandez et al., 1999; Manske et al., 2002). In most studies of topical antibiotic treatments effectiveness is between 60 and 70%. Non-antibiotic products such as formaldehyde, copper sulphate, peroxide-based products, peracetic acid, zinc sulphate, etc., have also been reported as effective (Britt and McClure, 1998; Read and Walker, 1998; Hernandez et al., 1999; Laven and Hunt, 2002; Stevančević et al., 2009).

Results of this study indicate that the topical application of the gel containing copper and zinc chelates with a bandage is an excellent option for the treatment of DD which is consistent with studies by other authors (Holzhauer et al., 2011). A study of a similar product Hoof fit spray (called Repiderma®) of the same company in seven herds showed an average healing rate of 89.15% (Versteegen, 2014). It is assumed that the composition of Hoof fit gel is the same as Hoof fit spray which is why the results of both trials are similar. Treatment with the same product without bandaging was moderately effective. In this case risk factors as housing system, type of floor and environmental hygiene were not investigated. Deficiencies in environmental hygiene and the possible impact of moisture, feces and urine of the effect of healing support necessity of using a bandage. In this trial, we confirmed that bandaging hoofs after surgical debridement, without the use of topical antimicrobial agent is insufficient to cure DD lesions.

Conclusion

Copper and zinc have an antimicrobial effect and assist in the healing of the lesion. The use of Intra Hoof fit gel under bandage is a good option to treat digital dermatitis and alternative to combat antibiotic resistance.

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