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COMPARISON OF THE EFFICACY AND SAFETY OF TWO DIFFERENT TOPICAL OXYTETRACYCLINE TREATMENTS FOR DIGITAL DERMATITIS.

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Summary:

The objective of this study was to compare the efficacy of a commonly used treatment for digital dermatitis (DD) to a novel application method of the same antibiotic. Additionally the safety of this antibiotic use was to be evaluated to ensure milk from these two treatments did not contain violative residues. Cows were randomly enrolled in 1 of 3 treatments groups, tetracycline hydrochloride powder and wrap (WRAP), tetracycline hydrochloride powder in a paste (PASTE) and control. Cows were enrolled during 5 hoof trimming sessions every 3 months. During the 5th session a subset of cows were selected for antibiotic residue testing using a commercially available residue test at days 0, 1 and 3. In total a 173 cows were enrolled in the treatment trial. Of these, 46 and 54 cows were re-examined at Days 3-7 and 8-12 days post-treatment, respectively. Based on exams at Days 8-12, 0%, 47.4%, and 57.1% of lesions were recorded as healed for control, PASTE and WRAP, respectively. Cows receiving PASTE had 7.4 (95% CI: 1.49-37.03) times greater odds of recovering from DD over the study period compared to CONTROL cows (p=0.01). Similarly, cows receiving WRAP had 16.6 (95% CI: 3.25,84.60) times greater odds (p=0.0007) of recovering from DD over the study period than CONTROL cows. There was no statistically significant difference between the PASTE and WRAP treatments (p=0.13). No cows tested positive for violative tetracycline residues at either day 1 or day 3. Treatment with either WRAP or PASTE is a safe and efficacious way to treat DD in the short term.

Keywords: Digital Dermatitis, Treatment, Antibiotic residue.

Introduction:

Digital dermatitis (DD) is a commonly found lesion at the time of hoof trimming (Cramer et al. 2008, Holzhauer et al. 2006). Although DD is a commonly found lesion at hoof trimming, not all affected cows are clinically lame (Cramer 2007). Surprisingly the exact etiological cause of DD is not clear although Treponema spp are commonly associated with lesions (Berry 2001). Due to its suspected bacterial cause, common treatments used in the field include topical antibiotics and chemical disinfectants in either powder, liquid or paste forms. Surprisingly given the prevalence of DD and the widespread use of topical treatments there are only a few reports in the literature supporting their use. The majority of these reports use liquid tetracycline as a positive control (Hernandez et al. 1999, Britt et al. 1996) or antibiotic powder underneath an elastic bandage (Berry et al. 2010, Moore et al. 2001).
The use of an elastic bandage as part of the treatment for DD creates and additional labour requirement for bandage removal post treatment. Removal of the bandage is necessary to avoid creating a moist anaerobic environment conducive to *Treponema* spp growth. From a practical on farm perspective one of the characteristics of an ideal treatment would be a one time application with no requirements for follow up treatment or bandage removal.

Currently, even with the widespread use of antibiotics for the treatment of DD there is only one report in the literature that has evaluated whether the application of tetracycline resulted in violative antibiotic residues in milk (Britt et al, 1999). This study reported on the use of tetracycline in a liquid form, but did not evaluate the risk of residues with the more commonly used powder form.

This present study had the following two objectives, to determine if application of tetracycline in a topical paste without bandaging would be as effective as the application of powdered tetracycline with a bandage for the treatment of DD. Additionally the objective of this study was to evaluate milk for violative tetracycline residues after these two treatments.

**Materials and Methods:**

Data were collected from the research farm associated with the University of Guelph. This farm houses approximately 150 cows in a combination of tie stalls and free stalls. As part of a larger research project evaluating early detection methods for lameness, all cows in this herd were hoof trimmed or evaluated for lesions every 3-4 months for 5 consecutive times. During these evaluations, lactating Holstein cows diagnosed with DD were randomly assigned to one of three treatments, tetracycline hydrochloride (HCl) in a paste (PASTE), tetracycline HCl powder under a bandage (WRAP), or a negative control (CONTROL). The PASTE treatment consisted of tetracycline HCl 1000mg/g mixed in a 1:1:1 ratio with glycol and vinegar. The WRAP treatment consisted of an approximately equivalent amount of tetracycline HCl 1000mg/g powder held against the lesion with an elastic wrap (3M Vetrap). All cows with the WRAP treatment had their elastic bandage removed 3 days post-treatment. Only the cows not identified as clinically lame by farm staff were used as control cows.

Examination of the affected hooves was carried out at Day 0 (EXAM1), days 3-7 days post-treatment (EXAM2), and days 8-12 post-treatment (EXAM3). All examination were carried out by the same individual (JH). Initial exam data collected included, approximate size of lesion, and sensitivity to pain using an algometer (Force Ten, Wagner Instruments). For EXAM1 and EXAM2 lesions were considered active if the cow reacted to pressure from an algometer and tissue was still pink or inflamed. The examiner was not blinded to treatment.

Data were analyzed using a generalized linear model with a binary outcome (lesion active or lesion healed), and p-values <0.05 were considered significant. Variables included in the analysis in addition to treatment included evaluation date, and exam date, and exam number. Re-occurrence and cure rate differences were evaluated using Fisher's exact test.

For the milk residue testing a convenience sample of 19 cows were selected on the last visit of the treatment study. Seven cows were enrolled in the PASTE treatment. Six cows were enrolled in the WRAP treatment. Two cows received both treatments and 4 cows were selected as non-treated controls. Controls for the milk residue testing were randomly selected from cows with no foot lesions present. Composite milk samples were collected at day 0, 1 and 3. Composite samples on day 0 were collected at the time of treatment in the hoof trimming chute. Milk samples for days 1 and 3 were taken during the afternoon.
milking, from a milk sampling device in the milking parlour. Milk from the 19 cows was tested for tetracycline residues using the IDEXX SNAP tetracycline test (IDEXX Laboratories Inc.) capable of detecting tetracycline HCl residues at 50 ppb. This detection level is lower than the maximum residue limit of 100 ppb in Canada. Test of the milk occurred according to manufactures instructions and was done within 24 hours of sample collection. Test colour change was read manually.

**Results:**

One hundred and seventy-three cows have been enrolled into the treatment portion of the trial. Of these 173, 46 and 54 cows were re-examined at EXAM2 and EXAM3, respectively. Both exam number and treatment were significant (p<0.05) in the final generalize linear model. At EXAM3, 0%, 47.4%, and 57.1% of lesions were recorded as healed for CONTROL, PASTE, and WRAP, respectively. Cows receiving PASTE had 7.4 (95% CI: 1.49-37.03) times greater odds of recovering from DD over the study period compared to CONTROL cows (p=0.01). Similarly, cows receiving WRAP had 16.6 (95% CI: 3.25,84.60) times greater odds (p=0.0007) of recovering from DD over the study period than CONTROL cows. There was no statistically significant difference between the PASTE and WRAP treatments (p=0.13). There was also no significant difference in re-occurrence rates for the three treatments in the three months following treatment (p>0.05), with rates of 38.9%, 50.0%, and 55.9% for CONTROL, PASTE and WRAP.

No cows tested positive for violative tetracycline residues at either day 1 or day 3. One cow tested positive from the pretreatment sample. Follow up on this cow revealed no prior history of recent antibiotic treatments and her day 1 and day 3 samples were negative.

**Conclusion:**

Similar to other studies (Berry et al. 2010, Hernadez et al. 1999, Britt et al. 1996) treatment with tetracycline was an effective way to treat DD in the short term. Using the PASTE treatment would eliminate the need for bandage application and removal. From a practical perspective this would reduce the cost of the treatment and make DD treatment less labour intensive.

Furthermore, treatment with either PASTE or WRAP did not result in tetracycline residues in milk when tested with a commercially available tetracycline residue test. Since the test detects tetracycline residues below the Canadian maximum residue limit no withdrawal period is recommended when using these 2 treatments.

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References


