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Evaluating the effects of USDA organic approved topical treatments on sole ulcers

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Objective

Sole ulcers are caused by a failure of the suspensory apparatus of the third phalanx within the claw horn capsule, and unbalanced weight bearing that leads to contusion and exposure of the underlying corium. Although subclinical lesions may cause little to no discomfort, clinical lesions often result in severe pain and lameness. Clinical sole ulcers require careful corrective trimming and a block applied to the healthy claw. Recovery may be prolonged and result in reduced longevity of animals affected. Management of these cases on U.S. Department of Agriculture (USDA) certified organic dairy operations requires the use of non-antibiotic therapies, most of which have not been evaluated in controlled studies. The purpose of this prospective randomized clinical trial was to determine if the application of non-antibiotic alternatives would improve healing as evidenced by a more rapid re-epithelization of lesions and a decrease in locomotion score for animals with a clinical sole ulcer.

Materials and methods

One hundred and seventy-three lactating dairy cows with sole ulcer lesions were enrolled between April of 2018 and December of 2020. Treatment outcomes were recorded on D0, 7, 14, 28, 56, and 112 and evaluation criteria included the locomotion score prior to trimming, presence of granulation tissue, and the presence of new epithelium. Enrolled animals were randomized and grouped into one of the five following topical treatments: a) copper sulfate, b) seven percent iodine tincture, c) hydrogen peroxide, d) honey, or e) no treatment. All sole ulcer lesions were lightly wrapped with a bandage following corrective trimming, application of a block to the healthy claw, and the topical treatment (if any) was applied. Treatments were applied on D 0, 7, and 14. Mixed linear models were used for: a) absolute locomotion score at each observation day, and b) change in locomotion score from the previous observation. Full-factorial models of treatment * day effect were explored. Cox proportional hazards regression for time-to-recovery (defined as days to locomotion score = 1 and no granulation tissue, or else right-censoring on or before D112) also was deployed.

Results

The results of this study indicate that no antibiotic-alternative treatment group proved either inferior or superior to the control treatment group; that is, corrective trimming and light bandage with no topical treatment. All treatment groups exhibited non-significant differences ($P>0.10$) when comparing treatment outcomes (both locomotion scores and time-to-recovery). There was evidence of immediate locomotion score reduction by D7 for all treatment groups likely associated with application of the block and the removal of weight bearing on the claw with the sole ulcer; however, due to the complex nature of this disease there was prolonged healing and continued reduction in locomotion scores through D 56 and 112 in all groups.

Conclusions

The outcomes of this study suggest that the time, cost, and effort to use one of the four topical antibiotic-alternative treatments used in this study were unlikely to provide a justifiable return on cost, time and effort invested, or result in improved health and welfare outcomes. This finding is consistent with anecdotal arguments that corrective trimming alone is sufficient for most uncomplicated lesions. In this study for the control group, we elected to wrap the lesion with a light bandage similar to that used for all other treatments in order to control for the impact of a wrap. We cannot specifically comment on if there is any benefit of a wrap compared to no wrap.