

A BI-WEEKLY ZINC SULFATE TREATMENT FOR CONTROLLING INTERDIGITAL DERMATITIS IN GOATS GRAZING IN A HIGH-RAINFALL AREA OF HAWAII

Michael L. Christiansen and Erik R. Cleveland, College of Agriculture, University of Hawaii, Hilo, HI, 96720-4091

ABSTRACT

A study was conducted to determine if soaking the feet of goats in a 10% zinc sulfate solution every two weeks would reduce the severity of foot scald in animals kept in a high-rainfall area of Hawaii. During the three month study, the forest area where goats were grazed received 1615 mm of rainfall. Thirty-two goats (mostly female) were randomly assigned to four groups: mature/control, mature/treated, kid/control, and kid/treated. Mature goats were at least 1 yr of age. Feet were inspected every two weeks and given a foot scald severity score. After each inspection, the feet of goats in the treated groups were soaked for 1 min in a 10% (wt/vol) zinc sulfate solution. The soaking procedure proved ineffective in controlling the severity of foot scald among treated goats. However, on the average, treated goats had less severe foot scald than controls during the wettest periods. No Age effect was observed. A significant date effect supported the idea that the severity of foot scald increases under wet conditions.

INTRODUCTION

Interdigital dermatitis or foot scald in sheep and goats is caused by the interaction of two bacteria, *Fusobacterium necrophorum* and *Corynebacterium pyogenes* (Merk, 1986). Under wet conditions *F. necrophorum* can combine with *C. pyogenes* to cause an inflammation of the skin of the hoof, usually between the toes. In more severe cases, the soft tissues of the foot may erode in patches and even separate from the hard cornified layer of the hoof. The deterioration of the hoof can result in lameness. Foot scald may persist or recur if pasture conditions remain wet.

Most research information available on the treatment and control of foot infections in grazing animals, focus on the treatment and control of foot rot in sheep. Foot scald is often confused with the early stages of foot rot, but foot rot is a more severe necrotic disease and is caused by a different combination of bacteria- *F. necrophorum* and *Bacteroides nodosus* (Merk, 1986). Routine hoof paring and foot bathing or soaking in a 10% zinc sulfate solution is recommended for controlling foot rot infections in sheep (SID, 1988).

The objective of this study was to assess the effects of routine foot soaking with a 10% zinc sulfate solution on the severity of foot scald in goats managed in a wet environment.

Materials and Methods

Thirty-two goats determined to have signs of foot scald were randomly assigned to four different experimental groups. These groups included: two control and two treatment groups of either mature (>1 year of age) or kid goats. Goats within the treated groups were given a foot bath for 1 min in a 10% (wt/vol) zinc sulfate solution every two weeks during the experiment. Control animals were not given a footbath.

At the beginning of the experiment and at two-week intervals throughout the study, the feet of each goat were inspected and scored for the severity of foot scald. Hoofs were trimmed only to prevent overgrowth. The feet of the goats in the treated groups were soaked following the foot inspection and grading. The severity of foot scald was scored as follows:

- 1 = no lesions
- 2 = shallow, localized pitting of the hoof pad and/or shallow, localized underrunning of the hoof wall.
- 3 = shallow pitting extending over the hoof pad and/or shallow, underrunning extending over the length of the hoof.
- 4 = moderately deep, localized pitting of the hoof pad and/or moderately deep, localized underrunning of the hoof wall.
- 5 = moderately deep pitting extending over the hoof pad and/or moderately deep underrunning of the hoof wall extending over the length of the hoof, or deep, localized pitting of the hoof pad or deep, localized underrunning of the hoof wall.
- 6 = deep pitting of the hoof pad and/or deep underrunning of the hoof wall extending over the length of the hoof.

During the experiment, all goats were grazed as one group in rotation among three large forested paddocks on an old lava flow covered primarily with trees. Paddocks contained very little top soil or grass sod. The experiment was conducted from May 18 to September 24, 1989. During this period, the experimental area received 1615 mm of rainfall.

Data were analyzed by analysis of variance using the GLM procedure (SAS, 1985). The analysis involved the use of a 2 (age) x 2 (treatment) x 9 (date) factorial model with repeated measures on the third factor (date) (Winer, 1971). Sources of variation included age, treatment, date, age x treatment, and date x treatment effects. Differences among means was determined using the Least Significant Differences procedure (SAS, 1985).

Results and Discussion

Age is an important factor affecting the susceptibility of sheep to a virulent foot rot infection (Kimberling and Ellis, 1990). As age of the animal increases, the resistance to foot rot decreases. However, there was no difference in the severity of foot scald between the mature and kid goats in the present study ($P = .93$). The average foot score for both age groups was 2.2.

The average foot scald severity scores recorded during the study are shown in Table 1. A graphic display of these same data is also provided in Figure 1 and includes the total rainfall for each of the 8 time periods between dates. The footbath technique used in this study was not very effective in controlling foot scald among goats. On the average, foot scores for goats in the treated group were not different from those of controls ($P = .35$), averaging $2.3 \pm .9$ and 2.6 ± 1.2 , respectively. Even though the short foot treatment every two weeks did not improve hoof condition among goats all that well, it did help to reduce the severity of foot scald under the wettest conditions. A significant date x treatment interaction was observed. Mean foot scores for the treated goats averaged .6 of a score lower than goats in the control group for the period of heaviest rainfall from Jun 29 to August 10. This observation suggests that footbathing with a 10% zinc oxide solution may have potential for limiting the severity of foot scald in goats under wet conditions.

Significant variation in the severity of foot scald among the different dates were consistent with the concept that wet conditions will simply exacerbate foot scald in an infected herd. Wet conditions can cause mud and manure build-up between the digits and within any lesions of the sole. The bacteria responsible for foot scald (*F. necrophorum* and *C. pyogenes*) are anaerobes. Soil and manure build-up bring hoof tissue into direct contact with *F. necrophorum* and *C. pyogenes* and provide the anaerobic environment necessary for their growth and survival. Moisture also softens hoof tissue, making the feet more susceptible to mechanical breakdown and bacterial entry. In the present experiment, the severity of foot scald within the goat herd increased as the total amount of rainfall increased (Figure 1). However, the distribution of rainfall was probably a more important contributor to foot infections than the total amount of rain that fell during any particular period. For example, the amount of rainfall received from July 27 to August 24 of the experiment was comparable to earlier periods of heavy rainfall, but the average foot scald severity score for this time period actually decreased. An evaluation of the rainfall pattern from July 27 to August 24 indicated that rainfall was rather sporadic for this period. The majority of rain fell on only 6 out of the 30 d for this time period. The drier conditions during this time probably contributed to an improvement in hoof scores within the goat herd since foot scald is often transient and disappears when drier conditions prevail (Merk, 1986).

CONCLUSION

It is concluded from this study that soaking feet in a 10% zinc sulfate solution for 1 min every two weeks is insufficient for controlling foot scald within a goat herd managed in a wet environment. Under very wet conditions, a more frequent treatment for a much longer duration would likely be warranted. Furthermore, results of this study support the concept that wet conditions increase the severity of foot scald in goats.

LITERATURE CITED

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dates) is shown above the control line.

TABLE 1. AVERAGE FOOT SCALD SEVERITY SCORES FOR GOATS
IN CONTROL AND TREATED GROUPS ON DIFFERENT DATES

Date	Control	SE ^a	Bi-Weekly footbath	SE
May 18 ^b	2.5		2.4	
Jun 2	2.2	.2	2.1	.3
Jun 14	2.8	.3	2.5	.2
Jun 29	2.2	.3	1.7	.2
Jul 13	2.7	.4	1.9	.1
Jul 27	3.1	.4	2.5	.2
Aug 10	2.9	.3	2.4	.3
Aug 24	2.4	.3	2.2	.2
Sep 8	2.6	.2	2.9	.2
Sep 22	2.8	.3	2.8	.2

^aStandard error (n = 16)

^bBeginning date of the experience. Initial foot scores were not used in the statistical analysis.

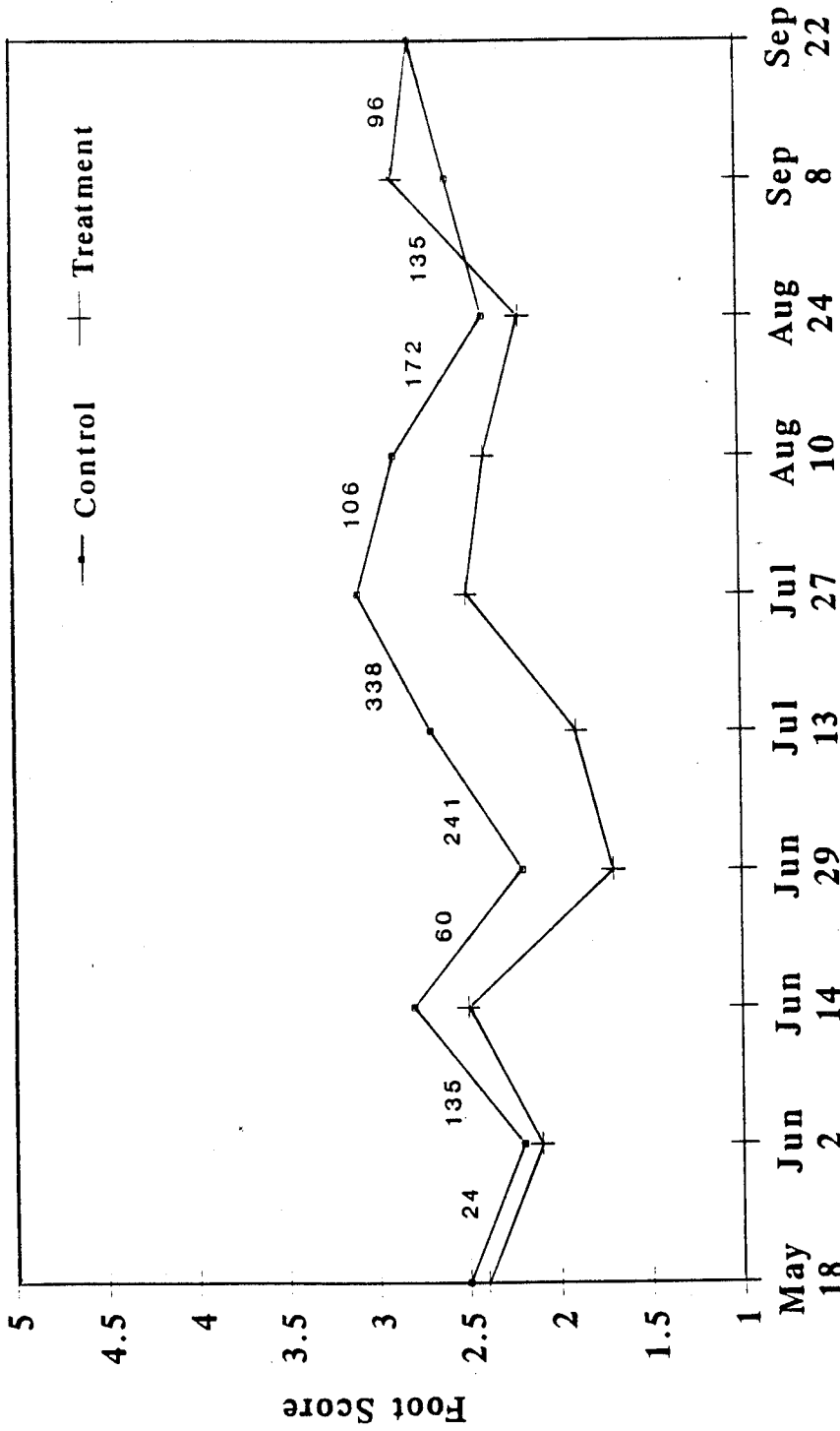


Figure 1. Average foot scald severity scores for goats in control and treated groups on different dates. A higher score represents a greater severity of footscald (1 = no lesions). Cumulative rainfall (mm) for each time period (between dates) is shown above the control line.