Evaluation of the Dosage of Tilmicosin for the Treatment of Acute Bovine Footrot (Interdigital Phlegmon)

JK Merrill[1], DW Morck[2], ME Olson[2] and CP Dick[1]
[1]Elanco, Division Eli Lilly Canada Inc., Guelph, Ontario, Canada,
[2]The University of Calgary, 2500 University Drive N.W., Calgary, Alberta, Canada

Abstract

Two studies were conducted in a commercial feedlot in Western Canada to determine the dosage of subcutaneous tilmicosin injection required as therapy for bovine footrot. Three hundred and twenty animals showing signs of acute lameness including inflammation and swelling of the skin and tissues of the interdigital cleft, coronet, and/or the distal limb were considered suspect cases of footrot by pen riders and presented to the hospital facility for evaluation. Candidates for enrollment were thoroughly examined to eliminate those cases of lameness caused by foreign objects, sprains, fractures, sole abscesses or other causes of lameness not associated with acute bovine footrot. As animals presented they were randomly assigned to either placebo (saline at 1.5 ml/50 kg body wt), 2.5, 5.0 or 10.0 mg tilmicosin/kg body wt in blocks of four animals (study 1) or to either 2.5, 5.0 or 10.0 mg tilmicosin/kg body wt in blocks of three (study 2). On day 1 (defined as the point in time that the animal is confirmed for inclusion on the trial and treatment administered), day 2, day 3 and day 4 the animals were scored for lameness, swelling and lesions using a 4 point scale. Treatment was considered successful if on day 4 the animal scored 0 (normal) for lameness and did not require retreatment for footrot in the next 10 days. Cure rates were 15.0, 68.0, 74.0 and 77.0 %, respectively, for the placebo, 2.5, 5.0 and 10 mg tilmicosin/kg body weight. There were no significant differences between the 2.5, 5.0 and 10 mg tilmicosin/kg body weight dosages but all were significantly ($p<.05$) higher than the placebo. There appeared to be a trend to improved efficacy with higher dosages.

Introduction

Acute footrot, also know as acute interdigital phlegmon, is a common bacterial infection of cattle.[1] Unpublished observations in a large Alberta feedlot reveal that this infection is the 2nd most common disease treated.

Typically this disease involves necrosis of the interdigital epidermis and the underlying dermis. Very often there is an ascending cellulitis which can result in severe swelling from the coronet to the fetlock joint. The infection is thought to be caused by a synergistic association of anaerobic bacteria including *Bacteriodes melaninogenicus*, *Fusobacterium necrophorum*,[2] and possibly other bacteria such as *Dichelobacter (Bacteroides) nodus*[3] or *Actinomyces pyogenes*.[4] Recently *B. melaninogenicus* has been divided into several distinct species of bacteria including *Porphyromonas assacharolytica* and *Prevotella intermedia*.[5] *F. necrophorum* and *B. melaninogenicus* have been previously used together to experimentally infect cattle.[2] Several treatments have been advocated for acute bovine footrot including penicillin[1], oxytetracycline[6], cephalosporins[7], and sulfonamides[1], but clinical studies involving the macrolide antibiotic tilmicosin have yet to be described. Many features of tilmicosin including long action, single administration, low volume and subcutaneous delivery could prove to be particularly useful in treating animals with acute footrot.

Materials and Methods

Two studies were conducted to evaluate the dosage of tilmicosin for the treatment of naturally occurring acute bovine pododermatitis (footrot). Both studies were randomized complete block designs with time as the blocking factor. One study had 20 replications per treatment and the other study had 80 replications per treatment. Treatments were as follows: Study one - 0, 2.5, 5.0 and 10.0 mg tilmicosin/kg body weight administered subcutaneously and study two - 2.5, 5.0 and 10.0 mg tilmicosin/kg body weight administered subcutaneously. Animals were initially selected as candidates for treatment of footrot by pencheckers. Animals were then moved to the hospital and treatment area of the feedlot for examination by the trial investigator as to suitability for enrollment in the study. Any animal treated within the last 30 days for footrot was excluded.

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Animals were blocked by time in groups of four (for the first study) and groups of three (for the second study) and randomly assigned to one of the four (first study) or three (second study) dosages. Clinical score (0-3) for each of lameness, swelling and lesions were assigned and recorded on day of initiation (day 1) and for three days following. The footrot was considered cured if the animal received a score of 0 for swelling, lesion and lameness on days 2 or 3, or a score of 0 for lameness on day 4. Animals that relapsed up to and including day 10 were recorded as treatment failures. Rations and management practices typical for the geographical area in which the trials were conducted were used.

Day 1 was defined as the point in time in which (one) the animal was confirmed for inclusion in the trial, (two) data recording was initiated and (three) treatment was administered. Response to therapy was monitored, using a clinical scoring method, by the clinical investigator. The following scoring system was employed:

A. Lameness was evaluated and scored on Days 1 to 4, as follows:

Score	Interpretation
0	**Normal**
1	**Slight lameness** - puts some weight on foot but moves readily
2	**Moderate lameness** - does not want to put weight on foot, moves slowly
3	**Severe lameness** - holds foot up at intervals, reluctant to move or place entire weight on foot, prefers to lie down.

B. Swelling was evaluated and scored on Days 1 to 4, as follows:

Score	Interpretation
0	**No swelling**
1	**Slight to moderate swelling**
2	**Moderate to severe swelling**
3	**Severe swelling**

C. Lesions were evaluated and scored on Days 1 to 4, as follows:

Score	Interpretation
0	**No lesion**
1	**Small interdigital lesion** - extending to 1/4 length of interdigital space
2	**Medium size necrotic lesion** - extending to 1/2 length of interdigital space
3	**Very large necrotic lesion** - involving almost all of the interdigital space.

If on the 4th day of evaluation the animal scored 0 for lameness it was sent "home", regardless of scores on swelling and lesions. Any signs of lameness on the fourth clinical evaluation constituted a treatment failure. All enrolled, sent "home" animals repulled for footrot within 10 days after initial treatment, and confirmed as footrot by the clinical investigator, were also deemed treatment failures. Treatment failures were treated according to standard feedlot protocol for footrot.

Statistical analysis of the data was performed using the GLM procedures of SAS 6.12, 1996 (8). Parameters analyzed included the proportion of animals that cured, and the clinical score data for lameness, swelling and lesions. The model contained effects due to trial and treatment. Treatments were compared using contrasts.

Results

A summary of the cure rate and clinical score data is shown in Table 1. Although, there were no significant differences in cure rates between the three tilmicosin dosages evaluated there was a trend for the two higher dosages to cure more animals than the 2.5 mg dose. No animals were categorized as treatment failures due to relapsing after initial treatment. There were no significant differences in the improvement of clinical score from day 1 to day 4 between the 2.5, 5.0 and 10.0 mg tilmicosin/kg body weight treatment groups. These treatment groups did show a greater improvement in clinical score than the placebo group.

Table 1. Cure rates and clinical score improvement.

	mg tilmicosin/kg body wt			
Item	0	2.5	5.0	10.0
Number of animals	20	100	100	100
Cure rate, %	15.0[a]	68.0[b]	74.0[b]	77.0[b]
Improvement in score day 1 to day 4				
Lameness	0	1.62	1.68	1.75
Swelling	.20	.93	1.10	1.16
Lesions	.15	.96	1.15	1.06

[ab]Means in the same row with different superscripts are significantly different ($p<.05$).

Discussion

Spontaneous cure rates observed in this study, approximately 15%, are similar to those observed by Morck et.al. (7). Using small numbers of animals Morck et.al. (9) experimentally induced footrot by injecting either *Porphyromonas levii* or *Prevotella intermedia* in conjunction *Fusobacterium necrophorum* interdigitally in the feet of steers. Once infected, steers were treated with tilmicosin at 10 mg/kg body weight and 83.3% of the animals responded favorably based on clinical scoring

of the severity of lameness, swelling and lesions. Cure rates in this study using naturally infected animals and treated with tilmicosin ranged from 68 to 77%. Animals treated with tilmicosin and cured based on clinical scoring at day 4 did not relapse. It appears that cure rate begins to plateau at the 5.0 mg/ kg dose rate with little difference between the 5.0 and 10.0 mg/kg dose levels. Based on these data it would appear that the recommended dosage of tilmicosin for treatment of this disease would be 5 mg/kg body weight. The 10 mg dose gave very little additional response and would double the drug cost. We feel caution should be exercised in using the 2.5 mg dose as cure rates may be unacceptable and the risk of reduced sensitivity developing may be greater.

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ABOUT THE AUTHOR: David Sainsbury, MA, PhD, Bsc, MRCVS, FRSH, Cbiol, FIBiol, is Honorary Director, Cambridge Centre for Animal Health and Welfare, and an international adviser and lecturer, and Emeritus Fellow of Wolfson College, University of Cambridge. He is also a former lecturer, Dept. of Clinical Veterinary Medicine, University of Cambridge.

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