Preventive Veterinary Medicine 96 (2010) 93–103

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

A within farm clinical trial to compare two treatments (parenteral antibacterials and hoof trimming) for sheep lame with footrot

G.J. Wassink[a,1], E.M. King[a,1], R. Grogono-Thomas[b], J.C. Brown[a], L.J. Moore[b], L.E. Green[a,*]

[a] Department of Biological Sciences, University of Warwick, Gibbet Hill Rd, Coventry CV4 7AL, West Midlands, UK
[b] School of Clinical Veterinary Science, University of Bristol, Langford House, Langford, North Somerset BS40 5DU, UK

ARTICLE INFO

Article history:
Received 14 December 2009
Received in revised form 7 April 2010
Accepted 8 May 2010

Keywords:
Sheep
Footrot
Clinical trial
Parenteral antibiotics
Foot trimming
Welfare
Productivity

ABSTRACT

From observational studies, farmers who use parenteral antibacterials to promptly treat all sheep with footrot (FR) or interdigital dermatitis (ID) have a prevalence of lameness of <2% compared with a prevalence of 9% lameness reported by farmers who treat lame sheep by trimming affected feet. We tested the hypothesis that prompt treatment of sheep lame with naturally developing FR or ID with parenteral and topical antibacterials reduces the prevalence and incidence of lameness with these conditions compared with less frequent treatment with trimming of hoof horn and applying topical antibacterials. A further hypothesis was that reduction of ID and FR would improve productivity. A lowland sheep flock with 700 ewes was used to test these hypotheses in an 18-month within farm clinical trial with four groups of ewes: two intervention and two control. The duration and severity of lameness was used to categorise sheep into three weighted scores of lameness (WLS): never lame (WLS0), mildly lame/lame for <6 days (WLS1) and severely or chronically lame (WLS2). The intervention reduced the prevalence of lameness due to FR and ID in ewes and lambs and the incidence of lameness in ewes. The WLS was also significantly lower in sheep in the intervention groups. Ewes with a higher WLS were subsequently significantly more likely to have a body condition score <2.5 and to have lame lambs. Significantly more ewes lambed and successfully reared more lambs that were ready for slaughter at a younger age in the intervention versus control groups. There was an increase in the gross margin of £630/100 ewes mated in the intervention group, including the cost of treatment of £150/100 ewes mated. We conclude that prompt parenteral and topical antibacterial treatment of sheep lame with ID and FR reduced the prevalence and incidence of these infectious conditions and led to improved health, welfare and productivity.

1. Introduction

Lameness is one of the greatest concerns for poor welfare in sheep (Goddard et al., 2006; Fitzpatrick et al., 2006). It has been estimated to cost the UK industry £24 million/annum (Nieuwhof and Bishop, 2005). More than 90% of farmers in the UK report lameness in their sheep, with a farmer-estimated prevalence of 10% with more than 80% of lameness caused by footrot (FR) and interdigital dermatitis (ID) (Grogono-Thomas and Johnston, 1997; Kaler and Green, 2008). In a study of 209 sheep farmers, those treating all sheep with FR with parenteral antibacterials and foot sprays reported a significantly lower peak prevalence of FR of 2% compared with the 9% reported by farmers who treated FR by paring the hoof horn and spraying disinfectant on to the foot (Wassink et al., 2003). In addition, farmers who reported prompt treatment of mildly lame sheep also reported a lower prevalence of lameness than those treating groups of lame sheep (Kaler

* Corresponding author. Tel.: +44 2476 524620; fax: +44 2476 524619.
E-mail address: Laura.Green@warwick.ac.uk (L.E. Green).
[1] Joint first authors.

0167-5877/$ – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.prevetmed.2010.05.006

Table 1
Flock numbers, occurrence of lameness and culling by treatment group 2005.

	Intervention group 1	Intervention group 2	Control group 1	Control group 2
	Control year 2		Intervention year 2	
No. ewes	175	177	181	177
No. lambs	364	323	357	312
Date first ewe lambed	7/03/2005	17/03/2005	11/03/2005	17/03/2005
% FR at foot exam March 2005	26.1	20.5	19.4	20.9
% ID at foot exam March 2005	44.9	43.8	38.9	50.3
No. treatments for FR and ID	78	232	20	18
No. treatments other lameness	5	4	2	0
Prevalence (95% CI)	1.9	1.1	4.6	5.3
Lame ewes	(1.1–2.6)	(0.6–1.7)	(2.6–6.7)	(3.5–7.1)
Incidence (95% CI)	1.3	0.8	2.3	2.5
Lame ewes	(0.7–1.8)	(0.4–1.2)	(1.4–3.1)	(2.0–3.0)
Prevalence (95% CI)	0.8	1.41	2.5	1.45 (1.2–1.7)
Lame lambs	(0.65–0.95)	(CI: 0.9–1.8)	(CI: 1.7–3.3)	
Incidence (95% CI)	0.4	1.1	1.1	0.6
Lame lambs	(CI: 0.2–0.6)	(0.8–1.4)	(CI: 0.8–1.4)	(0.4–0.8)
No. (%) culled 2005	49 (28)	31 (18)	52 (29)	54 (36)
% FR at foot exam September 2005	5 (3)	10 (6.1)	22 (13)	18 (11)
% ID at foot exam September 2005	5 (3)	31 (19)	20 (12)	66 (39)

No., number; %, percent.

and Green, 2008). Further evidence for the benefits of parenteral antibiotics comes from a prospective longitudinal study of 160 sheep on one farm where the treatment of sheep with FR and ID with parenteral and topical antibacterials was associated with a lower incidence of lameness in the subsequent 4 weeks (Green et al., 2007).

Dichelobacter nodosus is the necessary pathogen to cause FR (Beveridge, 1941) and is present in the majority of cases of both ID (inflammation of the interdigital skin) and FR (separation of hoof horn from the underlying tissue) (Moore et al., 2005). As a consequence, ID and FR are often a continuum of the same disease. The terms that are equivalent to ID and FR in Australia are benign and virulent FR (Depiazzi et al., 1991). *D. nodosus* is an anaerobic bacterium that has no known resistance to antibacterials. Parenteral antibacterial treatment of FR leads to recovery from lesions in over 90% of sheep (Sterk, 1960; Egerton et al., 1968; Grogono-Thomas et al., 1994) and in a recent factorial design study, over 90% of sheep with FR treated with long acting oxytetracycline recovered from lesions and lameness within 10 days whilst <30% sheep treated with foot trimming recovered in this time period (Kaler et al., 2010). This, together with the evidence above and biological reasoning, led to the hypothesis that prompt treatment of lame sheep with ID or FR with parenteral and topical antibacterials would reduce the prevalence (because of a reduced duration of lameness) and incidence (because a reduced infectious period would decrease the probability of transmission of *D. nodosus* between sheep) of lameness caused by these diseases compared with the traditional treatment of trimming hoof horn and applying a topical bactericide. Consequently, the health, welfare and productivity of the flock should increase. To test these hypotheses, a within flock clinical trial comparing these two treatments was set up on a convenience-selected farm in Oxfordshire with a commercial lowland spring-lambing flock of approximately 700, mainly North Country mule ewes. The objective was to compare prompt treatment of FR and ID with parenteral and topical antibacterials with a farmer's typical management of FR and ID (Wassink et al., 2003, 2005) which includes less frequent treatment of lame sheep with ID and FR by trimming hoof horn and applying a topical bactericide. The study lasted from March 2005 to December 2006.

2. Materials and methods

2.1. Study design March to September 2005

A sample size calculation was used to estimate the number of ewes required per treatment to test a reduction in lameness of 50% assuming a prevalence of lameness of 10%, 80% power and 95% significance. A total of 147 ewes were required per treatment.

Ewes lambed from the second week of March 2005. Ewes and lambs were identified with both ear tags and flank markings. The age (dentition), body condition score (BCS) (MAFF, 1994) and conformation of feet of ewes were recorded. All foot lesions (www.footrotinsheep.org) were also recorded. Ewes with triplets were excluded from the trial. After the ewes lambed they were allocated by researchers to one of two fields with similar pasture type and stocking density using stratified random sampling on age, BCS, foot conformation and presence of existing footrot lesions. Once the first two matched fields were stocked, two further fields with similar pasture type were filled. Each group consisted of approximately 175 ewes and their lambs (Table 1). The matched groups were moved between fields simultaneously and to similar pasture types and stocking densities throughout the trial period. In May 2005, when the youngest lamb in each group was 4 weeks old, one group from each pasture type was selected to be an intervention treatment group by tossing a coin; the other became the matched control group, thus giving two intervention and two control groups. Six observers collected data on age, BCS, locomotion and foot lesions over the 18-month study. All observers were trained by GJW