

Flystrike prevention on Merino lambs with the insect growth regulator dicyclanil

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ABSTRACT

The efficacy of a ready-to-use 5% dicyclanil pour-on formulation as a preventative of natural flystrike on Merino lambs was investigated in a field trial involving 5 sites in the southern Cape Province. A total of 1804 lambs treated with dicyclanil were compared with 882 untreated control lambs for up to 25 weeks after treatment. Efficacy was assessed by calculating the weekly cumulative strike rate at each site and aggregated for all sites, as well as by calculating the percentage reduction achieved in treated lambs. Cumulative strike rates for the untreated controls aggregated for all sites at Weeks 9, 14 and 19 after treatment reached 6.2, 12.8 and 17.8%, respectively, compared with 0.4, 1.7 and 3.6% for the dicyclanil treated lambs. Percentage control aggregated for all sites at Weeks 9, 14 and 19 after treatment was 93, 87 and 80%, respectively. Heavy rains during the 1st half of the trial did not substantially reduce the efficacy of the product.

Key words: blowfly strike, dicyclanil, IGR, insect growth regulator, Merino lambs.

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INTRODUCTION

After the ban of chlorinated hydrocarbons for the control of blowfly strike, organophosphates became the most widely-used chemical class for flystrike prevention. Since then, blowfly resistance to organophosphates has become widespread^{2,6,12,18} leading to a substantial reduction in the length of protection initially provided by this class of chemicals.

Since the introduction of the insect growth regulator (IGR) cyromazine for flystrike prevention, either as a concentrate for dipping and jetting^{8,9} or as a ready-to-use pour-on^{11,13}, cyromazine-based products have become well established among farmers as a valuable alternative to classic dips. Other IGRs, especially benzoylphenylureas, have also been investigated as potential flystrike remedies^{10,15} and have been introduced in several countries.

Efficacy against blowfly larvae has been

reported to be substantially higher for dicyclanil, a pyrimidin derivative with IGR activity¹⁷, than for cyromazine and diflubenzuron, both *in vitro* and *in vivo*⁵. Environment house and field studies on Merino sheep in Australia resulted in periods of protection against flystrike of longer than 20 weeks³. Topical application of dicyclanil on calves has been shown to prevent screwworm infestations on castration wounds for up to 25 days¹. In the current investigation the field efficacy of dicyclanil as a flystrike preventative for Merino lambs was investigated under South African conditions.

MATERIALS AND METHODS

Animals and treatment

A multi-centred field trial was conducted on 5 commercial farms in the Riversdale–Heidelberg area of the Western Cape Province (see Table 1 for location of sites). The sites were situated within a radius of 30 km and a maximum of 7 km from the coast, and had similar environmental and grazing conditions. A total of 2866 6–12-month-old unshorn lambs (99% pure Merino, 1% Merino crossbred) were involved in the trial. Only healthy animals were included in the study. No tail-docking was performed during the trial, but animals previously tail-docked were accepted. Skin pleating

was not specifically analysed. Animals showing skin lesions indicating previous blowfly strike and animals in poor condition were excluded from the study. All animals that had previously received endo- or ectoparasiticide treatment with an expected influence on blowfly strike were excluded from the study. At each site, animals were randomly assigned to 2 treatment groups, 1 with about two-thirds of the animals to be treated with dicyclanil, the rest to be left untreated.

Animals were treated with a ready-to-use, 5% dicyclanil pour-on formulation at the following recommended dose volumes: 10–20 kg: 20 ml; 21–30 kg: 25 ml; 31–50 kg: 30 ml; >50 kg: 35 ml. Ten animals were selected at random and weighed on an electronic scale. The arithmetic mean weight was used to calculate the dose volume to be applied. The product was applied using a commercial 20 ml pour-on applicator dosing gun (N J Phillips Pty Ltd, Somersby, Australia) with a spray nozzle. At each site the gun was calibrated for accuracy by dispensing a set dose 10 times into a measuring cylinder before and after treatment. Application was done by positioning the nozzle 30–45 cm from the fleece surface above the shoulder of the animal and dispensing half the dose as the gun was pulled back towards the rump. The other half of the dose was applied similarly over the breech area to cover an arc extending from about 10 cm below the tip of the tail on 1 leg to an area about 10 cm over the top of the tail and down the other leg. All animals at each site were treated on the same day. During treatment all animals were individually wool-branded using coloured marker aerosol sprays. Following treatment, animals at each site were grazed together on natural and improved pasture including lucerne and wheat stubble-fields. Normal farming procedures (e.g. crutching, dagging, worming) were allowed during the study.

However, farmers were instructed not to use any macrocyclic lactones or any ectoparasiticide other than the drug supplied to terminate the strikes (see below).

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Temperature and rainfall data were recorded at a locality central to the surrounding sites. Humidity was not recorded.

All treatments were administered between 23 and 27 October 1995. All animals were dry at the time of product application, excepting those at sites 2 and 3, where animals were slightly damp following intermittent rain on the day of treatment.

Assessment of efficacy

At each trial site, animals were visually inspected every 2nd day for signs of blowfly strike. Affected animals were identified, separated from the rest of the flock, and the strike lesions were examined and recorded. The strike lesions were treated with a licensed 2.5 % cypermethrin larvicide (Cypor, Logos Agvet) and the struck animals were withdrawn from the trial but left in the flock.

For each site, efficacy was assessed by calculating the weekly strike rate according to the formula $100 \times S/N$, where S is the number of strikes during a particular week and N the number of animals remaining in the trial. Cumulative strike rates were calculated by adding the weekly figures. The weekly strike rate aggregated for a treatment group across all sites in the trial was calculated using the formula $100 \times S_i/N_i$, where S_i was the number of strikes recorded during a given week for the particular treatment group at all the sites in the trial, and N_i was the total number of sheep in the group, across all sites, that remained in the trial during that week. The weekly figures were then added to provide the cumulative strike rate for each treatment group aggregated for all the sites in the trial.

For each site, weekly percentage reduction of flystrike was calculated using the formula $100 \times (C-T)/C$, where C is the weekly cumulative strike rate for the untreated control group, and T is the same parameter for the treated group. The weekly percentage reduction of flystrike aggregated for all sites was calculated similarly using the weekly cumulative strike rate aggregated for all the sites.

Data from each site were statistically analysed for significance using the standard Chi-square test. The trial was performed in compliance with the European guidelines for good clinical practice (European Commission III/3767/92 Final).

RESULTS

No adverse events were recorded during the study. The trial was planned so that it could be terminated if high flystrike incidence should require treatment of

Table 1. Cumulative strike rates in dicyclanil-treated and untreated control lambs at the end of the study at 5 sites.

Site number	Duration (weeks)	Number of lambs		Cumulative strike rate ^a (%)	
		Dicyclanil	UTC ^b	Dicyclanil	UTC ^b
1 Kadiesvlei	14	360	172	1.7 a	20.1 b
2 Kleinbosheuvel	14	353	167	1.1 a	13.2 b
3 Sanmeer	25	489	253	4.6 a	13.4 b
4 Diepvlei	19	180	90	3.4 a	24.6 b
5 Boskop	14	422	200	1.9 a	10.4 b

^aWithin the same site, numbers with different letters are significantly different ($P < 0.05$).

^bUntreated controls.

Table 2. Percentage control achieved at trial sites.

Weeks after treatment	Site number					
	1	2	3	4	5	Aggregated
9	100	100	87.2	85.4	88.4	92.8
14	91.7	91.4	74.8	89.9	81.7	86.5
19	na ^a	na ^a	67.3	86.3	na ^a	79.9

^aNot available, trial terminated at Week 14 after treatment.

any of the groups with an ectoparasiticide, or if sheep numbers would be substantially reduced because of the sale of sheep or for other reasons.

Table 1 summarises the results achieved at each site by the end of the trial. A total of 46 and 125 strikes were recorded for the dicyclanil group (1804 lambs) and for the untreated control group (882 lambs), respectively. Table 2 shows the percentage control achieved by dicyclanil at each site and aggregated for all sites by Weeks 9, 14, and 19 after treatment.

Figure 1 shows the weekly distribution of the cumulative strike rate aggregated for all the sites. At Week 9 after treatment the cumulative strike rates reached 0.4 and 6.2 % for the dicyclanil and the untreated control groups, respectively. At Week 14 after treatment the cumulative strike rate reached 1.7 and 12.8 % for the dicyclanil and the untreated control groups, respectively. At Week 19 after treatment the cumulative strike rate aggregated for the 2 sites remaining in the trial reached 3.6 and 17.8 % for the dicyclanil and the untreated control groups respectively. The aggregated cumulative strike rate for dicyclanil reached the 2 % benchmark at Week 17 after treatment (Fig. 1). The untreated control groups reached this 2 % benchmark between Weeks 3 and 4 after treatment. Figure 2 shows the weekly rainfall and the average temperature recorded for the area during the trial.

DISCUSSION

At some sites the number of strikes recorded during the first weeks for the untreated controls was rather low. How-

ever, it increased steadily and at the end of the trial the cumulative strike rates experienced by the untreated controls varied between 10.4 and 24.6 %. In comparable clinical studies other authors reported cumulative strike rates ranging from 8 to 21 %⁷, from 6 to 33 %¹¹, from 8 to 34 %¹³ and from 6 to 38 %¹⁴. It is thus

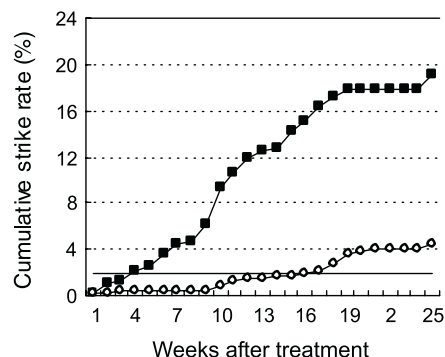


Fig. 1. Aggregated cumulative strike rate for treated and untreated lambs. Open circles = dicyclanil; solid squares = untreated controls; solid grey line = 2 % cumulative strike rate limit.

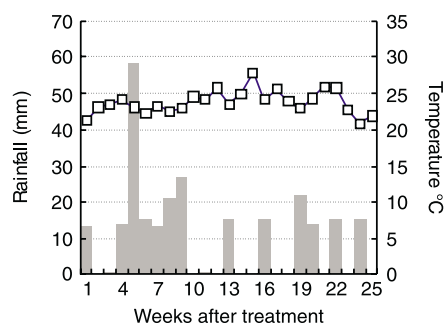


Fig. 2. Distribution of rainfall and average temperature during the trial. White squares = average temperature; grey bars = rainfall.

apparent that animals were exposed to an adequate fly challenge during the study. Differences between the sites such as those experienced in the present study are usual during field trials and have been explained by the influence of climatic, environmental and husbandry factors in the susceptibility of sheep to flystrike^{4,19}.

Several ready-to-use pour-on products are already available for the control and prevention of flystrike on sheep in South Africa and elsewhere. Nevertheless, very little has been published on their field efficacy as blowfly preventatives. A 6 % cumulative strike has been reported on treated sheep 3 weeks after treatment with an experimental ready-to-use 10 % propetamphos formulation⁷. In studies under European conditions, the cumulative strike rate on lambs treated with various cyromazine formulations ranged from 0 to 4.5 % 10 weeks after treatment¹¹, and from 1.3 to 2.3 % 12 weeks after treatment¹³. In the present study under South African conditions dicyclanil showed a substantially longer preventative effect. Taking the 2 % aggregated cumulative strike rate as a benchmark for adequate flystrike prevention, this benchmark was reached at Week 17 after treatment in dicyclanil-treated lambs (Fig. 1). Taking 80 % aggregated control as an alternative benchmark for adequate flystrike prevention, during the present study this benchmark was reached by dicyclanil-treated sheep at Week 19 after treatment (Table 2). At 4 of 5 sites the percentage control remained above the 80 % benchmark during the entire trial.

The results of the present study are consistent with those obtained on adult Merino sheep in Australia, where periods of protection against flystrike of 20 weeks and longer were obtained with the same dicyclanil formulation applied on sheep with long wool or off-shears³. In field trials against flystrike using the same

dicyclanil formulation on coarse wool lambs under European conditions, the cumulative percentage control 16 weeks after treatment was higher than 95 %¹⁶.

During the present study, heavy rains (50 mm) that occurred during Day 32 after treatment (Fig. 2) did not have a negative influence on the performance of the product.

The length of protection offered by dicyclanil should contribute a reduction in the number of treatments needed to protect sheep from flystrike during the blowfly season.

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