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Research paper

The effect on liveweight gain of using anthelmintics with incomplete efficacy against resistant *Cooperia oncophora* in cattle

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ABSTRACT

A replicated field trial was conducted to measure the effect on liveweight gain of failing to adequately control anthelmintic resistant populations of *Cooperia oncophora* and to determine whether populations, and hence production losses, increased with time. Eight mobs of 10 Friesian-Hereford calves were run on independent farmlets from January to December, over each of two years. All mobs were routinely treated with a pour-on formulation of eprinomectin every six weeks, which controlled parasites other than *Cooperia*. Four mobs also received six weekly treatments with an oral levamisole plus albendazole combination anthelmintic to control *Cooperia*. Liveweights, condition scores, faecal egg counts and larval numbers on pasture were measured throughout.

In the first year animals treated with eprinomectin alone were 12.9 kg lighter in November than those treated with eprinomectin plus albendazole and levamisole, however, in the second year there was no difference between the treatment groups. The data, therefore, support the view that while *C. oncophora* is less pathogenic than other cattle parasite species it can still cause production losses when present in sufficient numbers.

In the first year of the study, parasite load, as measured by faecal nematode egg count and larval numbers on herbage, tended to be higher and calf growth rates lower than in the second year. In both years, counts of infective larvae on herbage declined over winter–spring to be at low levels before mid-summer. This suggests that the carry-over of infection from one crop of calves to the next was relatively small and hence that the level of challenge to the young calves at the start of each year was largely due to the effectiveness of the quarantine treatments administered when the animals arrived on the trial site. Low survival of larvae on pasture between grazing seasons, resulting in small larval populations on pasture when drenching programmes start each summer, might help to explain the widespread development of anthelmintic resistance in this parasite under New Zealand grazing systems.

1. Introduction

Internal parasites are regarded as an important production limiting factor by a majority of New Zealand cattle farmers (Jackson et al., 2006). The recent emergence of anthelmintic resistance in pathogenic species such as *Ostertagia ostertagi* (Waghorn et al., 2016) is certain to enhance this view, and is a potentially serious future problem for the cattle industry. The cost of covert (undetected) resistance in parasites of sheep has been estimated at up to 14% of lamb carcass value (Sutherland et al., 2010; Miller et al., 2012), but equivalent estimates for cattle have not previously been determined.

In New Zealand, *Cooperia* spp. dominate infections in cattle under 12–18 months of age. *Cooperia oncophora* resistant to the macrocyclic lactone (ML) class of anthelmintics are present on almost every farm in the country (Mason and McKay, 2006; Waghorn et al., 2006; Leathwick and Miller, 2013) and many of these populations are also resistant to benzimidazole anthelmintics (Waghorn et al., 2006). Despite this many New Zealand farmers continue to use single action ML products (Jackson et al., 2006) and most use pour-on formulations which are unlikely to deliver high efficacy against *C. oncophora* (Leathwick and Miller, 2013). The continued use of these products is likely to reflect the perception, held by most New Zealand cattle farmers, that anthelmintic resistance is not a significant animal health issue (Jackson et al., 2006). Consequently, many farmers are likely to be failing to control *C. oncophora* on their farms, and presumably they continue to do this because they see no indication of parasitism in the treated animals. While it is generally considered that *Cooperia* spp. are of secondary importance as parasites of cattle (Brunsdon, 1964; Familton, 2001; Sutherland and Scott, 2010) there is evidence that infection can result in detrimental effects on animal growth (Coop et al., 1979; Stromberg

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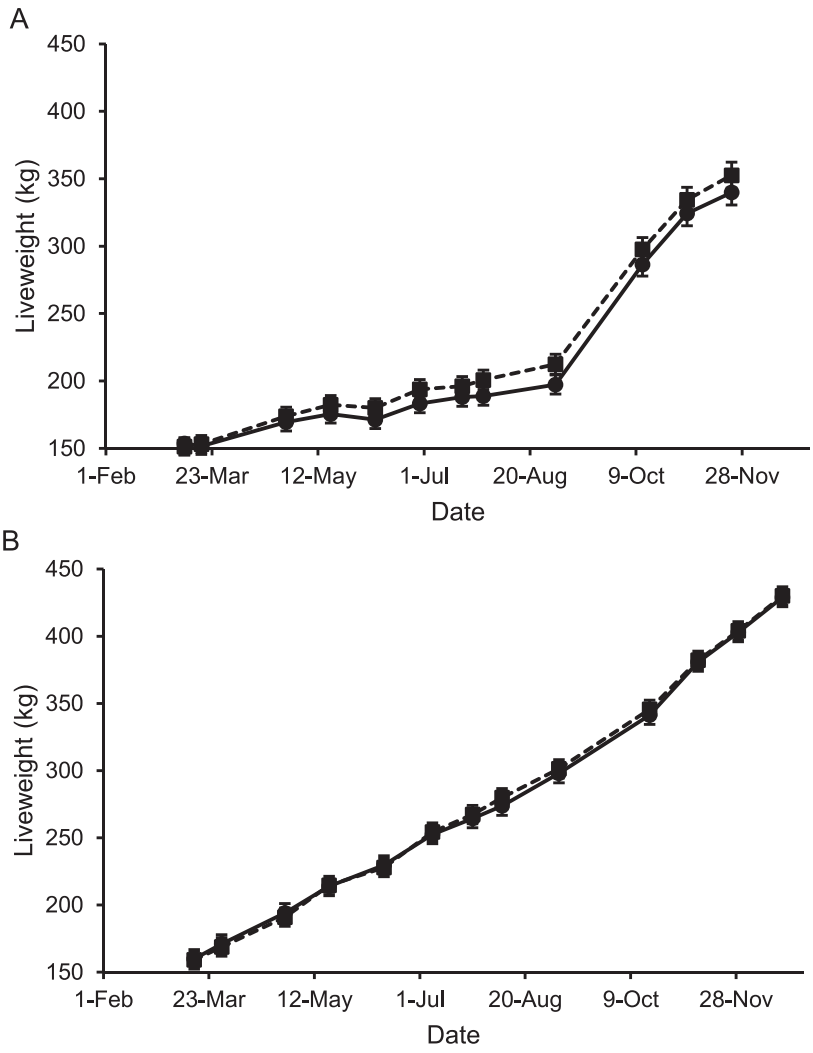

Fig. 1. Mean (± 95% CI) liveweights for A, 2010 and B, 2011 when calves were treated 5 times at 6 weekly intervals with either eprinomectin pour-on (solid lines) or eprinomectin pour-on plus an albendazole + levamisole combination oral drench (dashed lines).

et al., 2012; Leigh and Hunnam, 2013).

Part of the explanation for this apparent contradiction may lie in the levels of challenge to which cattle are exposed. Logically, continued use of a less than fully effective anthelmintic will result in increased levels of pasture contamination and subsequently the number of larvae ingested by grazing livestock. Thus, long-term use of single-active ML products might be expected to result in an accumulation of infective *Cooperia* spp. larvae on pasture and an increased impact on animal performance. Hence, a parasite with low inherent pathogenicity may have a greater impact as the numbers to which a host is exposed increase. The current study was, therefore, instigated to quantify the effect on liveweight gain of failing to adequately control *C. oncophora* by using single action ML pour-ons against a resistant worm population, and to determine whether this increased over time through any accumulation of larvae on pasture.

2. Methods

A replicated field study was conducted on the Flock House Research farm near Bulls in the Manawatu region of the North Island of New Zealand, from January 2010 to December 2011.

An area of approximately 24 ha was initially divided into 2 replicate blocks before each of these was divided into 20 adjacent paddocks which were grouped into 5 'clusters' of 4. The four paddocks within each cluster were then randomly allocated to one of four 'farmlets', a farmlet being a self-contained suite of paddocks carrying one group of animals and a single discrete worm population. Each farmlet, therefore, consisted of 5 paddocks, one from each cluster, which ensured that none of the paddocks within a farmlet were adjacent to each other and minimised the chances that any underlying pattern in the soil or pasture could influence the response to treatment. Each farmlet was randomly allocated to one of two treatments. Hence, eight farmlets, each of approximately 3 ha, were established in two complete replicate blocks of four, with the four farmlets within each block allocated to two replicates of two treatments.

Prior to the commencement of this trial the site was grazed with untreated 18–24 month-old cattle for several months in order to contaminate the site with cattle parasites, as previously it had been grazed exclusively with sheep for many years.

2.1. Animals

In January 2010, 80 newly weaned Friesian-Hereford cross calves were purchased at a commercial stock sale and transported to the farm. These animals were selected based on their uniformity of breed, size and condition, with no consideration given to their farm of origin or the anthelmintic resistance status of any parasites they may be infected with i.e. it was assumed that they would have a parasite infection and that any *C. oncophora* they were infected with would be largely resistant to ML anthelmintics. On their arrival at the research farm all calves were administered an oral dose of 0.2 mg/kg ivermectin (Ivomec, Merial Ancare New Zealand Limited, Auckland, New Zealand) which removed all parasite species except *C. oncophora* (mean post-treatment FEC was 128 eggs per g faeces (epg) and cultures were 96% *Cooperia*