Relevance of farmers criteria for targeted selective treatment against gastrointestinal nematodes in sheep

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Introduction

The increase of gastrointestinal nematode (GIN) resistance to anthelmintics (AH) is a worldwide challenge in sheep production. Targeted selective treatment (TST) reduces AH use as only part of the flock is treated (Kenyon, 2012). TST allows the maintenance of a nematode population in refugia and has been shown to slow down AH resistance development (Kenyon et al., 2012). The choice of animals to be treated is often made by farmers. Few studies have, however, studied the relevance of the criteria they use and the relevance of the treatment choice they make. Thus, the aim of this study was to assess the relevance of criteria used by farmers to apply TST and to test different treatment strategies.

Material & Methods

The study was conducted in the Drôme Valley, France on a mixed herd of 97 Mourerous and Merinos sheep (58 ewes, 21 lambs and 18 cull ewes). Five experienced sheep farmers individually estimated the GIN infection level (1 = low, 2 = medium, 3 = high) of each animal and stated their evaluation criteria guiding their estimate. Concurrently, faecal egg counts (FEC) were performed individually for all sheep using a McMaster method.

A linear regression (LR) was performed to test the relationship between FEC and the infection level estimated by farmers.

We then modelled two different situations by simulating the impact of deworming on infection levels and the number of animals treated. First, we calculated the number of animals left untreated when they had an infection level > 1000 FEC as well as the number of animals selected with < 1000 FEC by considering two possible farmers' strategies:

First, treating only animals rated 3, and second, those rated 2 and 3.

A second model was set up to identify animals requiring deworming (ewes only). For this, we considered that if more than half of the farmers had scored a ewe with an infection score of 3, it should be dewormed. We then compared this TST choice to (i) a random selection of animals to be dewormed, (ii) a target treatment by age and finally (iii) no treatment. Results were averaged for each group. Non-parametric mean comparison tests (Kruskal-Wallis for all the situations tested in one model and Wilcoxon for two by two comparisons) to highlight differences between the situations.

Results and Discussion

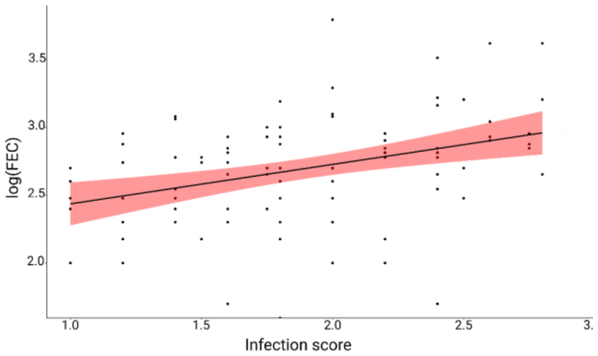

Figure 1 : Linear regression with log (epg) and mean of estimated infection score (1 = low to 3 = high) given by 5 farmers on 97 sheep. The red area shows the 95% confidence interval based on model regression analysis.

Average FEC of sheep was moderate with a large variability (687 ± 702). FAMACHA® and body condition score were the main criteria by all farmers to evaluate GIN infection.

Infection, as assessed by farmers was significantly correlated with FEC ($p = 0.02$, ajusted $R^2 = 0.09$) (Figure 1). Deworming ewes rated 3, resulted in 9 % of ewes >1000 FEC remaining untreated and 13% of ewes <1000 FEC treated in vein. If all ewes scored 2 and 3 are dewormed, the percentage of ewes > 1000 FEC and left untreated is reduced, but the proportion of ewes treated unnecessarily (i.e. < 1000 FEC is significantly increased (Figure 2).

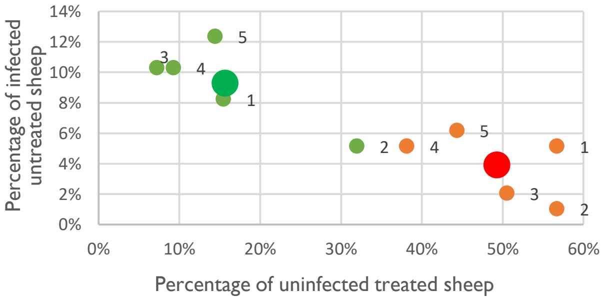

Figure 2 : Percentage of infected and untreated ewes and uninfected and treated and ewes with a threshold of 1000 FEC for infected animals and a score of 3 (green) or 2 and 3 (red) to determine which animals to treat. Means = large dots, individual farmers = small dots.

Deworming of animals scored 3 by at least 3 farmers results in 15 out of 97 sheep being treated. Figure 3 shows that target treatment and target selective treatment lead to a significant decrease in FEC average if compared to random treatment. Target selective treatment based on farmer estimates results in fewer animals treated and targets better high FEC value animals than targeted treatment ($p = 0.008$).

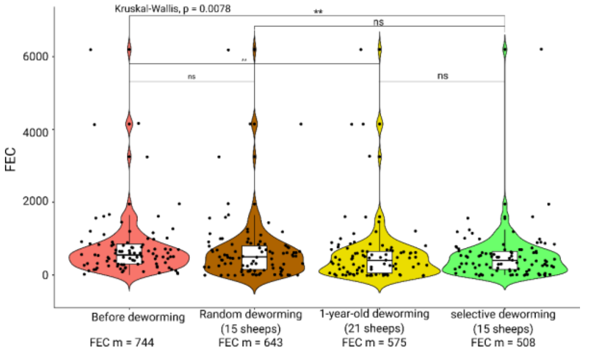

Figure 3 : Correlation between type of treatment (untreated, random treatment, targeted treatment (young animals only), targeted selective treatment (score 3 estimate by more than half of the farmers). $\bar{x}$: group mean recalculated by setting treated animals to 0 FEC. ns : not significant, ** : $p < 0.01$.

Conclusion

Farmers can recognize a significant proportion of GIN infected animals in a herd. This recognition is not absolute and some highly infected animals are not identified. However, the implementation of targeted selective treatments based on these observations leads to better results than random treatment or targeted treatment by group of animals.

Kenyon F., Jackson F. 2012. Targeted flock/herd and individual ruminant treatment approaches. Vet. Parasitol. 186, 10– 17.