Veterinary Parasitology 211 (2015) 71–79

Contents lists available at ScienceDirect

Veterinary Parasitology

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

Field evaluation of targeted selective treatments to control subclinical gastrointestinal nematode infections on small ruminant farms

F. Valcárcel*, A. Aguilar, M. Sánchez

Grupo de Parasitología Animal, Centro de Investigación en Sanidad Animal (INIA-CISA), 28130 Valdeolmos, Madrid, Spain

ARTICLE INFO

Article history:
Received 14 July 2014
Received in revised form 10 April 2015
Accepted 20 April 2015

Keywords:
Subclinical gastrointestinal nematodosis
Targeted selective treatments
Extensive management systems
Small ruminants

ABSTRACT

Targeted selective treatments (TST) are designed to identify those animals that would actually benefit from anthelmintic treatment, thus reducing the amount of drugs used and bringing down economic cost. In this study we assayed three TST programs based on GIN egg output, clinical sign and live weight criteria in a single area where only sub-clinical infections tend to occur and no anthelmintic resistance is reported. The study was carried out from February 2011 to August 2013 on four farms applying different management systems: an Ovine Extensive System, Ovine Semi-extensive Semi-irrigated System focusing on "Rubia del Molar" and Colmenareña" breeds, Ovine Semi-extensive System and Caprine Organic Semi-extensive System.

The number of sheep and goats treated in all the TST strategies was lower in comparison with systematic treatments, especially when selected based on clinical signs (100%, in both years), followed by egg output (87.57% and 90.44% in the first and second year respectively) and finally by live weight (37.95% and 96.69%, in the first and second year respectively). FEC was low throughout the study for all animals and groups. Apparently, the TST applied did not influence live body weight.

Preliminary results show that all three targeted selective treatments significantly reduced the number of animals treated and the cost of anthelmintic treatment on the farms, maintaining productivity in a low challenge environment. These results also seem to indicate that systematic anthelmintic treatments are unnecessary under these circumstances and traditional anthelmintic regimes should therefore be modified.

1. Introduction

Like many other agricultural production sectors, sheep husbandry is strongly influenced by environmental changes brought about by global climate change. Climate change can lead to the emergence of new diseases or changes in the prevalence of existing ones (Summers, 2009; Kenyon et al., 2009a). In this context, gastrointestinal nematodes (GIN) still remain a serious threat to small ruminant farming worldwide (Bentounsi et al., 2012; Mederos et al., 2012). Control of parasitic infections should be based on both knowledge of its epidemiology and appropriate management in combination with pharmacological products. However, most livestock producers administer anthelmintic treatment without any supporting diagnostic or epidemiological knowledge (Kenyon and Jackson, 2012; Valcárcel et al., 2013b).

While intensive or suppressive chemical treatment strategies can give rise to maximum production rates, they may not be economically sustainable and could lead to anthelmintic resistance (AR). Furthermore, AR is the single most important factor hindering the control of nematode parasite infection on small ruminant farms (Gilleard, 2006) and is global (for a review, see Jabbar et al., 2006). Therefore, a reduction in drug use is desirable to fight AR where it exists and to prevent unnecessary spending on small ruminant farms. The aim of targeted selective treatment (TST) is to identify those animals that could truly benefit from anthelmintic treatment thus reducing the use of drugs and economic cost. TST programs must be designed for each specific area and treatment application indicators need to be selected carefully (Greer et al., 2009). The objective is to apply the best criteria to animal selection which depends on the epidemiology of the parasites and the management system employed (Rinaldi and Cringoli, 2012); effective application depends on the accurate identification of those animals in need of anthelmintic treatment (Bentounsi et al., 2012).

* Corresponding author at: Parasitology Group, Animal Health Research Center (INIA-CISA), 28130 Valdeolmos, Madrid, Spain. Tel.: +34 91 620 23 00; fax: +34 91 620 22 47.

E-mail addresses: valcarcel.felix@inia.es (F. Valcárcel), aguilar@inia.es (A. Aguilar), maria2985@hotmail.com (M. Sánchez).

http://dx.doi.org/10.1016/j.vetpar.2015.04.014

Table 1
Characteristics of the study flocks.

	Flock 1	Flock 2	Flock 3	Flock 4	Flock 5
Type	Private meat farm	Government owned farm to provide selected individuals for private farmers		Private meat farm	Private organic milk farm
Species breed	Ovine crossed Merino	Ovine Rubia del Molar	Ovine Colmenareña	Ovine Alcarreña	Caprine Murciano Granadina
Flock size	900	180	140	2420	500
System	Extensive	Semi-extensive semi-irrigated		Semi-extensive	Semi-extensive
Grazing	Most of the time Large open areas Continental mountain forest Sometimes shared by cattle and wild red deer	5–6 six hours a day Small area Valley near the Tajo/Jarama rivers. Pasture irrigation commenced at the same time as this study. Both breeds graze together		5–6 h a day Mid-mountain area Small area Pastures are not shared	6–10 h a day Pastures are not shared
Location	Cuenca province 1239 m asl	Madrid province	495 m asl	Cuenca province 690 m asl	Madrid province 509 m asl
Reposition	Outside	Own		Outside	Reposition: own
Deworming	Mid-spring and Mid-autumn	No[a]		Mid-spring and Mid-autumn	No (organic farm)
Dose calculation	Average weight of flock[b]	Individual weight		Average weight of flock[b]	–
Check egg output before treatment?	No	Yes	Yes	No	
Deworming reposition	Yes	Yes	Yes	Yes	–
Age at beginning	3 months	12 months	12 months	3 months	3 months

Flock 1: Ovine Extensive System.
Flock 2: Ovine Semi-extensive Semi-irrigated System with the "Rubia del Molar" breed.
Flock 3: Ovine Semi-extensive Semi-irrigated System with the "Colmenareña" breed.
Flock 4: Ovine Semi-extensive System.
Flock 5CaOrSeS: Caprine Organic Semi-extensive System.
Asl: above sea level.
[a] During the previous five years egg output was regularly low or null.
[b] Heaviest animals receive a higher dose.

TST programs have been successfully applied in areas where clinical signs are evident and/or where AR has developed (Gallidis et al., 2009; Cringoli et al., 2009; Ouzir et al., 2011; Kenyon et al., 2013). However, it is not clear whether they work well in areas where GIN mainly produce subclinical infections as is the case on many small ruminant farms in Europe (Kenyon and Jackson, 2012; Valcárcel et al., 2013b). In this study we evaluated three TST programs based on GIN egg output, clinical signs or body weight loss in one area where only subclinical infections occur and no AR is reported.

Table 2
Number of animals treated using targeted selective treatment based on fecal egg counts, live weight loss and clinical signs; and reduction (%) in the number of anthelmintic treatments administered compared to a systematic treatment regime.

Flock	Deworming criterion	Group size	Months of sampling	During the first 12 months		During all the study	
				Number of animals treated	% reduction	Number of animals treated	% reduction
1	EOG	17	20	14 (27.2)	48.53	15 (40.8)	63.24
	LWG	17	20	6 (27.2)	77.94	7 (40.8)	82.84
	CSG	17	20	0 (27.2)	100.00	0 (40.8)	100.00
2	EOG	11	24	1 (17.6)	94.32	1 (35.2)	97.16
	LWG	12	24	15 (19.2	21.88	15 (38.4)	60.94
	CSG	12	24	0 (19.2)	100.00	0 (38.4)	100.00
3	EOG	10	24	4 (16.0)	75.00	8 (32.0)	75.00
	LWG	10	24	14 (16.0	12.50	15 (32.0)	53.13
	CSG	9	24	0 (14.4)	100.00	0 (28.8)	100.00
4	EOG	18	12	0 (28.8)	100.00		
	LWG	20	12	17 (32.0)	46.88		
	CSG	19	12	0 (30.4	100.00		
5	EOG	19	12	0 (30.4)	100.00		
	LWG	18	12	20 (28.8)	30.56		
	CSG	15	12	0 (24.0)	100.00		

Flock 1: Ovine Extensive System.
Flock 2: Ovine Semi-extensive Semi-irrigated System with the "Rubia del Molar" breed.
Flock 3: Ovine Semi-extensive Semi-irrigated System with the "Colmenareña" breed.
Flock 4: Ovine Semi-extensive System.
Flock 5: Caprine Organic Semi-extensive System.
EOG animals were only individually treated when elimination was equal to or higher than 300 GIN eggs per gram of feces (epg).
LWG animals were only individually treated when bodyweight was lower than 90% average group weight.
CSG animals were only individually treated when clinical signs appeared (diarrhea, severe bodyweight loss or anemia).
When an animal met deworming criteria for two consecutive months, the anthelmintic treatment was only administered the first time.
In brackets is the number of animals expected to be treated using the systematic treatment regime of 1.6 treatments per animal per year (Valcárcel et al., 2013b).