



## A telephone survey of internal parasite control practices on sheep farms in Spain

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### ABSTRACT

A telephone survey of farmers was conducted to determine current internal parasite control practices on sheep farms in Spain; the farmers were interviewed by their veterinarians. Anthelmintic choice was largely on veterinary advice and dominated by benzimidazoles and macrocyclic lactones. Anthelmintic rotation was separated into: no rotation (42% of farms); annual rotation (36%); rotate within year (20%); and rotate every second year (2%). The mean annual number of treatments varied subtly by region; ewes and rams 1.6–2.1, replacement lambs 1.7–2.1. Anthelmintics are administered primarily during spring and early summer (47% of treatments), and autumn (41%). Thirty-two percent of farmers introduced sheep to their properties and more than half did not quarantine drench the arrivals.

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### 1. Introduction

The prevalence of anthelmintic resistance in nematodes of small ruminants is largely unknown in the sheep farming regions of Spain. Despite earlier suspicions of resistance (Coles et al., 1993), the first confirmed case was that of benzimidazole resistance identified in *Teladorsagia circumcincta* infecting goats but associated with the importation of animals from Scotland (Requejo-Fernández et al., 1997). Subsequent to this finding, several regional surveys have been conducted to determine the prevalence of anthelmintic resistant nematode populations on sheep farms in the country. Faecal egg count reduction tests, egg hatch assays and/or larval feeding inhibition assays were used to measure drug resistance (i.e. reduced efficacy) in these surveys.

Álvarez-Sánchez et al. (2006) reported that all broad-spectrum anthelmintic classes available at the time were affected by resistance in the north-western region of

Castilla y León: benzimidazole, eight farms identified with resistance from 63 tested (12.7%); levamisole, nine farms from 26 tested (34.6%); and macrocyclic lactones, eight farms from 51 tested (15.7%). Pre- and post-treatment faecal coprocultures indicated *Teladorsagia* and *Trichostrongylus* were the main genera present. No parasite populations showed resistance to the three families, although six were recorded as being resistant or suspected as being resistant to two families.

A second survey (Diez-Baños et al., 2008) examined the efficacy of benzimidazoles and macrocyclic lactones on 72 farms in the region of Galicia (also in the north-west). Using data from faecal egg count reduction tests, resistance to benzimidazoles was identified on 13 of 72 farms (18.1%) and to the macrocyclic lactones on two of 72 farms (2.8%). *T. circumcincta* and *Trichostrongylus* spp. dominated coprocultures from benzimidazole-treated groups and only the former was recovered from coprocultures from macrocyclic lactone-treated animals.

In 2007–2009, a survey ( $n = 107$  farms) to determine the frequency of benzimidazole-resistance with a concurrent examination of contributing management and environmental factors was undertaken in the Aragon region of

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north-east Spain (Calvete et al., 2012). The estimated frequency of benzimidazole-resistance was 11% (determined by egg hatch assay), the sheep were treated 0.5–3 times/year, and spring and autumn were the predominant treatment periods.

Martínez-Valladares et al. (2012) recently characterised a *T. circumcincta* isolate from the province of León (in the region Castilla y León) finding resistance to levamisole and the macrocyclic lactones. The efficacy of the latter drug class varied with active ingredient and formulation type.

A survey ( $n=49$  farmers) of parasite control practices was completed in Galicia in 2001–2002 (Pedreira et al., 2006). In summary, anthelmintic treatment (1–2 times/year) was identified as the only parasite control practice and there was minimal interaction between the farmers and their veterinarians. Sheep were primarily treated in the spring or spring and autumn. No farmers completed faecal worm egg counts from their sheep before or after treatment and there was no quarantine anthelmintic treatment of incoming animals.

Aside from the regionalised surveys of Pedreira et al. (2006) and Calvete et al. (2012) there appears to be no published evidence of farmer practices in internal parasite control on sheep farms in Spain.

The release in Europe of both monepantel, the first amino-acetonitrile derivative anthelmintic to be developed for sheep (Kaminsky et al., 2008a,b) and a combination product containing abamectin + derquantel, the latter being the first spiroindole anthelmintic to be developed for sheep (Little et al., 2010, 2011) brings a responsibility for animal health professionals to understand how best to incorporate new anthelmintics into existing nematode control programs in a way that is least selective for resistance genotypes. Moreover, the opportunity of identifying how a new class could be used to help extend the lives of the older anthelmintics could also be explored as has been the case in New Zealand (Leathwick and Hosking, 2009) and Australia (Dobson et al., 2011a,b).

As a first step to providing guidance to veterinarians and animal health advisers in Spain on the use of new anthelmintics, the currently used internal parasite control practices and particularly the timing of treatments need to be better understood. In the absence of this type of information for Spain, a telephone survey of sheep farmers was conducted and the findings are reported herein.

## 2. Materials and methods

The survey was undertaken during the last quarter of 2008 and first half of 2009. Veterinarians with an interest

in sheep medicine conducted telephone interviews with farmers selected from their practices (these were often associated with sheep breeding associations or cooperatives). The survey protocol defined that farmers were to be selected at random but the potential for bias to occur in the selection process did exist, e.g. only those farmers likely to be amenable to interview may have been contacted. Each farmer participant was asked questions relating to farm and stock management, sheep demographics, and nematode control practices including treatment times, products, sources of advice and knowledge of anthelmintic resistance. The number of farmers to be interviewed in a defined region was determined on the basis of distribution of sheep in that region (i.e. the more sheep farmed, the greater the number of planned interviews). Survey responses were collated into spreadsheets (Microsoft Excel) and analysed. No statistical comparisons or repeatability evaluations (Scholl et al., 1994) were undertaken for this survey.

## 3. Results

Completed questionnaires ( $n=201$  from a planned 450) were received from the veterinarians who interviewed the farmers. This low completion rate was attributed to the veterinarians needing to focus their attentions on Bluetongue virus at the same time the survey was being conducted as opposed to farmers not being prepared to participate in the survey. Of the 201 responses, 196 were considered valid and therefore used in the analysis.

Approximately 65% of the sheep in Spain are farmed in the regions surveyed, viz. Andalucía (12%), Castilla y León (21%), Castilla-La Mancha (14%) and Extremadura (18%) (Ministry of Environment and Rural and Marine Affairs, Government of Spain, 2011). These regions are within the major areas for sheep meat and milk production (as evidenced by the sheep breeds described in Table 1). Galicia (Pedreira et al., 2006) and Aragon (Calvete et al., 2012) were not included in the present survey. After an initial breakdown of farm location to the provincial level, it was determined that the data would be analysed at regional and 'whole' country levels (Table 2).

### 3.1. General information

Farmers were asked for some general information about their farms and farming practices, particularly in relation to type of farming and their sheep being housed indoors. Durations of housing varied and in some responses, time periods were not recorded and were replaced by a description of associated events (e.g. lambing, milking etc.). In such

**Table 1**  
Farm type, housing of sheep and flock demographics.

Region	Farm type (% of flocks)			Housed (% of flocks)	Duration (months)			Mean flock size (range)		
	Mixed	Extensive shepherding	Other		Mean	Range	Main breeds	Ewes	Rams	Replacement lambs
Andalucía	60	40	0	95	2.4	1.0–6.0	Merino, Segureña	586(126–1080)	30(4–70)	85(0–80)
Castilla y León	67	15	18	95	3.8	1.0–12	Assaf, Churra	619(60–2000)	5(2–60)	100(0–500)
Castilla-La Mancha	94	2	4	94	5.3	1.7–12	Manchega	1235(235–4555)	29(4–110)	234(40–1000)
Extremadura	30	70	0	67	2.1	1.7–4.5	Merino	1366(350–5420)	52(10–150)	198(55–520)

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