Indian Journal of Animal Sciences **83** (8): 786–787, August 2013/Short communication

Anthelmintic resistance in gastrointestinal nematodes of cattle

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Received: 25 January 2013; Accepted: 27 March 2013

Key words: Anthelmintic resistance, FECRT, Cattle strongyles

Resistance to anthelmintic drugs against gastrointestinal nematodes of livestock has become an increasing problem in the recent years in many parts of the world (Prichard *et al*. 1980, Coles *et al*. 2006). For the control of parasites, a wide range of anthelmintics are available and the status of the present paper deals with the detection of anthelmintic resistance in 3 dairy farms located in Bengaluru city.

The 3 dairy farms were managed in a semi intensive system of grazing by day on pasture and housing at night. Regular anthelmintic drenching was carried out in the Military dairy farm (farm 1) 4 times a year. The drenching was carried out 3 times a year in Hessaraghatta (farm 2) and - NDRI farm (farm 3). In all the 3 farms albendazole (ABZ), fenbendazole (FBZ) were in use since the year 2000.

In each farm, heifers and lactating animals showing egg counts above 150 eggs per gram of faeces (EPG) and not treated 8–12 weeks prior to the test were selected irrespective of age, breed and sex, and were divided randomly into 5 groups of 10 animals each. Groups 1 and 2 were treated with ABZ (10 mg/kg BW) and FBZ (5 mg/kg BW) respectively. Group 3 animals received levamisole (LEV) (15 mg/kg BW). Animals in group 4 received ivermectin (IVM) @ 200 microgram/kg BW and group 5 animals (control) did not receive the anthelmintic treatment and were allowed for natural changes in egg counts during the tests.

Faecal samples were collected per rectum from individual cattle on the day of treatment and on 14th day of post treatment and egg per gram of faeces were determined as per Coles *et al.* (1992). Pretreatment pooled faecal samples from all the animals were cultured and third stage group wise larvae were identified based on the morphological characters (Anon 1971). Similarly on 14th day of post treatment faecal samples were collected and cultured to identify third stage larvae. The per cent faecal egg count reduction and efficacy for each anthelmintic were calculated as per Coles *et al.* (1992).

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The anthelmintic having efficacy less than 95% with lower 95% confidence limit less than 90 was considered as development of resistance in target parasite against the drug based on FECRT according to Coles *et al.* (1992). In the farm 1, FBZ and ABZ reduced the faecal egg count by 69% and 75% respectively with less than 90 lower 95% confidence limit. Levamisole treated group reduced the egg count by 98% with lower 95% confidence limit of 94%. However ivermectin was 99% effective in eliminating the infection with lower 95% confidence limit of 95% (Table 1).

In the farm 2, FBZ and ABZ reduced the faecal egg count by 80% and 77% respectively with lower 95% confidence limits of 66% and 63% respectively. The percent reduction was 98% in group treated with levamisole with lower 95 confidence limit of 94% (Table 1).

In farm 3, FBZ and ABZ reduced the faecal egg count by 94% and 98% respectively with lower 95% confidence limit of 84% and 94%.Levamisole treated group reduced the egg count by 96% with lower 95% confidence limit of 90%.However IVM was 99% effective in eliminating the infection and the lower 95% confidence limit was 95% (Table 1).

Culturing of faecal samples pre- and post-treatment showed mixed infections with *Trichostrongylus, Haemonchus, Cooperia, Bunostomum, Nematodirrus* spp. in all farms.

In this study strongyles were found to be resistant to FBZ and ABZ. The lower efficacy and resistance to FBZ and ABZ might be attributed to their continuous and prolonged use in controlling gastrointestinal nematodes in these farms. Levamisole had 96–98% efficacy with less than 95 lower 95% confidence limit whereas IVM has 98–99% efficacy with less than 95 lower 95% confidence limit. The study indicated susceptibility to levamisole and ivermectin.

Similarly, resistance to fenbendazole and albendazole against *Cooperia punctata, O. ostertagi* and *H. placei* which was reported by Miguel (2003), whereas Sreedevi and Hafeez, Papadopoulos (2000) reported the susceptibility of benzimidazoles in cattle against gastrointestinal nematodes

Table 1. Faecal egg count reduction test of four different anthelmintics in cattle

Anthelmentic	Mean pre treatment FEC			Mean post treatment FEC			Percent reduction in FEC			Lower 95% confidence limit			Upper 95% confidence limit			Results		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Control	1,200	980	850	1,800	1060	870	-	-	-	-	-	-	-	-	-	-	-	-
Fendbendazole	900	1,040	900	550	210	500	69	80	94	33	66	84	85	87	94	R	R	R
Albendazole	900	1,000	850	450	30	200	75	77	98	61	63	94	82	84	98	R	R	S
Levamisole	900	1,020	820	300	20	400	98	98	96	94	94	90	99	99	96	S	S	S
Ivermectin	900	-	800	200	-	100	99	-	99	95	-	95	100	-	99	S	-	S

as it reduced the egg count by 100%. In conclusion, there is a need to advice in alternate usage of anthelmintics along with integrated control measures against strongyles of cattle in view of the resistance to commonly used anthelmintics. As the levamisole and ivermectin are found to be effective to reduce the faecal egg count so it can be used alternatively with other anthelmintic drugs.

SUMMARY

Faecal egg count reduction test (FECRT) was used to detect anthelmintic resistance in cattle naturally infected with strongyle worms in 3 dairy farms in Bengaluru. The reduction faecal egg count with fenbendazole, albendazole, levamisole and ivermectin was 66–99, 75–77,96–98 and 99% with lower 95% confidence limits of 33–84, 61–94, 90–94 and 95 respectively. It was observed that *Trichostrongylus, Nematodirrus, Cooperia, Haemonchus, Bunostomum, Oesophagostomum* species developed resistance to benzamidazole except in one-farm but found to be susceptible with levamisole and ivermectin.

ACKNOWLEDGEMENTS

The authors thank ICAR, New Delhi, for facilities made for the research work through the Centre of Advanced Faculty Training in Veterinary Parasitology, Veterinary College, Bengaluru.

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