

Effectiveness of Albendazole, Oxfendazole and Ivermectin against gastrointestinal nematode infection in goats

(Eficácia do Albendazole, Oxfendazole e Ivermectin contra nematódeos
gastrintestinais de caprinos)

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SUMMARY

Twenty-seven native Brazilian goats were randomly allotted to three experimental groups containing seven animals each and one group containing six goats in order to study the efficacy of three broad spectrum anthelmintics. These goats harbored both naturally acquired and experimental infections. The groups with seven goats each were drenched with either albendazole (5.7 mg/kg liveweight), oxfendazole (4.5 mg/kg liveweight) or ivermectin (0.2 mg/kg liveweight) and the group with six goats remained untreated. At seven days post-treatment all goats were slaughtered and necropsied. *Post-mortem* worm counts showed the worm population of the treated groups was smaller than the untreated groups ($P < .05$). There was no difference in the worm population of the treated groups ($P > .05$). The mean efficacy of treated groups was 85.8% for the total worm population and 87.8% for *Haemonchus contortus*. Anthelmintic resistance and/or inadequate dosages might account for the results in this trial. These data stress the need for anthelmintic testing on goats.

KEY WORDS: Anthelmintics, Albendazole, Oxfendazole, Ivermectin, goats

RESUMO

Vinte e sete caprinos sem raça definida infectados com nematódeos gastrintestinais foram distribuídos ao acaso em três grupos contendo sete caprinos em cada um e um grupo

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contendo seis caprinos. Os grupos de sete caprinos foram tratados com albendazole (5,7 mg/kg de peso vivo), oxfendazole (4,5 mg/kg de peso vivo) ou ivermectin (0,2 mg/kg de peso vivo) e o grupo de seis caprinos permaneceu sem tratamento. Sete dias após o tratamento os caprinos foram sacrificados para colheita, contagem e identificação dos nematódeos. O número total dos nematódeos encontrados nos animais tratados foi menor do que nos não tratados ($P < 0,05$). Nenhuma diferença foi observada no número total de nematódeos encontrados entre os grupos tratados ($P > 0,05$). A eficácia média dos grupos tratados foi de 85,8% para o total de nematódeos encontrados e 87,8% para *Haemonchus contortus*. Os dados enfatizam a necessidade de testes para determinação da dose terapêutica adequada para caprinos.

PALAVRAS-CHAVES: Anti-helmínticos, Albendazole, Oxfendazole, Ivermectin, caprinos

INTRODUCTION

Goat farmers in Northeastern Brazil rely mainly on anthelmintic drenches for control of gastrointestinal nematodes. The most commonly used anthelmintics in the region, levamisole, albendazole and parbendazole, were shown to have reduced efficacy when used at dosages recommended for sheep (CHARLES et al 1989).

There is a great need for anthelmintic testing on goats, as it is well known that the pharmacokinetics of levamisole and benzimidazole differ between sheep and goats. This difference jeopardizes the use of dosages recommended for sheep gastrointestinal infection of goats (GALTIER et al, 1981; HALL et al, 1981; KETTLE et al, 1983; McKENNA, 1984; GILHAM & OBENDORF, 1985; McKENNA & WATSON, 1987). A trial was set up to check the efficacy of the anthelmintics in goats which could be recommended as an alternative to levamisole, albendazole and parbendazole.

MATERIAL AND METHODS

Twenty seven SRD goats (no-defined breed) averaging 12 months of age and weighting 20 kg were used in a trial conducted at Estação Experimental de Manejo da Caatinga and at Laboratório de Saúde Animal - Centro de Pesquisa Agropecuária dos Trópico Semi-Árido (EMBRAPA-CPATSA). To remove residual infection they were drenched with oxfendazole (10 mg/kg liveweight) and were found to be negative for

eggs seven days later (Wisconsin sugar flotation). After drenching they were allowed to graze together on a pasture known to be contaminated by gastrointestinal nematode infective larvae from June 8 to August 1, 1989. Fourteen days after they were added to the pasture, each goat was infected orally with an inoculum containing 4000 mixed infective larvae, in which *Haemonchus contortus* predominated.

Thirty five days after infection, the goats were randomly allotted to four experimental groups. One group, containing six goats, remained untreated while the other three groups, containing seven goats each, were drenched with albendazole*, oxfendazole** or ivermectin***. The albendazole treated group was drenched with 1.5 times the recommended dosage for sheep (5.7 mg/kg liveweight) while the oxfendazole and ivermectin treated groups were drenched with the dosage levels recommended for sheep by the drug manufacturers (4.5 mg/kg and 0.2 mg/kg, respectively). After treatment, goats were held in confinement for seven days prior to necropsy.

Inoculum preparation, goat infection, collection, enumeration and identification of adult and immature worms were done as described previously (CHARLES et al, 1989).

Anthelmintic efficacy was analyzed for significance at 5% level using one-way analysis of variance. To stabilize variance, worm counts were transformed by $\log(x+25)$ (BOX & COX, 1964).

RESULTS

Albendazole reduced 83.8% of the total worm population of treated goats while oxfendazole and ivermectin reduced it 84.8% and 88.8%, respectively. The mean number of total worms and of *Haemonchus contortus* found in the control and treated goats and the efficacy of each treatment can be seen in TABLE 1. *Oesophagostomum columbianum* was present in five of the untreated goats with a mean number of 92 (range of 30 to 130) and no *O. columbianum* was found in any of the treated groups.

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TABLE 1

Arithmetic mean number of nematodes recovered (adults and immatures) and efficacy of treatment with albendazole, oxfendazole and ivermectin

Nematode	Control		Albendazole		Oxfendazole		Ivermectin	
	N ^o worms	N ^o worms	Efficacy	N ^o worms	Efficacy	N ^o worms	Efficacy	
<i>H. contortus</i>	1218 a	148 b	87.8	176 b	85.6	121 b	90.0	
Total	1343 a	217 b	83.8	204 b	84.8	150 b	88.8	

Mean number of worms with different superscript in the same row are significantly different ($P < 0.05$). Values shown refer to actual arithmetic mean rounded to the nearest integer, but mean comparisons were made on log transformed data. Efficacy calculated by comparing post-treatment counts with counts in control animals.

DISCUSSION

There was no difference in the total worm population and *H. contortus* found among the treated groups ($P > 0.05$). Therefore, the mean efficacy of the anthelmintic agents in the treated groups against total worms and *H. contortus* was 85.8% and 87.8%, respectively. These means are below the cut off point of 90% recommended by PRESIDENTE (1985). The number of surviving worms was below 1000 worms which was suggested by PRESIDENTE (1985) as one of the cut off points to consider a worm population to be resistant. However, goats in the region generally harbor less than 1000 worms and are susceptible to the effects of low worm populations (PADILHA, 1982).

Few experiments on the use of albendazole, oxfendazole and ivermectin in goats have been reported. In these studies, adequate and inadequate efficacy results were observed. Previous experiments with albendazole at 3.8mg/kg of body weight in the State of Pernambuco showed a 71% reduction in total worm counts in treated goats (CHARLES et al, 1989). In other regions, when dosages were increased to 7.6 mg/kg to

10.0 mg/kg of body weight, the efficacy was greater than 99% (SATHIANESAN & SUDARAN, 1982; POMROY et al, 1988).

Oxfendazole when used at dosages of 4.5 mg/kg to 5.0 mg/kg body weight reduced worm population from 93 to 100% (MICHEL et al, 1979; RAHAMATHULLA et al, 1985; ELLIOT, 1987; McKENNA & WATSON, 1987). In the neighboring State of Ceará oxfendazole reduced only 62% of the worm counts of treated goats. When it was used in sheep infected with the same strain and treated with the same dosages, a reduction of 82.5% on their worm population was observed (VIEIRA et al, 1989a,b). Low reduction of worm counts was also observed when oxfendazole was used at 10.0 mg/kg of body weight in the United Kingdom (SCOTT et al 1989).

Ivermectin has been shown to be highly efficient in eliminating the worm burdens of goats (SWAN & GROSS, 1985, NJANJA et al, 1987). In sheep, however, a resistant strain of *H. contortus* was isolated from Southern Brazil and South Africa (ECHEVARIA & TRINDADE, 1989; VAN WYK & MALAN, 1988).

Goats and sheep in Northeastern Brazil are kept in communal pastures. Considering that sheep and goats share the same nematodes, the continuous use of underdosing in goats could contribute to the development of resistance in both hosts.

These data stress the need for anthelmintic testing on goats. Additional studies should be conducted, including controls which can eliminate the possible occurrence of resistance.

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