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Evaluating the efficacy of ivermectin and levamisole against gastrointestinal nematodes in goats

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Abstract

368 goats that were presented to the Campus Veterinary Hospital and Ambulatory Clinical Services, Mylardevpally, College of Veterinary Science, Rajendranagar, Hyderabad, from December-2017 to June-2018 were selected and screened for gastrointestinal nematodal infestation by different techniques (gross, direct faecal smear, sedimentation and flotation), out of which 140 goats (38.04%) were found positive for gastrointestinal nematodal infestation. Goats positive for gastrointestinal nematodal infestation were randomly divided into two groups (II and III) with each group having 10 positive cases. Efficacy of ivermectin (group II) and levamisole (group III) was evaluated by egg per gram technique. Faecal examination at day 0 revealed an egg per gram of 1520 ± 156.20 and 1310 ± 126.88 in group II and III, respectively. The use of direct smear, flotation and sedimentation techniques revealed *Strongyles spp.*, *Trichuris spp.* and *Strongyloides spp.* in these animals. Egg per gram counts of the animals treated with ivermectin (group II) is reduced by 86.22, 100 and 100% on day 3, 5 and 7 post-treatment respectively, and levamisole (group III) reduced by 77.38, 97.20 and 100% on day 3, 5 and 7 post-treatment respectively.

Keywords: Ivermectin, levamisole, goats

1. Introduction

Goats are one of the earliest domesticated ruminants which have served mankind longer than cattle and sheep. Over 94% of the goat population of the world is distributed in two continents Asia and Africa (Acharya, 1992) ^[1]. South Asian countries including India, Bangladesh and Pakistan are the major producers of goat milk, whereas, in Europe the most developed dairy goat industry is in France, Greece and Italy. Indian breeds such as Jamunapari, Barbari, Beetal, Surti produce fairly good amount of milk (Pal *et al.*, 2010) ^[2]. Goat is the means of livelihood for many marginal farmers, it contributes about 47.3 million rupees to national economy, particularly through milk, meat and by-products apart from providing the best quality manure, hair, skin, hides etc. (Rekib and Vihan, 1997) ^[3]. They are kept primarily for milk and meat so they contribute substantially to household income and food security in the rural areas. They provide a dependable source of income to about 40% of the rural population below poverty line in India and to many who do not possess any land. (Viswanath, 2002) ^[4]. Goat population in Telangana is 135.2 million. (According to Animal Husbandry annual report 2016-2017, 19th livestock census, 2012).

Helminths are common parasites of animals. Usually they are present in large numbers and have high species diversity. Gastrointestinal helminth infections are recognized as a major constraint to livestock production throughout the tropics and elsewhere (Githiori *et al.*, 2004) ^[5]. They cause lowered productivity (Perry and Randolph, 1999) ^[6], mortality (Sykes, 1994) ^[7], and high economic losses (Iqbal *et al.*, 1993) ^[8] affecting the income of small dairy farming communities. Parasitic infestations especially with gastrointestinal nematodes limit the productivity of livestock due to the associated morbidity, mortality, and cost of treatment and control measures (Nwosu *et al.*, 2007; Raza *et al.*, 2010) ^[9, 10]. The host-parasite relationship in case of nematode parasites result into large scale damage at the site of attachment. In spite of significant production losses, which may run into millions of rupees (Shah and Chaudhry, 1995) ^[11] the problem, is being neglected due to its chronic and insidious nature (Sanyal, 1998) ^[12].

Chemotherapy is the common method of treating and controlling parasitic gastroenteritis (Urquhart *et al.*, 2003) ^[13]. Ivermectin comes under macrocyclic-Lactones (ML) class of endectocides which, by increasing the membrane permeability to chloride ions, mediate the paralysis of the nematodes and certain classes of ectoparasites.

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Since the introduction of ivermectin in the beginning of the eighties, it has become a revolution in the veterinary therapy due to its wide spectrum activity and high efficacy besides the fact that it is active at extremely low dosages. It is established that subcutaneous injection is the most efficient route for ivermectin administration in terms of drug bioavailability in target animals when compared to oral administration of other drugs.

1.1 The present study was conducted with the following objectives

1. To find out the efficacy of ivermectin and levamisole against gastrointestinal nematodes in goats

2. Materials and methods

The present investigation was carried out in the Department of Veterinary Medicine in collaboration with the Department of Veterinary Parasitology, College of Veterinary Science, Hyderabad.

Five grams faecal sample was collected directly from the rectum of each goat with faecal scoop in a zip lock cover (Fig. 1). The collected samples were analysed by Direct Smear Method and Sedimentation /Salt Flotation Technique for the presence of nematodal eggs. The goats found positive for eggs of nematodal were again subjected to quantitative evaluation of Egg per gram on day 0, 3, 5 and 7 by modified McMaster's technique for the determination of level of parasitic infestation as described by Eysker and Ploeger (2000) [14]. Goats with faecal samples positive for gastrointestinal nematodal eggs were selected and were randomly divided into two groups viz., II and III and consisting of 10 animals each group. Two different drugs were administered as a single dose and the therapeutic efficacy was evaluated. Group II and III animals were treated with ivermectin (Neomec) at 200 µg/kg bw subcutaneously and levamisole (Nilverm) at 7.5 mg/kg bw orally, respectively. The efficacy of the therapeutic regimens were assessed based on reduction in the Egg per gram counts (EPG) on day 3, 5, 7. The Data collected was analyzed statistically as per the methods described by Snedecor and

Cochran (1967) [15].



Fig 1: Collection of faeces per rectally.

3. Results

The results of the present study are presented in Table 1. All 20 animals were found positive for gastrointestinal nematode parasites on day 0 of the experiment. The quantitative faecal evaluation on at day 0 revealed an egg per gram of 1520 ± 156.20 and 1310 ± 126.88 in group II and III, respectively. Ivermectin (Group II) reduced the egg counts by 86.22, 100 and 100%, respectively on day 3, 5 and 7 post-treatment and levamisole (Group III) reduced the egg counts by 77.38, 97.20 and 100%, respectively on day 3, 5 and 7 post-treatment. Pre-treatment faecal examination of each group identified *Strongyles spp.* as the predominant parasite (62.86 %) followed by *Trichuris spp.* (23.57 %) and *Strongyloides spp.* (13.57 %). However, the faecal egg counts were recovered from levamisole treated animals on day 3 and 5 post-treatment, while eggs were completely eliminated from ivermectin treated animals on day 5 and 7 post-treatment.

Table 1: Therapeutic Efficacy of Ivermectin and Levamisole against gastrointestinal-nematodal infestation in goats

Animal group	Therapeutic Drug	Egg per gram	Mean EPG \pm S.E	% Efficacy
II	Ivermectin	Day 0 (15200)	1520 ± 156.20	
		Day 3 (2200)	220 ± 38.87	86.22 ± 1.44
		Day 5 (0)	0 ± 0	100 ± 0
		Day 7 (0)	0 ± 0	100 ± 0
III	Levamisole	Day 0 (13100)	1310 ± 126.88	
		Day 3 (3200)	320 ± 59.25	77.38 ± 2.31
		Day 5 (500)	50 ± 30.73	97.20 ± 1.65
		Day 7 (0)	0 ± 0	100 ± 0

4. Discussion

In the present study it was noticed that levamisole was moderately effective against gastrointestinal nematodal infested goats. These observations were in agreement with the findings of Guha *et al.* (1987) [16], Charles *et al.* (1989) [17] and Keyyu *et al.* (2002) [18] and Hassan *et al.* (2012) [19]. Levamisole comes under Imidazothiazole group, which kills gastrointestinal nematodes by depolarizing nicotinic neuromuscular junctions and also acts as a cholinergic agonist in mammals, which was the basis for its narrow therapeutic index (Williamson, 2013) [20]. In the present study it was noticed that ivermectin was effective against gastrointestinal nematodes in goats. These observations were in agreement

with the findings of Dacasto *et al.* (1995), Godara *et al.* (2011), Hassan *et al.* (2012), Regassa *et al.* (2013) and Sharma *et al.* (2015).

Ivermectin comes under Macrocyclic Lactone group. The primary activity of the ivermectin is directed at the glutamate-gated ion exchange gates in the cellular membrane of the nerves and muscles of the nematodes and cause flaccid paralysis of the nematodes by interfering with neurotransmission and muscle cell junction. The antiparasitic effect is mediated through selective binding to glutamate-gated chloride ion channels and Ivermectin has a wide safety margin in mammals (Sharma *et al.*, 2015 and Godara *et al.*, 2011)

As depicted the efficacy of anthelmintics that were involved in the study were judged on Egg per gram (EPG) count on day 3. The efficacy could be judged by bringing down EPG earliest i.e., day 3. In the present investigation ivermectin could effectively bring down EPG count on day 3 itself, whereas the group of goats received levamisole remained second on day 3, but was effective on day 7.

5. Conclusion

The findings of the present investigation suggest ivermectin was an ideal anthelmintic preparation that could be employed in the treatment of both single and mixed gastrointestinal nematodal infestation in goats.

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