Efficacy of fenbendazole and ivermectin against naturally occurring gastrointestinal helminths of Chottanagpuri sheep at Ranchi, Jharkhand

A Jena, Lalita Kumari, AR Deb, SK Joshi and SS Biswal

Abstract

This study was aimed at evaluation of efficacy of common broad spectrum anthelmintics viz. Fenbendazole and Ivermectin, against gastrointestinal helminths in Chottanagpuri sheep of Jharkhand. A total eighteen growing lambs and twelve pregnant ewes were taken for the study, Fenbendazole was administered at the dosage of 10mg/Kg body weight orally and Ivermectin at the dosage of 0.2mg/Kg body weight subcutaneously. The egg per gram estimation were carried out on zero days before treatment and twice weekly upto 14th day post treatment and the efficacy was evaluated using fecal egg count reduction test. This experiment concludes that there is no such emergence of anthelmintic resistance in Chottanagpuri sheep pertaining to Fenbendazole and Ivermectin.

Keywords: anthelmintic resistance, Chottanagpuri sheep, gastrointestinal nematodes, fecal egg count reduction test, Fenbendazole, Ivermectin, Jharkhand.

Introduction

Gastrointestinal parasitism is of paramount importance in different agro-climatic zones and a potential threat to the livestock production and its economic growth (Meenakshisundaram et al., 2014 and Kumari et al., 2017) [12, 8]. The losses include anorexia, reduced feed intake and alteration in protein metabolism, along with loss of blood and plasma protein in the gastrointestinal tract. There are great economic losses in terms of decreased growth rate, reduction in wool production, sub-optimal reproduction and sometimes mortality (5-10%) of (adult and new born lambs) animals (Nasreen et al., 2007; Meenakshisundaram et al., 2014 and Kumari et al., 2017) [14, 12, 8]. As a result, diseases caused by helminths remain one of the major global impediments to small ruminant production (Kumsa and Abebe, 2009) [9]. In tropics upto 95% of sheep and goat are reported to be infected with helminths of which Haemonchus and Trichostongylus are the two most commonly involved genera (Odoi et al., 2007 and Mbuh et al., 2008) [16, 11]. Free ranching and open grazing in sheep leads to parasitic gastroenteritis both in clinical and subclinical forms. Gastrointestinal parasitism has been commonly treated by using variety of anthelmintics (Lalchandama, 2010 and Hassan et al., 2012) [10, 3]. This has inevitably led to development of anthelmintic resistance rendering helminths infection rampant as ever. So, anthelmintic resistance can be understood by drug efficacy studies of common broad spectrum anthelmintics (Meenakshisundaram et al., 2014) [12].

Perusal of literature indicates that very limited attempts have had been made to study the efficacy of broad spectrum anthelmintics in Chottanagpuri sheep of Jharkhand. Hence, this study was designed to detect the resistance to the most commonly used anthelmint-ics viz. fenbendazole and ivermectin against gastrointestinal helminths of Chottanagpuri sheep by the widely used in vivo fecal egg count reduction test (FECRT).

Materials and Methods

After getting approval of the Animal Ethical Committee, naturally infected growing lambs of Chottanagpuri sheep and pregnant ewes with gastro-intestinal helminths were selected among the farmers for evaluating the anthelmintic efficacy. A total of 18 number of Chottanagpuri growing lambs naturally infected with common gastro-intestinal helminthic parasites were selected for this trail. They were then, divided into three groups viz. T1, T2 and T3 each consisting of six lambs being treated with Fenbendazole at the dosage of 10mg/Kg body (Meenakshisundaram et al., 2014 and Kumari et al., 2017) [12, 8].
Similarly, in the 2nd part of this experiment, a total of 12 pregnant ewes were selected having almost similar gastrointestinal infections as observed in the case of growing lambs. These experimental pregnant ewes were divided into two groups comprising of six animals each, viz., T₁ and T₂. The ewes in group T₁ were treated with Fenbendazole at the dosage of 10mg/Kg body weight orally and T₂ were left untreated.

The egg per gram (EPG) estimation were carried out on zero days before treatment and twice weekly upto 14th day post treatment as per the method described by Stoll (Zajac and Conboy, 2011).

Results

The anthelmintic efficacy of Fenbendazole and Ivermectin against natural G.I. Helminths in Growing Lamb is presented in Table 1. The growing lambs (Group T₁) naturally infected with G.I. helminths were treated with Fenbendazole at the dose rate of 10 mg /Kg body weight orally and pre treatment EPG observations and per cent efficacy of drugs were taken before treatment (0 day) and post treatment EPG were recorded on day 3rd, 7th, 10th and 14th day. The EPG counts done on 3rd day post treatment indicated 76.47% efficacy of the drug whereas 96.08% efficacy was observed on 7th day with 97.02% efficacy on 10th day post treatment, lastly on 14th day, 97.19% anthelmintic efficacy was observed. All the six lambs (Group T₂) naturally infected with G.I. helminths were treated with Ivermectin at the dose rate of 0.2mg/Kg body weight by subcutaneous route on 0 day showing the EPG count as 900 ± 57.72. But when the EPG count was done on 3rd day post treatment, the drug was found to be 87.04% efficacious. The EPG counts from 7th day recorded an anthelmintic efficacy of 98.67%, thereon 100% efficacy was observed upto 14th day post treatment. The G.I. Helminth infected untreated control lambs (Group T₃) continued to discharge the eggs during the entire treatment period.

Discussion

The maximum pathogenic effects of gastro-intestinal parasitic infections in sheep are observed between two and half to three months’ age because the growing lambs after weaning are allowed to graze and house after weaning along with other animals of different age groups (Meenakshisundaram et al., 2014 and Kumari et al., 2017) [12][13]. This situation necessitates the control of G.I. helminths infection in growing lambs. Therefore, the control of G.I. helminths like, Paramphistomum, Fasciola, Moniezia expansa, Moniezia benedeni, Strongyloides, Trichostrongylus, Haemonchus, Trichuris, Oesophagostomum, Ostertagia and Cooperia infecting growing lambs were carried out by application of different broad spectrum anthelmintics. The anthelmintics, Fenbendazole and Ivermectin were chosen and administered in prescribed doses to the naturally infected animals in different groups. Both the drugs, Fenbendazole and Ivermectin showed higher anthelmintic efficacies from 7th day onwards as recorded by the post treatment EPG observations. Similar, results have also been observed by Hovorka et al. (1975) [4], Islam et al. (2003) [5], Nasreen et al. (2007) [14] and Mekala et al. (2012) [13] in Fenbendazole and by Islam et al. (2003) [5], Nasreen et al. (2007) [14], Nasreen et al. (2008) [15] and Desie and Amenu (2010) [2] in Ivermectin. Altogether it was found that Ivermectin was better and more effective than Fenbendazole. Long term effective control of G.I. helminths infection in Chottanagpuri sheep could be achieved by using the package of anthelmintic control both in organized as well as unorganized farming conditions. The use of supportive drugs was included keeping in mind to restore the normal functioning of different vital organs and also, to neutralize the undesirable effects on health and growth status caused by parasites (Nasreen et al., 2008 and Desie and Amenu, 2010) [15][16]. For optimizing the production from sheep farming it is highly essential to keep the animals as far as possible parasite

<table>
<thead>
<tr>
<th>Groups (No. of animals)</th>
<th>Drugs used</th>
<th>Dosage &amp; route</th>
<th>Avg. Pre-treatment EPG (0 day)</th>
<th>3rd day</th>
<th>7th day</th>
<th>10th day</th>
<th>14th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁(6)</td>
<td>Fenbendazole</td>
<td>10mg/ Kg B.Wt. (Orally)</td>
<td>850.00 ±7.63</td>
<td>200.00+57.63</td>
<td>33.33 ±21.08</td>
<td>29.97 ±11.03</td>
<td>27.27 ±10.07</td>
</tr>
<tr>
<td>T₂(6)</td>
<td>Ivermectin</td>
<td>0.2mg/Kg B.Wt. (S/C)</td>
<td>900.00 ±57.72</td>
<td>116.67 ±16.66</td>
<td>22.11 ±10.04</td>
<td>0.00 ±0.00</td>
<td>0.00 ±0.00</td>
</tr>
<tr>
<td>T₃(6)</td>
<td></td>
<td></td>
<td>666.67 ±49.43</td>
<td>866.67 ±42.15</td>
<td>916.67 ±40.13</td>
<td>966.67 ±49.43</td>
<td>1000.00 ±44.71</td>
</tr>
</tbody>
</table>

Group T₁ – Fenbendazole treated; Group T₂ – Ivermectin treated; Group T₃ – Infected Untreated control.

Table 2: Efficacy of Fenbendazole against Natural G.I. Helminths in Pregnant Ewes.

<table>
<thead>
<tr>
<th>Groups (No. of animals)</th>
<th>Drugs used</th>
<th>Dosage &amp; route</th>
<th>Avg. Pre-treatment EPG (0 day)</th>
<th>Avg. post-treatment EPG &amp; Drug Efficacy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr (6)</td>
<td>Fenbendazole</td>
<td>10mg/ Kg B.Wt. (Orally)</td>
<td>700.00 ±57.74</td>
<td>83.33 ±40.14 (88.10%)</td>
</tr>
<tr>
<td>T₁(6)</td>
<td></td>
<td></td>
<td>633.33 ±42.16</td>
<td>733.33 ±55.78</td>
</tr>
</tbody>
</table>

Group T₁ – Fenbendazole treated; Group T₂ – Infected Untreated control.
free from the time of birth itself. There are several parasites which affect lambs during the gestation period (145 ± 5 days) or just after parturition affecting the health conditions and growth rate in early stages of the growing lambs (Mekala et al., 2012) [13]. Thus, it becomes essential to apply the parasite control measures during the stage of pregnancy. The present study was thus conducted to control the natural common G.I. parasitic infection in pregnant ewes/sheep, so that the difference in growth rate and health condition of lambs during early period of life could be compared with that of the lambs born to parasite infected pregnant ewes. The anthelmintic Fenbendazole being economical and safe to be used during pregnancy was used to control G.I. parasites in pregnant ewes (Mekala et al., 2012; Meenakshisundaram et al., 2014 and Kumari et al., 2017) [13, 12, 8]. The result obtained during the present investigation revealed that the G.I. parasitic infection in pregnant ewes could be successfully controlled by Fenbendazole. However, the findings of the present study could be more authentic if such package of controlling parasitic infections during pregnancy be applied on larger no of naturally infected animals in both extensive and semi-intensive farming conditions. Similar, results have also been observed by Kelly et al (1977) [17]; Janssen, D. L. (1985) [6]; Barutzki et al. (1989) [1]; Raman et al. (2000) [13] and Mekala et al. (2012) [13] in Fenbendazole.

Conclusion
Anthelmintic treatment has been serving as the most effective mean for the control and amelioration of helminth infections in livestock including sheep. The prolonged and indiscriminate use of anthelmintics has led to emergence of anthelmintic resistance, which is a major constraint for nematode control throughout the world including India (Singh et al., 2002 and Meenakshisundaram et al., 2014) [18, 19, 12]. But this experiment concludes that there is no such emergence of anthelmintic resistance in Chottanagpuri sheep pertaining to Fenbendazole and Ivermectin.

Acknowledgement
The authors are thankful to the Dean, Ranchi College of Veterinary Science and Animal Husbandry, Kanke, Ranchi for providing all the facilities to undertake this research work.

References
20. Zajac AM, Conboy GA. Veterinary Clinical Parasitology. 8th Ed. Wiley-Blackwell Publication 2011; Chichester, West Sussex, UK.