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## Therapeutic efficacy of anthelmintics in management of *Toxocara vitulorum* infection in calves

**Gunajit Das, DN Kalita, Arabinda Phukan, TC Dutta, G Mahato and SC Phukan**

**Abstract**

A study was carried out to evaluate the therapeutic efficacy of anthelmintics i.e; Pyrantel pamoate, Piperazine citrate and fenbendazole for the treatment of *Toxocara vitulorum* infection in few local and cross-bred cattle calves of Assam upto 6 months of age. Faecal samples were collected before treatment and after treatment to count the eggs per gram (EPG) of faeces and drug efficacy percentage was estimated. The overall efficacy of piperazine citrate was found to be higher (78.79%), followed by fenbendazole (78.28%) and pyrantel pamoate (75.81%). However all the three anthelmintics were effective against *Toxocara vitulorum* infection, but considering the reduction in EPG count, cost and availability, fenbendazole at the dose rate of 7.5 mg per kg body weight for a single dose, may suitably be recommended along with the supportive therapy against *Toxocara vitulorum* infection in calves.

**Keywords:** Therapeutic-efficacy, Anthelmintics, *Toxocara vitulorum*, calves

**Introduction**

Toxocariasis is a common problem in cattle mainly in the calves as it accounts for high morbidity and calf mortality. Toxocariasis in bovines is caused by the gastro-intestinal nematode *Toxocara vitulorum*, which mainly affects the younger calves, incidence being highest in calves below 3 months of age (Pradhan *et al.*, 1991) [8]. Eggs of *Toxocara vitulorum*, started appearing in faeces of newborn calves as early as six days after birth and 81.6% infection rate in 19 days, reaching a peak in 60 days, however, no infection was found beyond 90 days (Gupta, 1986) [2]. Studies also revealed that the reason for higher incidence in calves is due to transmission of the larvae from cows to newborn through colostrum and transplacental route. Toxocariasis is characterized by unthriftiness, pot-bellied or tucked up abdomen, dull and harsh body coat, anaemia, restlessness, weight loss, stunted growth, sub-normal body temperature, constipation followed by diarrhoea and death of calves due to intestinal obstruction may occur (Soulsby, 1982) [10]. Toxocariasis also causes significant alteration in the haemato-biochemical status of the affected calves which leads to poor growth of the calves. For treatment of Toxocariasis in calves various anthelmintics like Piperazine, Fenbendazole, Albendazole, Pyrantel pamoate or Ivermectin have been used and they have reported different levels of efficacy. Piperazine administered at dose rate of 200 mg/kg body weight orally as a single dose reduced the EPG to 100% by 21 days post-treatment and levamisole at dose rate of 7.5mg/kg body weight subcutaneously as single dose was effective by 7<sup>th</sup> day post treatment in buffalo calves (Srinivasa Rao *et al.*, 2000) [11].

**Material and Methods**

Calves were grouped into 4 clinical groups containing 6 animals in each group, out of which Group I, Group II and Group III were clinically infected with *Toxocara vitulorum* and were given anthelmintic treatment, whereas Group IV was healthy animals. Group I was treated with Pyrantel pamoate (Nemoxid tab, IPCA) @ 25 mg/kg body weight orally, Group II treated with Piperazine citrate (PPZ syrup, Benmed) @ 200 mg/Kg body weight orally and group III was treated with Fenbendazole (Panacur, Intervet SPAH) @ 7.5 mg/Kg body weight. During the post treatment period supportive therapy with antidiarrheal (Diaroak), Dextrose 5% solution and mineral mixture (Minfa powder) were administered to all the affected animals based on the symptoms.

Efficacy of the drugs were assessed on the basis of reduction in EPG and haematobiochemical changes on post treatment days.

#### Determination of eggs per gram of faeces (EPG)

The number of eggs per gram of faeces (EPG) of all the positive samples were determined by Stoll's method (HMSO, 1979) [5].

#### Estimation of Efficacy Percentage

Efficacy of the drugs were calculated as per the following formula described by Soulsby (1982) [10].

$$\text{Percent Efficacy} = \frac{(\text{EPG before treatment} - \text{EPG after treatment})}{\text{EPG before treatment}} \times 100$$

#### Statistical Analysis

Data were analysed for statistical interpretation by using SAS System ('Local', X64\_7PRO).

#### Experimental Findings

##### Pre-treatment clinical observation

The infected calves were clinically found weak, dull with rough body coat, pale mucous membrane, diarrhoea, inappetence. Adult parasites were grossly visible in the faeces in the infected calves. However in some calves with moderate infection these signs were not detected.

##### Post-treatment clinical observation

There was substantial improvement of the clinical health of

the calves in all the treatment groups, which were evident with the disappearance of dullness and depression, regained appetite, improvement of the body coat and disappearance of diarrhoea.

#### Reduction of Eggs Per Gram (EPG) of faeces Eggs Per Gram (EPG) count

In group I, the Pre-treatment Mean  $\pm$  SE value of EPG was 1033.33  $\pm$  66.67. The post-treatment mean values of EPG on 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>st</sup> day were 733.33  $\pm$  49.44, 216.67  $\pm$  30.73, 50.00  $\pm$  22.36 and 0.00  $\pm$  0.00 respectively. The overall Mean  $\pm$  SE value of EPG was 406.66  $\pm$  77.45.

In group II, the Pre-treatment Mean  $\pm$  SE value of EPG was 1100.00  $\pm$  68.31. The post-treatment mean values of EPG on 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>st</sup> day were 716.67  $\pm$  47.73, 183.33  $\pm$  30.73, 33.33  $\pm$  21.08 and 0.00  $\pm$  0.00 respectively. The overall Mean  $\pm$  SE value of EPG was 406.67  $\pm$  81.92.

In group III, the Pre-treatment Mean  $\pm$  SE value of EPG was 1016.67  $\pm$  79.23. The post-treatment mean values of EPG on 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>st</sup> day were 683.33  $\pm$  60.09, 183.34  $\pm$  40.14, 16.67  $\pm$  16.66 and 0.00  $\pm$  0.00 respectively. The overall Mean  $\pm$  SE value of EPG was 380  $\pm$  77.52.

In group IV, mean values of EPG were 0.00  $\pm$  0.00 before treatment and on post-treatment days during the study period. Analysis of variance (Table 2) showed that the changes in the values of mean EPG was found to be highly significant ( $P < 0.01$ ) in different days as well as in different groups and their interaction between groups and days of treatment was also significant.

**Table 1:** Mean $\pm$ Se values of eggs per gram (epg) in different groups of calves at different days of treatment

Days of observation		Groups		
		I	II	III
Pre-treatment	0	1033.33 $\pm$ 66.67 <sup>a</sup> <sub>A</sub>	1100.00 $\pm$ 68.31 <sup>a</sup> <sub>A</sub>	1016.67 $\pm$ 79.23 <sup>a</sup> <sub>A</sub>
Post-treatment	3 <sup>rd</sup>	733.33 $\pm$ 49.44 <sup>a</sup> <sub>B</sub>	716.67 $\pm$ 47.73 <sup>a</sup> <sub>B</sub>	683.33 $\pm$ 60.09 <sup>a</sup> <sub>B</sub>
	7 <sup>th</sup>	216.67 $\pm$ 30.73 <sup>a</sup> <sub>C</sub>	183.33 $\pm$ 30.73 <sup>a</sup> <sub>C</sub>	183.34 $\pm$ 40.14 <sup>a</sup> <sub>C</sub>
	14 <sup>th</sup>	50.00 $\pm$ 22.36 <sup>a</sup> <sub>D</sub>	33.33 $\pm$ 21.08 <sup>a</sup> <sub>D</sub>	16.67 $\pm$ 16.66 <sup>a</sup> <sub>D</sub>
	21 <sup>st</sup>	0.00 $\pm$ 0.00 <sup>a</sup> <sub>D</sub>	0.00 $\pm$ 0.00 <sup>a</sup> <sub>D</sub>	0.00 $\pm$ 0.00 <sup>a</sup> <sub>D</sub>
Overall Mean $\pm$ SE		406.66 $\pm$ 77.45 <sup>a</sup>	406.67 $\pm$ 81.92 <sup>a</sup>	380 $\pm$ 77.52 <sup>a</sup>

Means bearing atleast one similar superscript in a row do not differ significantly.

Means bearing atleast one similar subscript in a column do not differ significantly.

Gr I: Pyrantel pamoate; Gr II: Piperazine citrate; Gr III: Fenbendazole.

**Table 2:** Analysis Of Variance (Anova) Of Eggs Per Gram (EPG)

Sources of variation	d.f	SS	MS	F
GROUP	3	3574333.33	1191444.44	139.62**
DAYS	4	11555500	2888875	338.54**
GROUP $\times$ DAYS	12	3876500	323041.67	37.86**
ERROR	100.00	853333.33	8533.33	

\*\* $P < 0.01$ , Highly significant.

#### Percentage of Efficacy

Efficacy of different anthelmintics on different post-treatment days have been presented in Table 3.

In Group I, treated with Pyrantel pamoate, the efficacy on post-treatment days 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>st</sup> were 29.03, 79.03, 95.16 and 100 percent respectively. In Group II, treated with Piperazine citrate, the efficacy on post-treatment days 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>st</sup> were 34.85, 83.33, 96.97 and 100 percent respectively. In Group III, treated with Fenbendazole, the efficacy on post-treatment days 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>st</sup> were 32.79, 81.97, 98.36 and 100 percent respectively.

**Table 3:** Efficacy (%) of different anthelmintic drugs against *Toxocara vitulorum* infection in calves

Days of observation	Groups (Efficacy %)		
	I	II	III
3 <sup>rd</sup>	29.03	34.85	32.79
7 <sup>th</sup>	79.03	83.33	81.97
14 <sup>th</sup>	95.16	96.97	98.36
21 <sup>st</sup>	100.00	100.00	100.00

Gr I: Pyrantel pamoate; Gr II: Piperazine citrate; Gr III: Fenbendazole.



**Fig 1:** EGG OF *Toxocara vitulorum*, 40x

### Results and Discussion

In Group I, the pre-treatment EPG ( $1033.33 \pm 66.67$ ) was significantly higher as compared to the healthy control group ( $0.00 \pm 0.00$ ). The EPG count declined from 3<sup>rd</sup> day onwards after the treatment with pyrantel pamoate, reaching zero on 21<sup>st</sup> day. The overall efficacy of pyrantel pamoate on the basis of EPG reduction was found to be 75.81%. Though there is very less published information on the use pyrantel pmoate against *T. vitulorum* infection in calves, Roberts (1992)<sup>[9]</sup> has suggested that Pyrantel pamoate at the dose rate of 25 mg/kg body weight is effective against *T. vitulorum* in calves.

Pyrantel pamoate is an anthelmintic of the Pyrimidin group, which is a depolarizing neuromuscular blocking agent in nematodal parasites and vertebrate host. It produces spastic paralysis of the worms by cholinomimetic action.

In Group II, the pre-treatment EPG ( $1100.00 \pm 68.31$ ) was significantly higher as compared to the healthy control group ( $0.00 \pm 0.00$ ). The EPG count declined from 3<sup>rd</sup> day onwards after the treatment with Piperazine citrate, reaching zero on 21<sup>st</sup> day post treatment. The overall efficacy of Piperazine citrate on the basis of EPG reduction was found to be 78.79%. Results of the present study are in accordance with the findings of Hossain *et al.* (1980)<sup>[6]</sup>, Devi *et al.* (2000)<sup>[1]</sup> and Srinivasa Rao (2000)<sup>[11]</sup>.

Piperazine produces neuromuscular hyper polarization in the parasite, producing reversible flaccid paralysis, which prevents it from maintaining their position in the host's gut and they are voided with the faeces.

In Group III, the pre-treatment EPG ( $1016.67 \pm 79.23$ ) was significantly higher as compared to the healthy control group ( $0.00 \pm 0.00$ ). The EPG count declined from 3<sup>rd</sup> day onwards after the treatment with Fenbendazole, reaching zero on 21<sup>st</sup> day post treatment. The overall efficacy of Fenbendazole on the basis of EPG reduction was found to be 78.28%. Similar findings were also reported by Gupta and Chabra (1990)<sup>[3]</sup>, Maqbool *et al.* (1998)<sup>[7]</sup> and Hafiz *et al.* (2010)<sup>[4]</sup>.

Fenbendazole an anthelmintic of the benzimidazole group, inhibits polymerization of tubulin in the parasite and blocks glucose uptake. It interferes with enzyme fumerate reductase and thus the energy production in the parasites, leading to diminished energy level in the parasite and ultimately death. On the basis of recovery from clinical signs, haemato-biochemical changes and the reduction of EPG count, the overall efficacy of piperazine citrate was found to be higher (78.79%), followed by fenbendazole (78.28%) and pyrantel pamoate (75.81%). However all the three anthelmintics were effective against *Toxocara vitulorum* infection, but considering the reduction in EPG count, cost and availability,

fenbendazole at the dose rate of 7.5 mg per kg body weight for a single dose, may suitably be recommended along with the supportive therapy against *Toxocara vitulorum* infection in calves.

### Conclusion

From the present study it can be concluded that though, all the 3 anthelmintics were effective for treatment of toxocariasis as eggs per gram reduced to 0 by 21<sup>st</sup> day post treatment, the overall efficacy of piperazine citrate was higher (78.79%), followed by fenbendazole (78.28%) and pyrantel pamoate (75.81%). But keeping in view the cost, availability and reduction of EPG, it can be recommended that Fenbendazole @ 7.5 mg/Kg body weight orally for a single dose along with supportive drugs is a suitable regimen for treatment of *Toxocara vitulorum* infection in calves and thereby preventing calf mortality, diarrhoea and other complications in field condition.

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