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## Comparative efficacy of commonly used anthelmintics against toxocarosis in buffalo calves in Mumbai, Maharashtra

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### Abstract

Efficacy of commonly used anthelmintics *viz.* Fenbendazole, Doramectin and Piperazine against toxocarosis in buffalo calves were comparatively evaluated by monitoring the faecal egg count in naturally infected calves before treatment and after treatment with these anthelmintics. For the study 48 naturally infected calves were grouped into 4 groups in which standard doses of fenbendazole, piperazine and doramectin were given and toxocara eggs per gram of feces were estimated by following Modified Stoll's dilution method. It was observed that all three drugs are effective in reducing the worms and eggs count from faeces however their comparative efficacy was found at par with each other with no significant differences.

**Keywords:** Toxocara, buffalo calves, piperazine, doramectin, efficacy

### Introduction

In dairy enterprises calf rearing is crucial management task as it represents future replacement stock. Optimized growth and minimum neonatal calf mortality is the key to successful and economically viable dairy farming (Dappawar *et al.*, 2018) [1]. Many researchers reported that the livestock owners do not deworm their calves timely due to which the health of the calves remains poor in the small holder buffalo production system (Singh and Singh 2000 and Das 2001) [2, 3]. As the calves are the future productive units of the dairy herd, the survival of calves is imperative for livestock propagation. Deworming in calves is essential and regular deworming cycle should be followed against parasitic infections. The toxocarosis, a calf hood disease mostly up to 6 months of age, the adult worms are eliminated spontaneously and it results in high morbidity, loss in production and disturbance in the breeding programme (Dappawar *et al.*, 2020) [4]. Pathogenicity caused by *T. vitulorum* infection in young calves is seen mainly in the form of diarrhoea and steatorrhoea. This is accompanied by inappetance, intermittent colic, tympany, occasional dysentery, anorexia, constipation, dehydration, abdominal pain, butyric odour in breath, loss of weight, loss of plasma proteins in to the intestine, glossiness and skin tone with eczema signs resembling intestinal obstruction, presence of mud coloured foul smelling faeces, unthriftiness and recumbency (Bharkad 1997, Singh *et al.*, 2008) [5, 6]. In view of the significance of calf mortality to dairy production, present study included the assessment of three antiparasitic drugs towards the infection of *T. vitulorum* in Murrah buffalo calves, named piperazine, fenbendazole and doramectin.

Piperazine is a cyclic secondary amine anthelmintic compound. It occurs in white crystalline powder form which is soluble in water and alcohol. Piperazine is frequently used in veterinary practices since it is active against ascarids. Piperazine is commercially available in variety of salts including citrate, adipate, phosphate, hexahydrate, chloride, sulphate *etc.* Second drug, Fenbendazole is a broad spectrum benzimidazole anthelmintic which has activity against wide range of helminth parasites. It is active against all important nematodes of farm animals. Fenbendazole is only marginally absorbed after oral administration. Absorbed fenbendazole is reversibly metabolized to active compound, oxfendazole that is further oxidised to sulphones. Fenbendazole is a safe drug with margin of safety. Doramectin is mutational biosynthetic agent isolated from fermentation of soil organism *Streptomyces avermitilis*. It is related pharmacologically to ivermectin and acts as endectocide. Doramectin is formulated in an oil-based vehicle that delays the absorption when injected. It is mostly used in bovines for the treatment and control of roundworms, lungworms, grubs, mites, lice, horn flies, *etc.*

(Sandhu, 2014) [7].

The current manuscript presents a brief account of comparative efficacy of the commonly used anthelmintic drugs against *Toxocara* sp. in naturally infected buffalo calves.

### Materials and Methods

In a region-wide survey of buffalo calves to appraise their gastrointestinal parasitism status, faecal samples of 500 buffalo calves were examined in the laboratory of the department of Parasitology, Mumbai Veterinary College, Mumbai during October, 2020 to January, 2021. The present study was carried out in 48 buffalo calves upto 3 months of age which were naturally found positive for presence of

*Toxocara* sp. nematodes. Positive samples were subjected to faecal egg count by Modified Stoll's dilution method as described earlier by Soulsby, (1982) [8] to obtain Eggs Per Gram (EPG) of faeces.

For assessing the efficacy of drugs named fenbendazole, piperazine and doramectin, 56 samples positive only for *T. vitulorum* buffalo calves were divided into 4 groups T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> and each group comprise of 14 buffalo calves. While grouping those buffalo calves, were selected for assessing the drug efficacy which had EPG more than 1000, irrespective of age and sex of buffalo calf. The drugs used for the assessment study were commercial products of different pharmaceutical companies.

**Table 1:** Groups of *Toxocara* positive buffalo calves under trial

Treatment groups	Therapy	Dose and route of administration	No of animals
T <sub>0</sub>	Control group	---	12
T <sub>1</sub>	Fenbendazole 2.5% suspension (MSD- Animal Health- India)	5mg/kg BW (Oral)	12
T <sub>2</sub>	Piperazine citrate-15% (NuCare Laboratories (India))	200mg/kg BW (Oral)	12
T <sub>3</sub>	Doramectin-1% (Zydus AH)	0.2mg/kg BW (S/C)	12

Group T<sub>0</sub> was kept as control group. Group T<sub>1</sub> was treated with suspension of Fenbendazole at dose rate of 5 mg/kg body weight. The product used was, PANACUR- fenbendazole 2.5% suspension. Each ml of PANACUR suspension containing 25 mg active fenbendazole. Group T<sub>2</sub> was treated with Piperazine citrate syrup with help of drenching bottle at dose rate of 200 mg/kg body weight. The drug was of product of NuCare Laboratories (India) named Piperazine liquid. Group T<sub>3</sub> was treated with Doramectin injection, injections were given subcutaneously with the help of 20 gauge needle. Doramectin injection was of Zydus AH pharmaceutical company, named DUROMECT. 1ml of DUROMECT was containing 10mg doramectin. The recommended dose rate was 0.2 mg/kg body weight.

Drugs were administered twice, on day zero and on 7<sup>th</sup> day after first dose in different 3 groups. To check the reduction in the egg count, faecal samples were collected on 14<sup>th</sup> day after the administration drugs.

Percent reduction in the faecal egg count was calculated by formula

$$\text{EPG} = \frac{\text{Eggs per gram on zero day} - \text{Eggs per gram on 14}^{\text{th}} \text{ day}}{\text{Eggs per gram on zero day}} \times 100$$

The statistical analysis of these data was done by employing Factorial RBD with the help of WASP 2.0, an online free software provided by ICAR-CCARI, Goa.

### Results and Discussion

In present study, three antiparasitic drugs, namely Fenbendazole, Doramectin and Piperazine were used to check the efficacy against *T. vitulorum* infection. For the drug trial study, the calves having more than 1000 were selected. By dividing 48 calves, four groups were made irrespective of sex and groups were named as T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>. Each group was consisted of 12 buffalo calves. Among four groups, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were treated with fenbendazole, doramectin and piperazine respectively and T<sub>0</sub> kept as control group.

The results of the study revealed that three antiparasitic drugs, viz. fenbendazole, piperazine and doramectin showed 96.70%, 98.46% and 97.61% efficacy against *T. vitulorum*, respectively. There was no reduction noticed in faecal egg count in the calves belonging control group T<sub>0</sub>. The data obtained about EPG from T<sub>0</sub> group was used for statistical comparison with that of other treatment groups. Pre and post treatment EPG of buffalo calves and efficacies of three antiparasitic drugs have been shown in Table 2.

**Table 2:** *Toxocara* EPG in each group of buffalo calves under trial

Drug under trial	No. animals in each group	EPG Pre-treatment	EPG Post-treatment
Fenbendazole (T <sub>1</sub> )	12	3616.67 ± 464.14 <sup>ax</sup> (1400-6200)	141.67 ± 28.758 <sup>ay</sup> (0-300)
Piperazine (T <sub>2</sub> )	12	2616.67 ± 376.96 <sup>bx</sup> (1000-5400)	58.33 ± 19.30 <sup>ay</sup> (0-200)
Doramectin (T <sub>3</sub> )	12	6891.67 ± 735.51 <sup>cx</sup> (1800-10800)	175.0 ± 25.0 <sup>ay</sup> (0-300)
Control (T <sub>0</sub> )	12	4091 ± 686.17 <sup>ax</sup> (1500-8500)	3890.00 ± 949.97 <sup>by</sup> (1700-7800)

Different superscripts x,y among rows show significant difference among rows (within weeks)

Different superscripts a,b,c, among columns show significant difference among columns (within treatments)

T<sub>1</sub> group was treated with PANACUR®-2.5% Fenbendazole Suspension at 5mg/kg of body weight. Out of 13 calves, three calves showed 100% reduction in egg count after 14 days of treatment. While overall average reduction in egg count of

group found 96.70%. Though PANACUR®- 2.5% Fenbendazole Suspension showed good results against *T. vitulorum*, it had lowest efficacy among three drugs used in the study. These results were in partial agreement with the

findings of Sultana *et al.*, (2015) <sup>[9]</sup> who found the 95.50% efficacy of fenbendazole. Whereas, Davila *et al.*, (2010) <sup>[10]</sup> and Maqbool *et al.*, (1998) <sup>[11]</sup> recorded the 85% and 84.99% efficacy of fenbendazole against *T. vitulorum* infection respectively.

T<sub>2</sub> group was treated with piperazine citrate- 15% syrup at dose rate of 200mg/kg of body weight. Average reduction in egg count of overall group was 98.46%, after 14 days of treatment. Among 13 treated calves, 7 calves showed 100% reduction in faecal egg count. Piperazine citrate had highest efficacy than othe two compounds used under study. The current drug efficacy trial showed that piperazine has highest efficacy against *T. vitulorum* infection among three drugs used. Similar findings were reported by Satrija *et al.* (2011) <sup>[12]</sup> and reported 98-99% efficacy of piperazine citrate against *T. vitulorum* in buffalo calves. More recently, Maurya *et al.*, (2020) <sup>[13]</sup> and Kanu *et al.*, (2021) <sup>[14]</sup> recorded the 100% efficacy of piperazine against *T. vitulorum* in buffalo calves.

T<sub>3</sub> group was treated with Inj. DUROMEECT™ 1% at dose

rate of 0.2 mg/kg of body weight. In that group, 2 calves showed 100% reduction in faecal egg count of post treatment. Average reduction in egg count of overall group was 97.61%, after 14 days of treatment. In the present study, comparatively lower efficacy of doramectin was found than 98.77% and 100% efficacy than earlier reported by Avcioglu *et al.*, (2011) <sup>[15]</sup> and Galdhar *et al.*, (2003) <sup>[16]</sup>, respectively.

Mean  $\pm$  SE values of percent efficacy in different treatment groups were found to be  $3.39 \pm 3.05$ ,  $96.70 \pm 0.56$ ,  $98.46 \pm 0.49$  and  $97.61 \pm 0.33$  for T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively. The percent efficacies of different treatments were compared statistically and they were found significantly different at 5% level of significance ( $p \leq 0.05$ ). All the treatment groups were significantly different when compared with the results of control group T<sub>0</sub>. There was significant difference in the results of T<sub>1</sub> and T<sub>2</sub> groups as their efficacies were  $96.70 \pm 0.56$  and  $98.46 \pm 0.49$ . But there was no as such significant difference in results of T<sub>3</sub> group when compared with the results of T<sub>1</sub> and T<sub>2</sub> groups.

**Table 3:** Comparison of drug efficacy in different treatment groups (n=48)

Sr. No.	Group name (Drug used)	Percent efficacy (Mean $\pm$ SE)	F – Value	F – Critical
1	T <sub>0</sub> (Control group)	$3.39 \pm 3.05^c$	889.56	2.80
2	T <sub>1</sub> (Fenbendazole)	$96.70 \pm 0.56^b$		
3	T <sub>2</sub> (Piperazine)	$98.46 \pm 0.49^a$		
4	T <sub>3</sub> (Doramectin)	$97.61 \pm 0.33^{ab}$		

\*Note: Means bearing dissimilar superscripts differ significantly at 5% level of significance ( $p \leq 0.05$ ).

## Conclusion

The results of present study revealed that there is no significant difference between the effects of three drugs *viz.* Fenbendazole, Piperazine and Doramectin used against toxocarosis in buffalo calves, if provided on proper time. It is therefore concluded to use any of these drugs within fortnight of birth of the calf to obtain healthy calves for buffalo dairy farm enterprise.

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