

# Evaluation of furazolidone, sulfadimidine and amprolium to treat coccidiosis in beetal goats under field conditions

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**Abstract:** Coccidiosis is a protozoal and occasionally fatal diarrheic disease of goats imposing heavy economic losses to farming community. This study aimed to evaluate the efficacies of Furazolidone, Sulfadimidine and Amprolium against coccidiosis in Beetal goats. Twenty-four (24) Beetal goats naturally infected with coccidiosis were randomly divided into four groups of 6 (A-D). Goats in groups A, B and C were treated orally with Furazolidone (10mg/Kg), Sulfadimidine (100mg/Kg) and Amprolium (55mg/Kg), respectively for 7 days. Goats in-group D served as positive control. Oocysts per gram (OPG) of feces counts of individual goats in each group were performed on Days; 0 (pre-treatment) 7, 14 and 21 (post-treatment). OPG counts amongst goats in all groups at day 0 were not significant ( $P>0.05$ ). On days 7, 14 and 21, OPG values decreased significantly ( $P<0.05$ ) in groups A, B and C compared to group D. The efficacy of Furazolidone, Sulfadimidine and Amprolium was 98.6, 98.0 and 99.6 percent, respectively on Day 21 (end of trial). Statistically, the efficacies of three drugs were not significantly different ( $P>0.05$ ). In conclusion, Furazolidone, Sulfadimidine and Amprolium are well-tolerated and any one of these may be recommended to effectively treat coccidiosis in Beetal goats.

**Keywords:** Coccidiosis; Beetal goats; Furazolidone; OPG.

## INTRODUCTION

Parasitism is one of the foremost impediments to livestock productivity, resulting in poor feed utilization, decreased growth, and associated morbidity and mortality. In addition, there is the increased cost of treatment and control measures (Pedreira *et al.* 2006; Nwosu *et al.* 2007). Among these parasites, coccidiosis is a very important disease in small ruminants. The disease is clinically associated with dysentery, reduced growth and infrequent deaths. The disease is worldwide in distribution and is caused by many species of *Eimeria*, which invade the cells of the intestinal epithelium (Agyei *et al.* 2004; Galip, 2004; Yakhchali and Golami. 2008).

Coccidiosis is an economically important disease of goats and infection may cause subclinical production losses. The disease has been reported in America, Europe, Asia and Africa (Agyei *et al.* 2004). A number of drugs have been found effective to treat and control coccidiosis in goats, including Amprolium (Young *et al.* 2011; Rehman *et al.* 2011), Toltrazuril (Mundt *et al.* 2009; Rehman *et al.* 2011) and Decoquinate (Morand-Fehr *et al.* 2002), Diclazuril (Platzer *et al.* 2005; Mundt *et al.* 2009), Sulfadimidine (Ghanem *et al.* 2008). However, on large

goat farms in Pakistan variable results have been recorded, especially in the rainy season (personal communication). This paper describes the efficacy of different anticoccidial drugs in the treatment of coccidiosis in Beetal goats in Pakistan.

## MATERIALS AND METHODS

### Source of Animals

Thirty (30) adult ( $\geq 1$  yr. of age) Beetal goats from different goat farms in Dera Ghazi Khan, Punjab, Pakistan were used in this study. These goats reared under similar climatic and animal husbandry conditions since birth, and had no history of prior use of coccidiostats. Animals remained under close veterinary clinical supervision throughout the duration of the trial.

### Experimental design

A total of 24 Beetal goats, naturally infected with coccidiosis selected on the basis of clinical signs and microscopic detection of Oocyst per gram (OPG) of feces ( $>7000$  OPG). OPG, a standard diagnostic approach determining the extent of infection by the oocyst forming parasites, was employed to determine the efficacies of the therapeutic agents used. All the goats were randomly divided into four groups of 6 viz. A, B, C and D. A fifth group E comprising of 6 Beetal goats negative for

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coccidial oocysts was also included in the study. An approval for the current study was obtained from the Ethical Review Committee of University of Veterinary and Animal Sciences Lahore (Pakistan) as per requirement. The animals in group-A were treated with Furazolidone (FURASYM, Symans Pharmaceuticals, Pakistan) at 10mg/kg PO for 7 days. Goats in group-B were given Sulfadimidine (SULPHASYM, Symans Pharmaceuticals, Pakistan) at 100mg/kg PO for 7 days while the animals in group C were administered Amprolium (AMPROVIL water soluble powder, Symans Pharmaceuticals, Pakistan) at 55mg/Kg PO for 7 days. Goats in group-D were confirmed as infected and left untreated (control positive) and those of group E were non-infected and left untreated (control negative). Fecal samples collected from the study animals were analyzed in the Medicine Laboratory at the UVAS, Lahore. OPG counts were performed on Day 0 (before treatment) and then on Days 7, 14, 21 (after treatment) using the McMaster Technique described by Jarvie *et al.* (2005). The percent efficacies (and 95% C.I) of the drugs (Thrusfield, 2005) were measured by fecal oocysts per gram counts reduction (FOCR) test calculated from the arithmetic mean of the group OPGs as per the formula given below:

$$\text{Efficacy of Drug treatment (\%)} = \frac{\text{Mean pre-treatment OPG} - \text{Means post-treatment OPG}}{\text{Mean pre-treatment OPG}} \times 100$$

## STATISTICAL ANALYSIS

The data were analyzed by repeated measures test (ANOVA) while differences within treatment groups were measured by post-hoc test (LSD). *P* values of less than 0.05 were taken as statistically significant.

## RESULTS

The OPG values in goats of different treatment groups are given in table 1. On Day 0, difference was not significant ( $P>0.05$ ) in OPG values of goats in groups A, B, C and D, whereas no oocyst was found in the fecal samples of any goat in-group E. On the other hand, a significant difference ( $P<0.05$ ) in OPG was observed among groups A vs D, B vs D and C vs D on Days 7, 14, 21. On days 7, 14 and 21 the mean group OPG count gradually decreased in A, B and C groups, while the mean OPG of group D increased ( $P<0.05$ ) significantly. No significant difference in efficacy ( $P>0.05$ ) was observed for the three drugs at different days in the goats, but all observed drug efficacies increasing from Day 7 to Day 21. Moreover, clinically no adverse effects of any of the drugs used were observed during the course of the study. The percent efficacies of different drugs against coccidiosis are shown in Table 2. The efficacy of Furazolidone, Sulfadimidine and Amprolium was 98.6%, 98% and 99.6%, respectively on Day 21 (end of trial). Statistically, the efficacies of three drugs were not significantly different ( $P>0.05$ ).

## DISCUSSION

Many drugs have been used in veterinary medicine for coccidiosis. Young *et al.* (2011) reported that the administration of Amprolium in goat kids at a dose rate of 50mg/Kg for 5 days effectively reduced *Eimeria* oocysts, but when dosed at 10mg/Kg for 5 days, Amprolium showed only minimal efficacy. However, other studies carried out at various dose rates designated Amprolium as the most effective treatment (Tiwari and Roy, 2004). Recently, a study of coccidiosis in young goat kids from India showed that the administration of Amprolium at 100mg/Kg for 7 days was an effective treatment for

**Table 1:** Oocyst per gram (OPG) counts of 30 Beetal goats in different treatment groups observed on different days

Group	OPG at days			
	0	7	14	21
A (n=6)	7,067±51.5 <sup>a</sup>	258±7.1 <sup>a</sup>	167±6.7 <sup>a</sup>	100±51.6 <sup>a</sup>
B (n=6)	7,617±59.5 <sup>a</sup>	350±7.6 <sup>a</sup>	192±5.8 <sup>a</sup>	150±53.2 <sup>a</sup>
C (n=6)	7,400±58.4 <sup>a</sup>	142±5.1 <sup>a</sup>	75±3.1 <sup>a</sup>	33±16.7 <sup>a</sup>
D (n=6)	7,133±49.4 <sup>a</sup>	14,267±98.7 <sup>b</sup>	57,067±395.0 <sup>b</sup>	456,533±3,159.9 <sup>b</sup>
E (n=6)	0	0	0	0

Values in the same column bearing similar superscript letters are statistically non-significantly different ( $P>0.05$ ). (mean ± SE). A= Furazolidone, B= Sulfadimidine, C= Amprolium, D= positive Control, E= negative Control

**Table 2:** Comparative efficacy of three drugs against coccidiosis in 24 Beetal goats in Pakistan

Groups	Efficacy (%) of drugs (±95% C.I.) on days		
	7	14	21
A	96.3 (±4.79)	97.6(±2.99)	98.6(±2.30)
B	95.4 (±4.1)	97.5(±3.06)	98.1(±2.67)
C	98.1(±2.67)	99.0(±1.95)	99.6(±1.23)

Repeated measures ANOVA, ( $P>0.05$ ) Non-significant difference in the final efficacies of three drugs (Group A: Furazolidone, Group B: Sulfadimidine, and Group C: Amprolium)

clinical coccidiosis (Yadav *et al.* 2007). In the present study, the percentage reduction in fecal oocysts counts in the Amprolium treated group were 98.1%, 99.0% and 99.6% on Days 7, 14 and 21, respectively. The oocysts counts were close to zero by Day 21 post treatment, which reflects the near complete effectiveness of Amprolium and confirms the findings of the studies described earlier. Likewise, a percent reduction in OPGs of 76.9% and 92.0% on Days 7 and 21, respectively was reported by Devina *et al.* (2011), which is in close agreement with the findings of the current study. The effect of Amprolium on oocyst counts reduction was also reported by Ghanem *et al.* (2008); Rehman *et al.* (2011); Young *et al.* (2011) and Iqbal *et al.* (2012). Sulfadimidine treatment in our study showed efficacy of 95.4%, 97.5% and 98.0% on Days 7, 14 and 21, respectively which is in accord with oocyst counts reduction of 93.4% on Day 7 and 98.4% on day 21 reported by (Devina *et al.* 2011). A comparable effect of Sulfadimidine on oocyst count reduction was also reported by Mundt *et al.* (2007) and Ghanem *et al.* (2008). In the present study, the efficacy of Furazolidone was recorded as 96.3%, 97.6% and 98.6% on Days 7, 14 and 21, respectively. Similarly, 95% efficacy was reported by Nisar *et al.* (2009) for Furazolidone. Statistically, there was no significant difference ( $P>0.05$ ) in efficacy between Furazolidone, Sulfadimidine and Amprolium. No adverse effects for any of the three drugs administered to goats were recorded during or after the study. In conclusion, Furazolidone, Sulfadimidine and Amprolium appear to be equally effective and well-tolerated by Beetal goats and thus any one of these could be recommended to effectively treat coccidiosis in Beetal goats under field conditions.

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