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RESEARCH ARTICLE

# Epidemiology and Economic Benefits of Treating Goat Coccidiosis

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**ABSTRACT**

A study was carried out to determine the prevalence of Eimeria species and to compare the efficacy of Toltrazuril and Amprolium against coccidosis. Of the total 121 fecal samples examined for Eimeria, 67 (55.99%) were found infected with four species of Eimeria. Amongst the identified species, *E. ninakohlyakimovae* was the commonest one (49.25%) followed were *E. arloingi, E. caprina* and *E. hirci* with prevalence of 44.78, 25.37 and 19.40%, respectively. Kids had significantly ($P<0.05$) higher prevalence of Eimeria than adults. Higher prevalence of Eimeria was observed in female goats. Forty five Eimeria positive animals were randomly divided into three equal groups, i.e., groups A to C. Group A was treated with Amprolium (2g/40kg BW) and group B was treated with Toltrazuril (15mg/kg BW) for three days each while no drug was given to Group C. On day 7 post treatment, all goats of group B stopped shedding oocysts while 8 (53.33%) goats of group A stopped shedding oocysts. After the treatment, goats of group B gained 2.2 kg body weight over a period of 15 days compared 1.2 kg weight in group A. The lowest weight gain (0.5 kg) was in goats of group C (untreated control). No significant difference in milk yield of the three groups was recorded. It can be concluded that control of goat coccidiosis through single treatment of Toltrazuril is economically beneficial.



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## INTRODUCTION

Coccidiosis is one of the most ubiquitous and economically important diseases of the goat (Foreyt, 1990). It has been reported in a large number of regions and countries of Europe, Africa, Asia and America (Penzhorn *et al*., 1994; Faizal *et al*., 1999; Agyei *et al*., 2004). Sixteen species of Eimeria have been recorded from goats in different parts of the world (Soe and Pomroy, 1992; Zajac and Conboy, 2006). Goat coccidiosis has been reported in Pakistan (Asif *et al*., 2008). The disease is more serious in 4-6 months old kids and also when animals of any age are kept in unhygienic and overcrowded houses (Varghese and Yayabu, 1985). The adult goats in a herd keep their infections year-round, continually contaminating the environment with oocysts which serve as a source of re-infection and of new infections for young kids (Baker, 1975). Eimeria infection is more common in females (Soliman and Zalat, 2003).

Affected animals usually develop a strong immunity with increasing age. Immunity to coccidiosis produced by infection with *E. bovis* apparently involves both humoral and cellular responses (Faber *et al*., 2002). Calves that recover from infection are either solidly immune from re-infection (species specific) or can be infected without showing clinical disease (Sanger *et al*., 1959).

Goat coccidiosis causes high mortality in kids that may reach upto 58% (Jalila *et al*., 1998). The high mortality rates and lowered productivity due to poor growth, together with costs of anticoccidials, drug administration and disinfection, are all factors causing losses by coccidiosis in domestic animals (Cornelius, 1980).

Prevention of losses and reduced productivity from coccidiosis in young animals depends on management to reduce the level of environmental contamination by infective occysts and to minimize stress and avoid crowding of kids. Treatment of older goats with anticoccidial drugs suppresses the passage of oocysts in their feces, consequently reducing the risk of infection to kids. The administration of anticoccidials to young animals at weaning and shipping when stress is likely to prevent disruption of the host-parasite equilibrium, with the resultant appearance of clinical signs (Baker, 1975; Craig, 1986).

To control and treat coccidiosis in goats, several drugs are found to be effective. These drugs include Amprolium (Kimbita *et al*., 2009), Toltrazuril (Ghanem *et al*., 2008) and Decoquinate (Morand–Fehr *et al*., 2002). Amprolium also found to be effective in controlling coccidiosis in cattle (Sanger *et al*., 1959) and buffaloes (Sanyal *et al*., 1985). But comparison of these in goat coccidiosis has not been studied.

In case of poultry, efficacy of various anticoccidants has been evaluated by many researchers in Pakistan (Ashraf *et al*., 2002; Abbas *et al*., 2009). But no literature is available on the effects of anticoccidants regarding control of ruminant coccidiosis and body weight and milk production gain. In preview of scarcity of information and significance of the parasite, present study has been conducted.

## MATERIALS AND METHODS

One hundred and twenty one fecal samples were collected. A questionnaire was designed using close-ended questions for the purpose of collection of necessary information. The inclusions of the questionnaire were a) farm and owner details, b) details of animals including age and sex and c) history of treatment with anthelmintics/ anticoccidants. Animals having no history of treatment with with anthelmintics/ anticoccidants were included in the study. Five grams of fecal samples were collected directly from rectum or immediately after defecation in a wide mouth plastic bottle and preserved in 10% formalin (Zajac and Conboy, 2006). Collecting bottles were labeled properly. Various Eimeria species were identified (Zajac and Conboy, 2006).

Forty five Eimeria positive animals were randomly divided into three equal groups, i.e., groups A to C. Quantitative fecal examination was performed twice a week by McMaster technique to determine the number of oocysts per gram of feces (OPG) as per standard procedure (MAFF, 1986). Group A was treated with Amprolium (2g/40kg BW) and group B was treated with Toltrazuril (15mg/kg) for three days each while no drug was given to group C. Milk yield and body weight of each animals was recorded at the start and end of experiment, i.e., 15 days. Logistic analysis was carried out by using logit model including all variables in the model with backward elimination procedure. Factors with paired characteristics were analyzed using Odd's Ratio (OR) and Mantel-Haenszel Chi-square. All the analyses were carried out using SAS software package (1998) at 95% confidence level.

## RESULTS

### Surveillance

Four species of Eimeria identified were *E. ninacohylakimovae, E. arloingi, E. caprina* and *E. hirci.* Sixty seven goats out of 121 (55.99%) were found shedding Eimeria oocyst. *E. ninakohlyakimovae* was the highest of the identified species (49.25%), followed in order by *E. arloingi*, *E. caprina* and *E. hirci* with prevalence of 44.78, 25.37 and 19.40%, respectively (Table 1). Eimeria was observed in all age groups. Kids had significantly higher prevalence (68.0%; 34/50; $\chi^2$=16.715) than adults (46.47%; 33/71; OR=0.462) (Fig. 1). Eimeria infection was found to be more prevalent in females (60.46%; 52/86; $\chi^2$=10.476) as compared to males (42.85%; 15/35; OR=0.566) (Fig. 1).

**Table 1:** Percentage prevalence of identified species of Eimeria

| Species | No. of animals infected (out of 67) | Percentage |
|---|---|---|
| *Eimeria ninacohylakimovae* | 33 | 49.25 |
| *Eimeria arloingi* | 30 | 44.78 |
| *Eimeria caprina* | 17 | 25.37 |
| *Eimeria hirci* | 13 | 19.40 |

### Oocyst count

Intensity of infection was higher in kids (average OPG = 5740) compared to adults (average OPG = 946). Determination of post treatment reduction in oocyst count on day 7 revealed that all the goats of group B (Toltrazuril treated) stopped shedding oocysts while eight (53.33%) goats of group A (Amprolium treated) stopped shedding oocysts. All the animals of group C still continued shedding oocysts.

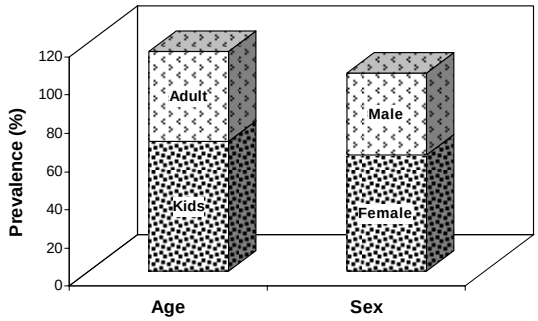


**Fig 1:** Association of sex and age with Eimeria

### Effects of anticoccidants on weight gain and milk yield

Goats of group B gained 2.2kg body weight over a period of 15 days while gain in body weight of goats of group A was recorded as 1.2kg. The lowest weight gain of 0.5kg was in goats of group C. There was a statistically significant (P<0.05) difference between weight gains in treated (group A and B) and non-treated goats (group C). Non significant difference in milk yields before and after treatment of the three groups has been recorded (Table 2).

## DISCUSSION

Coccidiosis caused by Eimeria species in goats is one of the most economically important diseases (Foreyt, 1990) which has been reported from Europe, Africa, Asia and America (Faizal *et al*., 1999; Agyei *et al*., 2004). Sixteen species of Eimeria have been recorded from goats in different parts of the world (Zajac and Conboy, 2006). Eimeria species identified in present study have been reported earlier by Faizal *et al*. (1999) and Ruiz *et al*. (2006). *E. ninakohlyakimovae* has been reported as the most prevalent specie by many researchers from various countries (Faizal *et al*., 1999; Ruiz *et al*., 2006). Higher prevalence of Eimeria in kids as compared to adults has been reported by Abo-Shehada and Abo-Farieha (2003). The observation that kids shed higher number of oocysts

compared to adults has also been reported elsewhere (Ruiz *et al*., 2006). Adults acquire immunity with the passage of time and may, therefore, suppress coccidian prevalence. Results of higher prevalence of Eimeria in females are consistent with the findings of Sharma *et al.* (2009).

**Table 2:** Mean milk yields of goats of treated (A & B) and non-treated (C) groups

| Groups | Mean Milk Yield (L) | | Difference | Mantel-Haenszel Chi-square (P-value) |
|---|---|---|---|---|
| | Day 0 | Day 15 | | |
| A | 1.75 | 2.00 | 0.25 | 1.18 (0.278) |
| B | 2.00 | 2.20 | 0.20 | 1.20 (0.305) |
| C | 1.90 | 2.10 | 0.20 | 1.09 (0.415) |

Gjerde and Helle (1986) and Taylor and Kenny (1988) reported significant reduction in daily mean oocyst count in case of lambs when treated with single dose of Toltrazuril at 20 mg/kg BW. Results of Frandsen *et al*. (1992) revealed that Toltrazuril was highly effective in suppressing goat coccidiosis when administered in drinking water at 30 p.p.m. Effectiveness of Toltrazuril may be due to that it is effect against all developmental stages of cocidia within the cells of an infected animal as compared to Amprolium which is effective against early developmental stages (Balicka-Ramisz, 1999). Toltrazuril was also found to reduce oocyst counts better than Amprolium in case of experimentally infection given to buffalo calves with *E. bovis* and *E. zuernii* (Ghanem *et al*., 2008). Ghanem *et al*. (2008) suggested that treatment with Toltrazuril from first day of treatment is the most effective way to overcome eimeriosis in buffalo calves as demonstrated by reduction of the OPG. Mundt *et al*. (2003) reported that treatment of coccidiosis in calves by Toltrazuril during the prepatent period (metaphylactic treatment) produces high anticoccidial effect.

In the present study, differences in weight gain of treated and un-treated goats showed the potential economic losses inferred by coccidiosis. High gains in weight of treated animals may be attributed to high feed intake and accelerated feed conversion ratio (Morand-Fehr *et al*., 2002). Significant improvement in the growth rate has been reported when goats were treated with decoquinate for 75 days (Morand-Fehr *et al*., 2002). No significant difference in milk yield was observed. This may be due to short duration (15 days) of experiment. Morand-Fehr *et al*. (2002) also found no apparent impact on milk yield while treating goats for shorter time with decoquinate in comparison to improved milk performance in case of longer treatment.

From the results of the present study, it can be concluded that control of goat coccidiosis caused by Eimeria species through the treatment of Toltrazuril is economically beneficial in terms of weight gain and reduction in oocyst counts.

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