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The Prevalence of Coccidian Species in Sheep in Kars Province of Turkey

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ABSTRACT

Coccidia were detected in the faeces of 556 out of 592 sheep (93.9%) in sheep in Kars province. The prevalence of coccidiosis was significantly higher ($p < 0.01$) in young (97.9%) and immature sheep (96.6%) than in adult sheep (90.2%). Mixed infections were widespread (71.5%). Ten species of *Eimeria* were recognized. These species (and their prevalences) were: *Eimeria ovinoidalis* (47.7%), *E. bakuensis* (*E. ovina*) (46.6%), *E. parva* (37.1%), *E. granulosa* (27.7%), *E. ahsata* (23.4%), *E. pallida* (23.2%), *E. faurei* (15.1%), *E. intricata* (13.9%), *E. crandallis* (13.7%) and *E. punctata* (2.3%). *Eimeria punctata* is reported in sheep from Turkey for the first time. The mean oocyst count from infected animals was 3451 ± 409 opg (range 50–117 600). The mean was higher (9529 ± 502) in young sheep. Differences in the counts from young, immature and adult sheep were statistically significant ($p < 0.01$). However, no clinical cases of coccidiosis were encountered.

Keywords: age, coccidia, *Eimeria*, sheep, Turkey

Abbreviations: opg, oocysts per gram of faeces

INTRODUCTION

Coccidiosis is a common global protozoan infection and is widespread in sheep, especially in lambs. Mortality reaches 10% in lambs and coccidiosis causes large economic losses (Soulsby, 1986). Fourteen species of *Eimeria* have been detected in sheep, the clinically most important species being *E. ovinoidalis*, *E. parva* and *E. ahsata* (Levine, 1985; Levine and Ivens, 1986).

There have been some studies on ovine coccidiosis in Turkey (Sayin *et al.*, 1986; Güler *et al.*, 1990; Küçükerden and Dumanli, 1992; Demir, 1995), but none in the northeastern region of Turkey, which has very different climatic and geographic conditions from the other regions. It is very cold and dry in winter and has a temperate climate (warm and rainy) during the summer season. The sheep are therefore grazed on the pasture from April to November. The aim of this study was to determine the prevalence and intensity of infection with coccidia in various age groups of sheep in Kars district of Turkey.

MATERIALS AND METHODS

Faecal samples were collected from 12 different locations in Kars province. The faecal samples were taken every month from one settlement over one year between February 1997 and January 1998. The animals were divided into three groups, namely young (less than 6 months old), immature (6–12 months old) and adult (over 12 months old) sheep. Animals were chosen randomly from each sheepfold. The faecal samples were collected directly from the rectum of each sheep and stored at 4°C until examined.

First, the faecal samples were examined by the procedure of flotation with saturated salt solution. The number of coccidian oocysts per gram (opg) was then determined for each infected sample by a modified McMaster technique. The minimum number of detectable oocysts was 50 per gram (see Table IV). Also, the coccidia in each infected faecal sample was sporulated at 27°C in 2.5% potassium dichromate (MAFF, 1986). They were then identified on the basis of the morphological characteristics of the oocysts and sporocysts (Joyner *et al.*, 1966; Pellerdy, 1974; Levine, 1985; Levine and Ivens, 1986).

Statistical analysis

Statistical evaluation of the results was done using Student's *t*-test (Kabukçu, 1994).

RESULTS

Based on the groups of age and season, the prevalence of coccidiosis in the sheep is shown in Table I. Coccidial oocysts were not detected in only 36 (6.1%) out of 592 sheep. The rate of infection was significantly higher ($p < 0.01$) in the young and immature sheep than in adult sheep. The prevalence of mixed infections is shown in Table II. Mixed infections were common (71.5%) and most sheep contained two or three different *Eimeria* species (53.2%).

TABLE I
The prevalence of coccidian oocysts in sheep in Kars province by age and season

Season	Under 6 months		6–12 months		Over 12 months		Total	
	x	*n* (%)	*x*	*n* (%)	*x*	*n* (%)	*x*	*n* (%)
Spring	28	28 (100.0)	8	8 (100.0)	82	77 (93.9)	118	113 (95.8)
Summer	112	109 (97.3)	–	–	53	47 (88.7)	165	156 (94.6)
Autumn	–	–	105	100 (95.2)	68	60 (88.2)	173	160 (92.5)
Winter	–	–	63	62 (98.4)	73	65 (89.0)	136	127 (93.4)
Total	140	137 (97.9)	176	170 (96.6)	276	249 (90.2)	592	556 (93.9)

x, number of samples examined; *n*, number and percentage of samples diagnosed positive

The prevalence of the 10 *Eimeria* species identified is given in Table III. The mean values for opg in coccidia infected animals are shown in Table IV. Oocyst counts per gram were higher ($p < 0.01$) in lambs under 6 months of age than in other groups.

No clinical cases of coccidiosis were observed.

TABLE II
Numbers of sheep with single or mixed infections of different *Eimeria* spp.

	No. of *Eimeria* spp. present							
	1	2	3	4	5	6	7	8
No. of infected sheep	133	187	128	64	27	11	4	2
Percentage	22.5	31.6	21.6	10.8	4.6	1.9	0.7	0.3

TABLE III
The prevalence of *Eimeria* species in sheep of different ages in Kars province

Eimeria species	Under 6 months		6–12 months		Over 12 months		Total	
	x	*n* (%)	*x*	*n* (%)	*x*	*n* (%)	*x*	*n* (%)
E. ovinoidalis	71	(51.8)	95	(55.9)	99	(39.8)	265	(47.7)
E. bakuensis	95	(69.3)	90	(52.9)	74	(29.7)	259	(46.6)
E. parva	62	(45.3)	65	(38.2)	79	(31.7)	206	(37.1)
E. granulosa	14	(10.2)	43	(25.3)	97	(39.0)	154	(27.7)
E. ahsata	52	(38.0)	36	(21.2)	43	(17.3)	131	(23.4)
E. pallida	46	(33.6)	55	(32.4)	28	(11.2)	129	(23.2)
E. faurei	47	(34.3)	21	(12.4)	16	(6.4)	84	(15.1)
E. intricata	39	(28.5)	31	(18.2)	7	(2.8)	77	(13.9)
E. crandallis	14	(10.2)	41	(24.1)	21	(8.4)	76	(13.7)
E. punctata	5	(3.7)	4	(2.4)	4	(1.6)	13	(2.3)

n, number of samples diagnosed positive

TABLE IV
Mean($\pm$SD) oocyst counts per gram (opg) in sheep of different ages

Under 6 months	6–12 months	Over 12 months	Overall
9529 ± 1502 (50–117 600)	2774 ± 255 (50–25 200)	568 ± 48 50–5800)	3451 ± 409 50–117 600)

DISCUSSION

The prevalence of coccidiosis in sheep in Kars province (Table I) was higher than that in some earlier studies (Varghese and Yayabu, 1985; Sayin *et al.*, 1986; O'Callaghan *et al.*, 1987; Maingi and Munyua, 1994). However, coccidian oocysts were found in 94.8% of lambs in Elaziğ province (Güler *et al.*, 1990) and the prevalence of infection in lambs was close to that recorded by Küçükerden and Dumanli (1992).

Fourteen *Eimeria* species have been reported from sheep worldwide (Levine and Ivens, 1986). However, only nine *Eimeria* species were identified from sheep in different regions of Turkey in previous studies (Sayin *et al.*, 1986; Güler *et al.*, 1990; Küçükerden and Dumanli, 1992; Demir, 1995). In this study, *E. punctata* is reported in sheep for the first time in Turkey. The most prevalent species were *E. ovinoidalis*, *E. bakuensis* (*E. ovina*) and *E. parva*, respectively. Previously reported species such as *E. weybridgensis* (Gregory *et al.*, 1980; Amarante and Barbosa, 1992), *E. marsica* and *E. gonzalezi* (Levine and Ivens, 1986) were not detected. Although *E. crandallis* was reported to be the most prevalent species in Southern Australia (O'Callaghan *et al.*, 1987), England (Joyner *et al.*, 1966) and Tanzania (Kusiluka *et al.*, 1996), its prevalence was quite low in Kars province (13.7%).

Mixed infections with different *Eimeria* species are widespread (Joyner *et al.*, 1966). Some other researchers have reported that mixed infections with three or four *Eimeria* species are more common than infections with a single *Eimeria* species (Gregory *et al.*, 1980; O'Callaghan *et al.*, 1987; Da Silva and Miller, 1991).

The mean opg in infected animals of 3451 is compatible with the results of the other studies (Küçükerden and Dumanli, 1992; Maingi and Munyua, 1994; Kusiluka *et al.*, 1996). However, the mean opg in young sheep was higher than that in another study in Turkey (Güler *et al.*, 1990).

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Especies de coccidios en ovejas en la provincia de Kars en Turquía

Resumen – Se detectó la presencia de coccidios en las heces de 556 ovejas de un total de 592 (93,9%) en la provincia de Kars. La prevalencia de coccidiosis fue significativamente mas alta ($p < 0.01$) en animales jóvenes (97,9%) e inmaduros (96,6%) que en animales adultos (90,2%). Las infestaciones por más de una especie fueron comunes (71,5%). Se diagnosticaron diez especies de *Eimeria*. Estas especies (y su prevalencia) fueron las siguientes: *Eimeria ovinoidalis* (47,7%), *E. bakuensis* (*E. ovina*) (46,6%), *E. parva* (37,1%), *E. granulosa* (27,7%), *E. ahsata* (23,4%), *E. pallida* (23,2%), *E. faurei* (15,1%), *E. intricata* (13,9%), *E. crandallis* (13,7%) y *E. punctata* (2,3%). *Eimeria punctata* se describe en ovejas en Turquía por primera vez en este trabajo. El recuento medio de ooquistes por animal fue de 3451 ± 409 OPG (rango entre 50 y 117 600). La media fue mas alta (9529 ± 502) en animales jóvenes. Las diferencias en el recuento entre animales jóvenes, inmaduros y adultos fueron estadísticamente significativas ($p < 0.01$). Sin embargo, no se registró ningdn caso de coccidiosis clínica.

Especes de coccidies observées chez des moutons de la province de Kars en Turquie

Résumé – Des coccidies furent détectées dans les fécès de 556 moutons de la province de Kars, sur un total de 592 animaux (93,9). La prévalence de l'infection fut de façon significative plus élevée chez les jeunes animaux (97,9%) et chez les moutons pré-adultes (96,6%) que chez les animaux adultes (90,2%). Des infections multiples furent observées chez la majorité des animaux (71,5%). 10 espèces d'*Eimeria* furent identifiées. Ces espèces (ainsi que leur prévalence) furent: *Eimeria ovinoidalis* (47,7%), *E. bakuensis* (*E. ovina*) (46,6%), *E. parva* (37,1%), *E. granulosa* (27,7%), *E. ahsata* (23,4%), *E. pallid*a (23,2%), *E. faurei* (15,1%), *E. intricata* (13,9%), *E. crandallis* (13,7%) et *E. punctata* (2,3%). C'est la première fois qu' *E. punctata* est observée chez des moutons de Turquie. Le nombre d'oocystes par animal infecté fut de $3\,451 \pm 409$ OPG (variant de 50 à 117 600). Cette valeur fut plus élevée chez les jeunes animaux ($9\,529 \pm 502$). Les différences entre les trois groupes d'âge furent statistiquement significatives ($p < 0{,}01$). Cependant aucun cas de coccidiose ne fut enregistré.