

The Frequency of Eimeriidae Species in the Domestic Geese in Kars Province of Turkey

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Summary. This study was designed to determine the prevalence of coccidia species in the domestic geese (*Anser anser domesticus*) in Kars province, Turkey. The study involved 400 randomly selected geese of different age and localities. The faecal samples were collected between May and October, 2001 from the cloaca of individual animals. The samples were examined by using saturated salty water flotation technique. OPG (oocysts per gram of faeces) counts in faecal samples containing oocysts were calculated by modified McMaster technique. The sporulation of coccidia oocysts was done in potassium dichromate solution at 27°C. Coccidian oocysts were detected in 80.8% of the samples and seven different species of Eimeriidae were identified. The species identified in this study were *Tyzzzeria parvula* (81.7%), *Eimeria anseris* (11.2%), *E. fulva* (16.7%), *E. hermani* (13.3%), *E. nocens* (2.8%), *E. stigmosa* (31.6%), and *E. truncata* (37.8%). The OPG counts in infected geese ranged from 100 to 144 000. The rate of mixed infections was 64.4% and that of pure infection was 35.6%. The rate of mixed infections caused by two different coccidia species was 43%. During this study, necropsies were performed on 32 goslings that died of clinical diarrhea. Endogenous developing forms (meronts, gamonts) of coccidia species were seen in the intestine of 21 (65.6%) geese. Of these, 5 (5/21) had characteristic lesions of intestinal coccidiosis. Examination of kidneys revealed endogenous developing forms of *E. truncata* in the tubulus of 4 goslings (4/21).

Key words: Eimeriidae, geese, Kars, Turkey.

Abbreviations: OPG - oocysts per gram of faeces.

INTRODUCTION

Coccidiosis is an important protozoan disease of domestic animals. The disease is manifested by severe symptoms such as diarrhea, dehydration, and deaths in young animals (Mimioğlu *et al.* 1969, Levine 1985).

Although coccidiosis has frequently been reported in the domestic geese, information on its clinical characteristics and economic importance is limited (Soulsby

1986). Two types of coccidiosis, intestinal and renal coccidiosis, are described in geese. Renal coccidiosis caused by *Eimeria truncata* (Railliet and Lucet, 1891) Wasielewski, 1904 is widespread throughout the world. It is commonly reported in goslings between 3 weeks to 3 months old and causes high morbidity and mortality (Mimioğlu *et al.* 1969, Gajadhar *et al.* 1983a), which reaches up to 100% in goslings in acute episodes (Tolgay 1973, Soulsby 1986).

Eimeria anseris Kotlán, 1933, *E. kotlani* Gräfner and Graubmann, 1964, *E. nocens* Kotlán, 1933, *E. stigmosa* Klimeš, 1963 and *Tyzzzeria parvula* Klimeš, 1963 are the most common species involved in intestinal

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coccidiosis of geese. Additionally, experimental infections have been induced by coccidia species of wild geese such as *E. fulva* Farr, 1953, *E. hermani* Farr, 1953, *E. magnalabia* Levine, 1951 and *E. striata* Farr, 1953 (Pellérdy 1974, Gajadhar *et al.* 1983a, Levine 1985).

Merdivenci (1983) reported *Eimeria anseris* and *E. truncata* in the domestic geese in Turkey, but there is no detailed study addressing to the infection rate and epidemiology of coccidiosis. Six percent (107000/1795000) of the total geese population of Turkey is raised in the Kars province (Anonymous 1999). Geese rearing is most often performed as a small family enterprise and constitutes a very important portion of meat production, which plays a role in the economy of the province.

This study was therefore carried out to determine the frequency of Eimeriidae species in the domestic geese in Kars, Turkey.

MATERIALS AND METHODS

The study animals were randomly (simple lottery) selected from clinically healthy geese (*Anser anser domesticus*) from different localities in Kars, Turkey. Visits were made between May and October, 2001 to collect samples from the geese of different age. In total, 400 faecal samples were taken from the cloaca of geese and goslings individually.

Faecal samples were examined for the presence of coccidia oocysts by centrifugal flotation technique using saturated salty water solution. A modified McMaster technique was used to determine OPG (oocysts per gram of faeces) counts in samples positive for coccidia oocysts. The coccidia oocysts were sporulated in 2.5% (w/v) potassium dichromate solution in Petri dishes at 27°C (Mimioğlu *et al.* 1969, MAFF 1986). The identification of coccidia species was made as previously described (Pellérdy 1974, Gajadhar *et al.* 1983a, Hiepe 1983, Levine 1985, Chauve 1988, Rommel *et al.* 1992).

Necropsies were carried out on goslings that died of severe diarrhea of 32 geese. Intestines and kidneys were preserved in 10% formalin solution. Sections were taken from these tissues in 5 µm thickness and stained with hematoxylin and eosin.

Statistical analysis of the data was performed using Epi - info 6.0. A Yates' corrected chi-squared test was used to compare the differences between proportions (Dean *et al.* 1994). A probability of $P < 0.05$ was accepted as statistically significant.

RESULTS

The prevalence of Eimeriidae species was found to be 80.8% (323/400) in the domestic geese raised in

Kars. The infection rate with coccidia species in different localities and age groups are given in Table 1. There was no statistically significant difference in the total infection rate in different age groups ($P = 0.18$) and localities ($P = 0.4$).

Seven Eimeriidae species were identified in this study. The most prevalent species was *Tyzzeria parvula* (81.7%, 264/323) (Table 2). The distribution of Eimeriidae species in different age groups is shown in Table 2.

OPG counts were determined and results were given in Table 3. OPG numbers were less than 5001 in 65.6% (212/323) of the geese. The comparison between age groups according to OPG counts revealed that number of animals with < 1000 OPG was significantly higher in the group aged between 5-6 month than the others ($P < 0.001$), while the proportion of animals with 10001-25000 OPG was significantly higher in the 1-2 months group ($P = 0.028$). No significant difference was noted in other groups and OPG counts.

Mixed infections were 64.4% (208/323) and infection with single coccidia species was 35.6% (115/323) in this study. The rate of mixed infections caused by two different coccidia species was 43%. The maximum number of Eimeriidae species present in a sample was 7. However, the maximum numbers of oocyst species found was 1 or 2 (Table 4).

Coccidia oocysts identified in this study are shown in Figs 1-7.

The endogenous developing forms (meronts, gamonts) of coccidia species were found in the intestines of 21 of 32 necropsied goslings. Of these, 5 (5/21) had oedematose and hyperemic intestinal mucosae, and the intestinal content was watery and brownish red. Microscopically, hyperemic vessels, epithelial desquamates, and endogenous forms of coccidia in lamina propria (Fig. 8) and epithelial cells of the intestinal villi were seen. Macroscopic lesions were not observed in the kidneys. Histological examination of the kidneys revealed tubular nephrosis and tubular necrosis. Endogenous developing forms of *E. truncata* were also encountered in the epithelium of the renal tubules of 4 (4/21) goslings (Fig. 9). Furthermore, the tubules were dilated up to 3-4 times of the normal size.

DISCUSSION

No detailed study was previously carried out on coccidiosis in the domestic geese in Turkey. In a previous study conducted by Merdivenci (1983) in Turkey the

Table 1. The infection rate (% in brackets) with coccidia species in the domestic geese according to localities and age groups

Locality	n	x	1-2 months		3-4 months		5-6 months	
			n	x	n	x	n	x
Paşacıyırı	52	38 (73.1)	5	5 (100)	-	-	47	33 (70.2)
Akçakale	35	29 (82.9)	35	29 (82.9)	-	-	-	-
Aynalı	55	45 (81.8)	42	34 (81.0)	13	11 (84.6)	-	-
Doğruyol	32	28 (87.5)	21	19 (90.5)	11	9 (81.8)	-	-
Merkez	30	24 (80.0)	23	18 (78.3)	-	-	7	6 (85.7)
Akçalar	60	51 (85.0)	25	21 (84.0)	35	30 (85.7)	-	-
Arpaçay	60	52 (86.7)	-	-	60	52 (86.7)	-	-
Çalabaş	40	31 (77.5)	-	-	40	31 (77.5)	-	-
Borluk	36	25 (69.4)	36	25 (69.4)	-	-	-	-
Total	400	323 (80.8)	187	151 (80.8)	159	133 (83.7)	54	39 (72.2)

n-number of samples examined; x - number and percentage of samples diagnosed positive

Table 2. The distribution (% in brackets) of Eimeriidae species according to age groups

Age	x	<i>Tyz. parvula</i>	<i>E. anseris</i>	<i>E. fulva</i>	<i>E. hermani</i>	<i>E. nocens</i>	<i>E. stigmosa</i>	<i>E. truncata</i>
1-2 months	151	116 (76.8)	9 (6.0)	24 (15.9)	25 (16.6)	4 (2.7)	36 (23.8)	46 (30.5)
3-4 months	133	114 (85.7)	17 (12.8)	22 (16.5)	4 (3.0)	2 (1.5)	40 (30.1)	70 (52.6)
5-6 months	39	34 (87.2)	10 (25.6)	8 (20.5)	14 (35.9)	3 (7.7)	26 (66.7)	6 (15.4)
Total	323	264 (81.7)	36 (11.2)	54 (16.7)	43 (13.3)	9 (2.8)	102 (31.6)	122 (37.8)

E. - *Eimeria*; *Tyz.* - *Tyzzeria*; x - number of infected animals

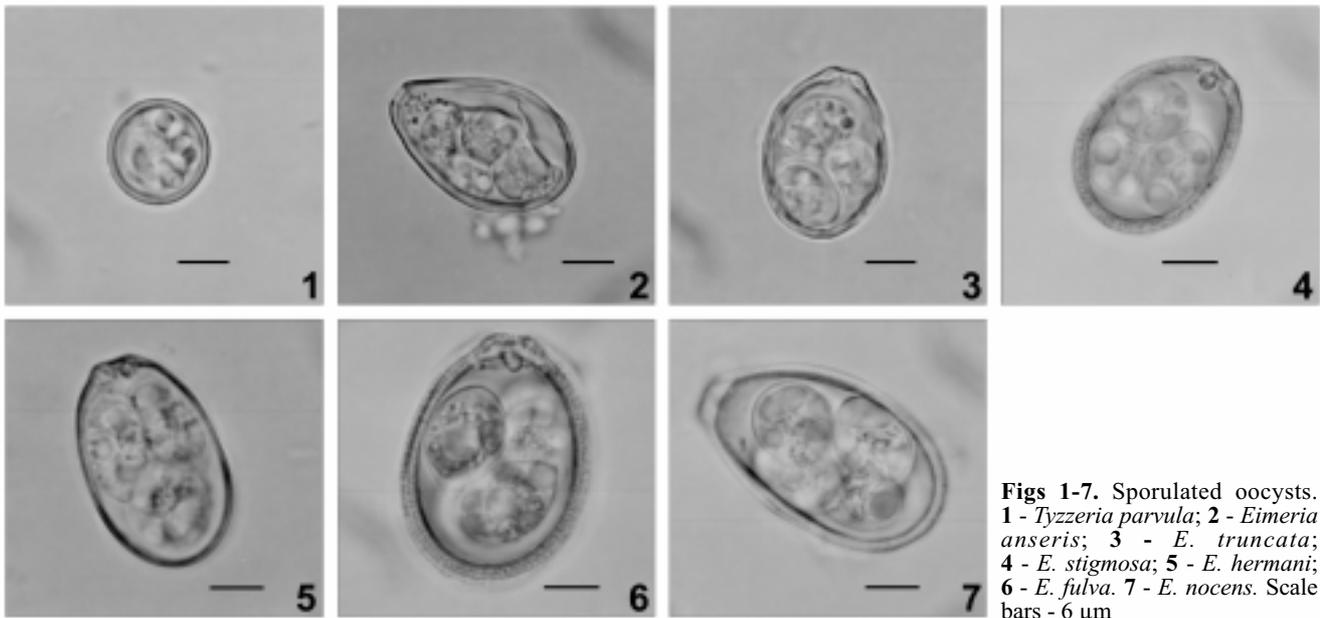
Table 3. The dispersion of the number (% in brackets) of infected animals according to OPG counts and age groups

Age	OPG < 1000	1000-5000	5001-10000	10001-25000	25001-50000	> 50000	Total
1-2 months	31 (20.5)	58 (38.4)	18 (11.9)	27 (17.9) ⁺	10 (6.6)	7 (4.6)	151
3-4 months	41 (30.8)	50 (37.6)	17 (12.8)	15 (11.3)	5 (3.8)	5 (3.8)	133
5-6 months	23 (59.0) [*]	9 (23.1)	3 (7.7)	1 (2.6)	1 (2.6)	2 (5.1)	39
Total	95 (29.4)	117 (36.2)	38 (11.8)	43 (13.3)	16 (5.0)	14 (4.3)	323

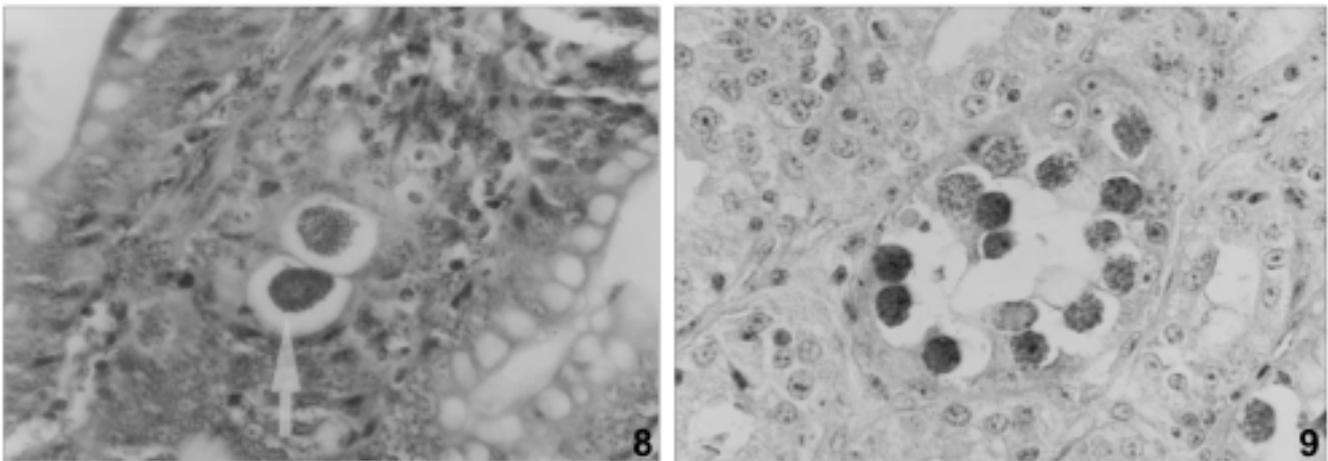
OPG - oocyst per gram of faeces; * P<0.001; + P=0.028

Table 4. The number of Eimeriidae species prevalent in individual goose faecal samples

No. of Eimeriidae species present in faecal samples	1	2	3	4	5	7
Percentage of 323 faecal samples	35.6	43.0	15.8	4.3	0.9	0.3



Figs 1-7. Sporulated oocysts. 1 - *Tyzzeria parvula*; 2 - *Eimeria anseris*; 3 - *E. truncata*; 4 - *E. stigmosa*; 5 - *E. hermani*; 6 - *E. fulva*. 7 - *E. nocens*. Scale bars - 6 μ m



Figs 8, 9. 8 - intestine of goose with meronts in lamina propria; 9 - kidney of goose with gamonts in tubular epithelial cells. H&E, x 400

Eimeriidae species (*Eimeria anseris* and *E. truncata*) were the only species encountered in the domestic geese. The prevalence of coccidia species, the different species of Eimeriidae, and OPG counts in domestic geese in Kars were investigated in this study. Domestic geese population of the Kars province increase from May to November. Goslings are usually fed on pasture and slaughtered in winter months except for breeding geese. This study was carried out between May and October. Because, the disease is very important in young animals in these months.

Tyzzeria parvula, *Eimeria anseris*, *E. fulva*, *E. hermani*, *E. nocens*, *E. stigmosa*, and *E. truncata* were identified in the domestic geese in Kars. These were similar species identified in domestic geese in France (Chauve 1988). *Tyzzeria parvula* was the most prevalent species followed by *E. truncata* and *E. stigmosa*. *Eimeria truncata*, causative agent of renal coccidiosis, was found to be 37.8% in this study. This is similar to that reported by Gajadhar *et al.* (1983b) who found the prevalence of renal coccidiosis as 45.3% in wild geese.

Two types, intestinal and renal coccidiosis, in geese are reported (Tolgay 1973, Gajadhar *et al.* 1983a, Hiepe 1983, Soulsby 1986, Rommel *et al.* 1992). In this study, excretion rate of coccidia oocysts was 80.8% in the geese, but OPG counts were found to be low. The lower OPG counts may indicate a latent infection. It may also be due to the fact that animals were on pasture which might have hindered transmission of coccidia oocysts between the geese. However, caution should be exercised when extrapolating OPG counts in poultry species as they exhibit irregularity in time and number of excreted oocysts.

Meronts and gamonts were seen in 21 of 32 necropsied goslings. However, characteristic macroscopic and microscopic intestinal lesions were encountered in only 5 of the animals which had also typical macroscopic and microscopic lesions as described previously by other researchers (Pellérdy 1974, Gajadhar *et al.* 1983a, Rommel *et al.* 1992). Macroscopically, small whitish nodulus reported previously in the studies carried out in different countries by authors (Pellérdy 1974, Gajadhar *et al.* 1983a, Rommel *et al.* 1992) were not observed in the kidneys of necropsied geese, but meronts and gamonts of *E. truncata* were found in the kidney in 4 goslings.

It is concluded that coccidia species are very common in the domestic geese raised in Kars province, Turkey. This may imply that geese are under potential risk of developing clinical coccidiosis. It is therefore necessary to carry out further detailed studies on epidemiology of coccidiosis and experimental infections in order to understand and control the disease.

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