

**Brief Communication**

## **A study on prevalence of *Eimeria* spp. infection in camels of Tabriz region**

**Yakhchali<sup>\*1</sup>, M., Athari<sup>2</sup>, Sh.**

1. Department of Pathobiology, Faculty of Veterinary Medicine, University of Urmia, Urmia, Iran

2. PhD Student, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

Received 15 Jul 2010; accepted 10 Oct 2010

---

### **ABSTRACT**

This investigation was carried out to determine the prevalence of *Eimeria* infections and the diversity of *Eimeria* species in camels of Tabriz region. The prevalence of *Eimeria* spp. infection and the intensity of faecal oocysts were determined in 164 camels using floatation and sporulation techniques. Faeces of 34 camels (20.73%) were infected with four *Eimeria* species including *E. bactriani* (52.42%), *E. cameli* (19.31%), *E. pellerdyi* (15.68%) and *E. dromedarii* (12.59%). Of infected animals, mixed infection was at most with four *Eimeria* species in 10.54% of camels. There was a significant difference between the prevalence of *Eimeria* infection in camels among different age groups ( $P<0.05$ ). Infection rate was higher in female camels (54%) with less than one year-olds. There was significant differences in the prevalence between male and female camels in all age groups ( $P<0.05$ ). It is concluded that *Eimeria* infection is a problem in camel husbandry in Tabriz region and further studies will reveal more information about economic effects of this parasite which it will be useful for establishing control programs.

**Keywords:** Prevalence, *Eimeria* spp., Camel, Tabriz

---

### **INTRODUCTION**

Old world camels and New World camels belong to the Camelidae family under the suborder Tylopoda (Wernery & Kdaden 2002). Twenty million old world camels inhabit in North and East Africa countries, and Middle and Far East countries. The camel is an economically important animal in arid and semi-arid areas of the world. The coccidia comprise of a large group of obligatory intracellular

parasites (Duszynski *et al* 1999). The coccidia genera *Eimeria* and *Isospora* both infect camels, however only *Eimeria* species were recognised as causing disease (Kaufmann 1996). Five reported *Eimeria* species have the capability to infect camels. They are intestinal parasites (Boyd 1985, Kaufmann 1996, Lewine & Ivens 1986, Yakhchali & Cheraghi 2007). Although camels are considered to be susceptible to some species of *Eimeria* described, only a few published studies are available. Camels are considered as multi purpose animals (meat,

---

\*Author for correspondence. E-mail: m.yakhchali@urmia.ac.ir

transportation, skin, and milk) especially, in north-west of Iran. Upon the annual report of Iranian Veterinary Organization (IVO) in 2004, the average population of camels was 108,000, distributed over too many flocks and camel-raising areas in Iran. Approximately 0.3% of this population is living in north-west of Iran, especially, in East Azerbaijan province. The objective of recent study was to determine the prevalence of *Eimeria* infections and *Eimeria* spp. diversity of camels of north-western Iran.

## MATERIALS AND METHODS

Over a period of one year (41 samples per season), 164 camels from small flocks in Tabriz region were randomly selected. Sample size was calculated according to Thrusfield (1997). The camels were crossbred and indigenous which reared traditionally. Fecal samples (10g per animal) were collected directly from the rectum of each examined camel. Each camel was numbered and subjected to a clinical examination. The sex and age of camels and also their faecal consistency were recorded. The age was determined on the basis of eruption of permanent incisor teeth (Smallwood 1992). A part of each fresh fecal sample (3g) was mixed with tap water (42 ml). The mixture was subjected to centrifugal sedimentation (2500 rpm for 2 minutes) and floatation technique using standard Sheather solution (Saturated sugar solution with specific gravity 1.12). The oocysts were counted by the modified McMaster technique (Kaya 2004). The intensity of infection was estimated in terms of oocysts per gram of feces. Sporulation of oocysts was performed using Hendrix procedure (Hendrix 1998). At least 100 oocysts were obtained from feces samples of infected animals for parasite's specie identification. Prevalence of mixed infections with two or more *Eimeria* spp. were estimated. The identification of *Eimeria* species was based on morphometry and morphology of oocysts, according

to Dubey and Pande (1963), Kawasmeh and Elbihari (1983) and Soulsby (1986). Statistical evaluation was undertaken using SPSS for Windows. Data were evaluated with the Chi-square test with 95% confidence interval (CI).

## RESULTS AND DISCUSSION

Of examined animals, 34(20.73%) camels were found naturally infected. Infection rate in young camel calves (<1 year-olds) was higher than old ones. Some of the infected animals showed wasting, diarrhea and debility without mucus and blood. Older camels shedding oocysts in faces did not show any symptoms of coccidiosis. There were significant differences in prevalence between different age groups ( $P<0.05$ ). The prevalence of infection in male and female camels is shown in Table1. Fourteen (14.89%) male and 17 (24.29%) female examined camels had *Eimeria* infection. Infection rate was higher in female camels (54%) with less than one year-olds. There was significant differences in the prevalence between male and female camels in all age groups ( $P<0.05$ ) (Table1).

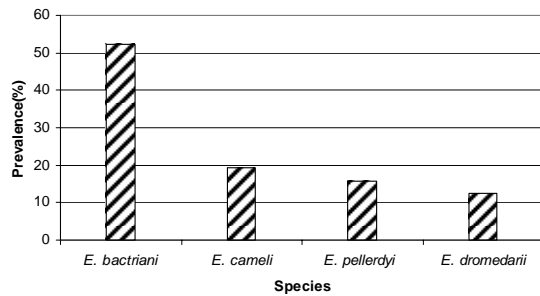
**Table1.** The prevalence of *Eimeria* infections and consistency and intensity of oocysts in naturally infected camels in Tabriz suburban.

Age (year)	<1		1-4		>4	
Sex	M	F	M	F	M	F
No. of camels	38	14	48	26	8	30
Prevalence (%)	11	54	20	33.3	0	9.19
Intensity	4(H)	8(H)	10(Mo)	9(Mo)	0	3(L)
Consistency	4(D)	7(D)+1(S)	10(S)	9(SS)	0	3(N)

M: male, F: female, N: normal, SS: semi soft, D: diarrhea, L: low opg count (<2500), Mo: moderate opg count (2500-19000), H: high opg count (>19000).

Laboratory findings showed that *Eimeria* species were prevalent parasites in gastrointestinal of the examined camels comparing to infection with eggs of helminthes. *E. bactriani* (52.42%) was the most prevalent specie. *E. cameli* (19.31%), *E. pellerdyi* (15.68%) and *E. dromedarii* (12.59%) were other

identified species with respective prevalence rate (Figure 2). Of 20.73% infected animals, mixed infection was at most with four *Eimeria* species in 10.54% of naturally infected camels.



**Figure 1.** Prevalence of *Eimeria* spp. exhibited by oocysts morphology and morphometry in camels.

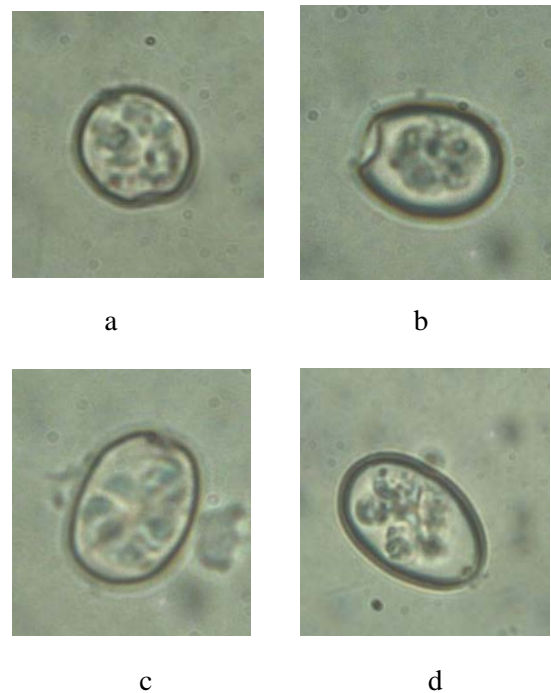
Single infection was observed in 6.12% of animals (Table2). The high prevalence and infection rate of yellow-green diarrhea in camel calves (*Camelus bactriamus*, 16%) indicated coccidiosis as the principal cause of disease (Yakhchali & Cheraghi, 2007). The prevalence of *Eimeria* infections and intensity of oocysts in naturally infected camels in this region is partially in agreement with the findings of Kawasmeh and Elbihari (1983).

**Table2.** Prevalence of mixed *Eimeria* species in naturally infected camels of Tabriz region.

Number of <i>Eimeria</i> species	Number of infected camels	Prevalence (%)
1	18	6.12
2	27	9.18
3	22	7.48
4	31	10.54

Sex and age of camels had a significant effect on prevalence. This finding is in agreement with Yakhchali and Cheraghi (2007). According to Kaufmann (1996), young camels are much more susceptible to *Eimeria* infections than adult camels. It seems that the camels among the age group of >4 year-olds with low prevalence of *Eimeria* infections

and having normal form of faeces with low opg counts served as carriers for camel calves. While nearly all animals were exposed to coccidia, some of them may not show obvious signs of disease. *E. bactriani*, *E. cameli* and *E. dromedarii* infections are common in indigenous camels in this region. The most prevalent species was *E. bactriani*, and *E. dromedarii* was the least common. These findings are in line with previous observations (Daruish & Golemansky 1993, Hussein *et al* 1987, Kasim *et al* 1985, Wei & Wong 1990, Yakhchali & Cheraghi, 2007).



**Figure 2.** Identified *Eimeria* spp. from naturally infected camel of Tabriz region (\* sporulation time) (1000×):

a. *E. bactriani* (9 days\*), b. *E. cameli* (13 days), c. *E. pellerdyi* (6 days), d. *E. dromedarii* (16 days)

In contrast, Abubakr *et al* (2000) reported that the highest prevalence rate belonged to *E. dromedarii* in camels. In previous studies by Kawasmeh and Elbihari (1983), Yagoub (1989), Kasim *et al.* (1985) and Anwar and Hayat (1999) one or more species were found (*E. dromedarii* and *E. cameli*) with an overall prevalence rate of 14% in Saudi camels, 17.4% in Sudanese camels, 41.6% in Saudi Arabian camels and 12.5% in Pakistan camels, respectively.

The two species (*E. dromedarii* & *E. cameli*) included in the present study were formerly considered pathogenic species to young camel calves (Dia *et al* 2002, Hussein *et al* 1987). Therefore, the presence of these two pathogenic species of *Eimeria* showed that coccidiosis might be contributing to the enteric syndromes affecting young camel calves in this region. Hence, the aggregation a range of age groups of camels was considered the most important factor influencing the prevalence of infection. Camel husbandry has been considered a sector of food supply for rural and sometimes urban people in this geographical region of Iran. Thus, their health status is important and epidemiological investigation on coccidia infections is useful for control purposes. From the information of recent investigation, it seems that *Eimeria* infection is a problem in camel husbandry in Tabriz suburb. Therefore, further investigations will reveal more information about economic effects of this parasite which it will be useful for establishing control programs.

### Acknowledgment

The author would like to thank the camel's owners of the region for their cooperation in the field study. Special thanks to Dr. K. Mardian for reviewing of this manuscript and Mr. E. Aghapour, Parasitology Laboratory for his technical assistance.

### References

- Abubakr, M.I., Nayel, M.N., Fadlalla, M.E., Abdelrahman, A.O., Buobeida, S.A. and Elgabara, Y.M. (2000). La prévalence de parasites gastro-intestinaux chez le chamelon est reportée pour la première fois au Bahreïn. (The prevalence of gastrointestinal parasites to the camel is put back for the first time to Bahrein). *Revue d Elevage et de Medecine Veterinaire* 53: 267-271. (in French)
- Anwar, M. and Hayat, C.S. (1999). Gastrointestinal parasitic fauna of camel slaughtered at Faisalabad abattoir. *Pakistan Journal of Biological Sciences* 2(1):209-210.
- Boid, R., Jones, T.W. and Luckins, A.G. (1985). Protozoal diseases of Camels. *British Medica Journal* 141: 87-105.
- Daruish, A.I. and Golemansky, V.G. (1993). Coccidia (Apicomplexa, Eucoccidiida) in camels (*Camelus dromedarius* L.) from Syria. *Acta Zoologica Bulgarica* 46: 10-15.
- Dia, M.L., Diop, A., Ahmed, O.M., Diop, C. and Elhacen, O.T. (2000). Diarrhées du chamelon en Mauritanie: résultats d'enquête (Diarrheas of the camel in Mauritania: results of inquires). *Revue d Elevage et de Medecine Veterinaire* 2: 149-152. (in French)
- Dubey, J.P. and Pande, B.P. (1963). On eimerian recovered from Indian camel (*Camelus dromedaries*). *Indian. Journal of Veterinary Sciences* 34: 28-34.
- Duszynski, D.W., Wilson, W.D., Upton, S.J. and Levine, N.D. (1999). Coccidia (Apicomplexa: Eimeriidae) in the Primates and the Scandentia. *International Journal of Primatology* 20: 761-797.
- Hendrix, C.M. (1998). *Diagnostic Veterinary Medicine* (2nd edn.). Mosby Publishers, Pp. 257-259.
- Hussein, H.S., Kasim, A.A. and Al-Shawa, Y.R. (1987). The prevalence and pathology of *Eimeria* infections in camels in Saudi Arabia. *Journal of Comparative Pathology* 97: 293-297.
- Kasim, A.A., Hussein, H.S. and Al-Shawa, Y.R. (1985). Coccidia in camels (*Camelus dromedarius*) in Saudi Arabia. *Journal of Protozoology* 32: 202-203.
- Kaufmann, J. (1996). *Parasitic infections of domestic animals*. Bir khauser verlog, Germany, Pp. 262-263.
- Kawasmeh, Z.A. and Elbihari, S. (1983). *Eimeria cameli* (Henry and Masson 1932) Reichenow, 1952: redescription and prevalence in the Eastern Province of Saudi Arabia. *Journal of Cornell Veterinary* 73: 58-66.
- Kaya, G. (2004). Prevalence of *Eimeria* species in Lambs in Antakya Province. *Turkish Journal of Veterinary and Animal Sciences* 28: 687-692.
- Lewine, N.D. and Ivens, V. (1986). *The coccidian parasites (Protozoa, Apicomplexa) of Artiodactyla*. University of Illinois Press, Urbana, USA. p. 65.
- Smallwood, J.E. (1992). *A guide tour of veterinary anatomy*. W. B. Saunders Company, Pp. 322-323.
- Soulsby, E.J.L. (1986). *Helminthes, Arthropods and Protozoa of Domesticated Animals*. Lea and Febiger, 8<sup>th</sup> Ed., ELBS, London, Philadelphia, Pa., Pp. 614-615.
- Thrusfield, M. (1997). *Veterinary epidemiology*. 2<sup>nd</sup> Ed., Blackwell Sciences, P. 182.

- Wernery, U. and Kdaden, O.R. (2002). Infectious Diseases in Camelids. Blackwell Sciences, Oxford, Pp. 3-17.
- Wei, J. and Wong, C. (1990). Investigation of the species of coccidia in the Bactrian camel in Mongolia. *Chinese Journal of Veterinary Medicine* 22: 23-24.
- Yagoub, I.A. (1989). Coccidiosis in Sudanese camels (*Camelus dromedarius*): First record and description of *Eimeria* spp. harbored by camels in the eastern region of Sudan. *Journal of Protozoology* 36: 422-443.
- Yakhchali, M. and Cheraghi E. (2007). Eimeriosis in Bactrian and Dromedary camels in the Miandoab region, Iran. *Acta Veterinaria* 57 (5-6): 545-552.