

## Coccidiosis due to various species of *Eimeria* in the stunted and diarrheic native turkey poults: Pathology and morphological characterization of oocysts

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Received 08 Sep 2009; accepted 16 May 2010

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### ABSTRACT

Fecal samples of 60 turkey poults that showed chronic progressive symptoms like unthriftiness, loss of weight, diarrhea were collected from the most rural areas with high rate of turkey population in north and west part of country for intestinal protozoan parasites. According to the morphological characteristics, like shape, presence or absence of micropyle, and/or polar granule, the 5 different types of eimerian oocysts were diagnosed in the stool of infected birds, including *E. adenoids*, *E. meleagridis*, *E. dispersa*, *Eimeria spp* (*E. innocua* or *E. subrotunda*) and *E. meleagrimitis*. Various life-cycle stages of *Eimeria* were identified in the epithelial lining of inflamed intestine of the affected turkey poults.

**Keywords:** Stunted and diarrheic native turkey poults, various species of *Eimeria*

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### INTRODUCTION

Currently, one of the most important and costly diseases in poultry around the world is coccidiosis. The causative agent is well-known recognized coccidian, as the genus *Eimeria*, is an intracellular parasite that invade the intestinal epithelium and causes severe damage of these cells, leading in reduction of feed conversion, body weight gain, and egg production as well as increased mortality. Their oocyst which shed through droppings could be resisting in any severe weather condition for long duration. The beginning of sporulation coincides with

oocyst infectivity. Epidemiological examination and specific diagnosis of *Eimeria* infections in particular morphometrical and biological characteristics are well known methods for prevention and control of coccidiosis, however to date the newly procedures like molecular detection may also be complementary in definite diagnosis. (Levine 1985, Matsubayashi *et al* 2009, McDougald 1998, McDougald 2003). This study was an attempt to document the coccidian infection in domestic turkeys as well as with the aim of recognizing morphological diversity, and detecting of co-infection with other protozoan parasites.

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## MATERIALS AND METHODS

**Animals.** Sixty, 1-12-week-old turkey poults (*Meleagris gallopavo*) that had one or more clinical signs like; unthriftiness, loss of weight, diarrhea, and growth retardation were collected from rural areas in north and west regions of the country. The target birds were bred free run in small groups with other species under conditions of poor nutrition and poor sanitation.

**Faecal examination.** Faecal samples were obtained from each live bird through cloacae smear preparation and examined for *Eimeria* oocysts utilizing routine saturated salt flotation method or Clayton – Lane procedure. The size of captured oocysts was measured by ocular micrometer.

**Histopathology.** After assessment of stool samples, the poults were scarified and gastrointestinal tract including duodenum, jejunum, ileum, caecum, colon and cloaca were fixed in 10% neutral buffered formalin, processed routinely, sectioned at 5  $\mu\text{m}$  and then stained with hematoxylin and eosin.

## RESULTS

Faecal examination revealed that only 6 poults from sixty examined birds were infected with *Eimeria* oocysts. This finding was consistent with those birds that evaluated for histopathological examination. According to the morphological characteristics that documented in poultry science literature, and on the basis of evidences in present study almost all of *Eimeria* species that exclusively cause infection in turkey were found (Figures 1-5). The species typing in the genus of *Eimeria* depends mainly on 1: oocyst morphology including; shape and size (The mean of length  $\times$  width) and length / width index and 2: existence or not of intrastructural constituents like micropyle and polar granule (Table 1). In histopathological study various life-cycle stages of *Eimeria* infected the covering epithelial cells whereas the glandular epithelium devoid of any



**Figure 1.** An oocyst of *Eimeria* spp (*Eimeria innocua* or *E. subrotunda*). Subspherical shape with a smooth wall, without micropyle and polar granule, Bar= 9 $\mu\text{m}$ .



**Figure 2.** An oocyst of *E. meleagrimitis*. Subspherical shape with a smooth wall and polar granule (Pg), without micropyle, Bar= 9  $\mu\text{m}$ .



**Figure 3.** An oocyst of *E. adenoides*. Oval shape with a smooth wall, polar granule (Pg), and micropyle (M), Bar= 9  $\mu\text{m}$ .



**Figure 4.** An oocyst of *E. dispersa*. Oval shape with a 1-layered smooth wall without polar granule and micropyle, Bar= 9  $\mu$ m.

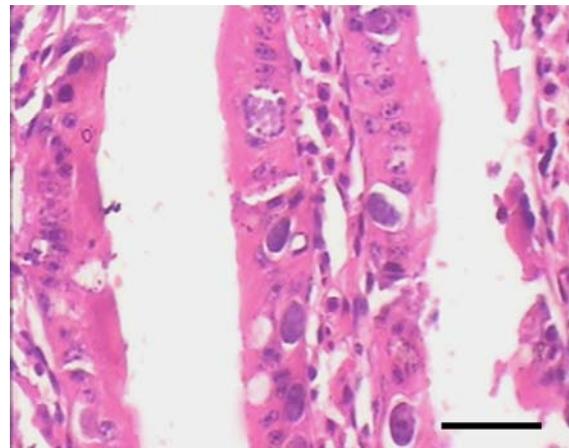


**Figure 5.** An oocyst of *E. gallopavonis* or *E. Meleagridis*. Oval shape with a smooth wall and polar granule (Pg), without micropyle, Bar= 9  $\mu$ m.

intracellular parasite, exceptionally in one bird that the protozoa was located in the lamina propria. The coccidian life cycle stages, contained of trophozoite, schizont, macrogamete and oocyst distributed from duodenum to colon (Table 2). There is also mild to moderate an infiltrate of various types of inflammatory cells (majority lymphocytes) in lamina propria and different stages of the protozoan life cycle were seen in the epithelial lining of the intestine (Figure6).

## DISCUSSION

Both morphological structure and biological behavior are useful in differentiation of *eimeria* species. Although endogenous and exogenous stages



**Figure 6.** A tissue section from the intestine in the turkey poults with coccidiosis. Various stages of *Eimeria* life cycle including developing trophozoites and a

of the life cycle is most commonly used in recognition of species, but because the endogenous stages in some species is poorly known therefore, individual features of oocysts that conveniently obtained from alive birds are more valuable in their definite diagnosis. Based on morphological studies of oocysts, *E. adenoids*, *E. meleagridis*, *E. meleagrimitis*, and an *Eimeria spp* were identified. The morphological characteristics of above mentioned *Eimeria spp* are compatible to those described for *E. innocua* or *Eimeria subrotunda*. Nevertheless, for definite diagnosis and differentiation of the two species, molecular methods could be fruitful. Furthermore the location of parasites in the host is helpful to differentiate of species (Levine, 1985). To date, no study has reported the prevalence of *Eimeria* infections in turkey in Iran. However it must be considered that coccidiosis in birds may be has a potentially role as primary or together with other infectious diseases affecting productivity and economic crisis (Matsubayashi *et al* 2009). The results of several studies showed that emerging of coccidiosis is highly affected by factors like climatic changes, hygienic conditions, insufficient feeding, immunity and poor management (Cornelissen *et al* 1995). This study revealed, 6 individual poults that

**Table 1.** Morphological characteristics of various *Eimeria* oocysts in the diseased turkey poullts.

Characteristics	Shape	length × width (average in μm)	Index length/widht h	Micropyle	Polar granule
<i>E. adenoides</i>	ovoid	26.1×17.4	1.50	+	+
<i>E.spp</i> ( <i>E. meleagridis</i> or <i>E.gallopavonis</i> )	ovoid	27.5×18.8	1.46		+
<i>E. dispersa</i>	ovoid	26.4×19.4	1.14		
<i>E.spp</i> ( <i>E .innocua</i> or <i>E. subrotunda</i> )	sub spherical	23.2×20.3	1.14		
<i>E. meleagrimitis</i>	sub spherical	20.3×19.7	1.03		+

**Table 2.** Localization of the lesions and life-cycle stages in the affected turkey poullts.

no.	Tissue				
	Duodenum	Jejunum	Ileum	Cecum	Colon
1	+	+	+		
2	+	+	+		
3		+	+		+
4		+			
5		+	+	+	
6			+		

harbored *Eimeria* oocysts in their intestinal tracts were grazed in the north part of country indicating that the climatic condition of these regions like temperature and moisture are desirable for spread of coccidiosis. In contrast to coccidiosis in poultry that eosinophils infiltrating in large numbers to the lamina propria, in our study none of the infected intestines were invaded by eosinophils. One of the striking discrepancies of oocyst structure among the poultry is lack of residual body in those *Eimeria* that host specified in turkeys.

#### Acknowledgment

The authors wish to thank University of Tehran for financial support of the project.

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