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Giardia psittaci and *Eimeria dunsingi* in Budgerigar Colonies

Muhabbet Kuşu Kolonilerinde Giardia psittaci ve Eimeria dunsingi

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Abstract: Severe diarrhea, ruffled feathers and lack of appetite were diagnosed in a budgerigar flock and totally 35 birds had died within last 2 weeks. Birds were captived in two rooms and there was a corridor separating them. Fresh faecal samples collected from both of sections. Native method and zinc sulphate flotation methods were used to diagnose *Giardia* sp. and *Eimeria* sp., respectively. After examination, *Giardia psittaci* was diagnosed in 8 of 10 samples from one section and *Eimeria dunsingi* was diagnosed in 7 of 23 samples from another section. Birds with giardiasis treated with metronidazole for 5 days (800 mg/L) in drinking water and birds with coccidiosis treated with toltrazuril 1.5 ml for 1 lt, 2 days by in drinking water.

The purpose of this study was to determine the treatment of *Giardia* and *Eimeria* infections in budgerigars and prophylaxys in Turkey.

Key words*:* Budgerigar, *Eimeria dunsingi*, *Giardia psittaci*, treatment.

Öz: Bir muhabbet kuşu sürüsünde şiddetli ishal, kabarmış tüyler ve iştahsızlık problemleri teşhis edildi ve son 2 haftada 35 kuş ölmüştü. Kuşlar bir koridorun ayırdığı iki ayrı odada besleniyorlardı. Her iki bölümden de taze dışkı örnekleri toplandı. *Giardia* sp. ve *Eimeria* sp. teşhisi için sırasıyla natif ve çinko sülfat flotasyon metotları kullanıldı. Muayene sonrasında, bir bölümden alınan 10 numunenin 8'inde *Giardia psittaci* teşhis edilirken, diğer bölümden alınan 23 örneğin 7'sinde ise *Eimeria dunsingi* teşhis edildi. Giardiasis görülen kuşların içme sularına 5 gün boyunca 800 mg/L dozunda metronidazole ve coccidiosis görülen kuşların içme sularına 2 gün boyunca 1 litreye 1.5 ml %2,5 toltrazuril eklenerek tedavi edildi.

Çalışmanın amacı Türkiye'de muhabbet kuşlarında *Giardia* ve *Eimeria* infeksiyonlarının tedavisi ve profilaksisini belgelemektir.

Anahtar sözcükler*:* Muhabbet kuşu, *Eimeria dunsingi*, *Giardia psittaci*, sağaltım.

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Introduction

Giardia spp. is a protozoan that has been reported in budgerigars (*Melopsittacus undulatus*) with morphological differences to those parasiting mammals mostly *Giardia psittaci* (Acosta et al., 2009). *Giardia* infections have been described in aviary birds (Filippich et al., 1998; Fudge and McEntree, 1986), but most reports have examined symptomatology rather than transmission potential. Although *Giardia* spp. typically found in birds, such as *G. ardeae* and *G. psittaci*, it does not cross the host class boundary (Erlandsen et al., 1991; Filippich et al., 1998) and, some *G. duodenalis-like organisms* observed in birds (Gallagher et al., 1995) do warrant further consideration. Diagnosis can be made by visualizing the trophozoites on a direct fecal smear or by a positive *Giardia* antigen ELISA test. Treatment involves the administration of metronidazole (Greenacre, 2003).

Coccidiosis is a disease caused by parasites of the genus *Eimeria* and *Isospora* belonging to the phylum Apicomplexa with a complex life cycle, affecting mainly the intestinal tract of many species of mammals and birds (Peek and Landman, 2011). The disease can cause hemorrhagic diarrhea, depression, emaciation, weight loss and sometimes death (Hiepe and Jungman, 1983; Levine, 1985; Mimioglu et al., 1969). Species of *coccidial* agents that diagnosed in aviary birds are *Eimeria dunsingi*, *E. haematodi*, *Isospora psittaculae*, *I. serini* and *I. lacazei* (Black et al., 1997; Inci, 2001; Ritchie et al., 1994). For diagnosis faeces collected from live birds or at necropsy can be examined directly for oocysts or by first concentrating oocysts by flotation using standard zinc sulphate or Sheather's sugar (Yabsley, 2008).

Materials and Methods

Twelve budgerigars from a group of 210 animals were brought to the Veterinary Medical Teaching Hospital from a breeding budgerigars flock in Burdur province with diarrhea, ruffled feathers and lack of appetite. The breeding flocks were visited by the veterinarian of the Veterinary Teaching Hospital of the Faculty of Veterinary Medicine, University of Mehmet Akif Ersoy.

Birds were captived in two separate rooms and there was a corridor between them. In one of the rooms (2x3 m² approximately) nearly half of the birds (n= 110) were bred free. These birds were aged between 6-10 months. In the other room, rest of the birds (n= 100) were placed in small cages individually as pairs and they were between 1-2 years old. However, in both sections mice were seen and their nest box contained excessive loose

droppings and not given importance to hygiene rules. Also an aquarium was used to create moisture.

According to the history taken from the owner, the birds suffered from the disease and totally 35 birds had been died within last 2 weeks (22 birds from free room and 13 birds from cages). Fresh faeces samples collected from both of rooms and numbered same with cage numbers. Samples from free breeding room defined as "free room". Twenty three of caged room and 10 of free room (in total 33) fresh faeces samples were collected for parasitological examination.

All faecal samples were examined by native technique and centrifuge flotation method in $ZnSO_4$ solution for initial diagnosis (MAFF, 1986). After examination a solution of 2.5% potassium dichromate was added to the faeces containing oocysts and mixed to homogenize. This mixture was filtered and stored in a petri dish at room temperature for sporulation. Identification of the oocyst was made according to morphological characteristics (Inci, 2001; Levine and Ivens, 1986). Direct smear examination were conducted from faecal samples containing *Giardia* cysts and trophozoites under the microscope after stained by Giemsa.

Results

After examination, *Giardia psittaci* was diagnosed in 8 of 10 samples from "free room" and *Eimeria dunsingi* was diagnosed in 7 of 23 samples from numbered cages. After completed sporulation, the morphological characteristics of oocysts and sporocysts were identificated. According to this, the oocysts were distinctly ovoid and outer layer were colourless or slight brown, inner layer were colourless or slight blue. They were measured at 25 to 33 µm. Sporulated oocysts were 12.5 to 15 x 7.5 to 10 µm in diameter (mean 14 x 9 µm). The sporocysts contained two sporozoites arranged head-to-tail. The sporozoite nuclei were located centrally next to a single large refractile granule. According to this data, only one *Eimeria* spp. was diagnosed in birds and it was very pathogenic *Eimeria dunsingi* (Figures 1 and 2).

Trophozoites and cysts of *Giardia* species were detected in the same faecal samples. Cysts of parasites can be seen particularly with native preparations. However nucleus and parts of non-resorbed filament may be visible in stained preparations.

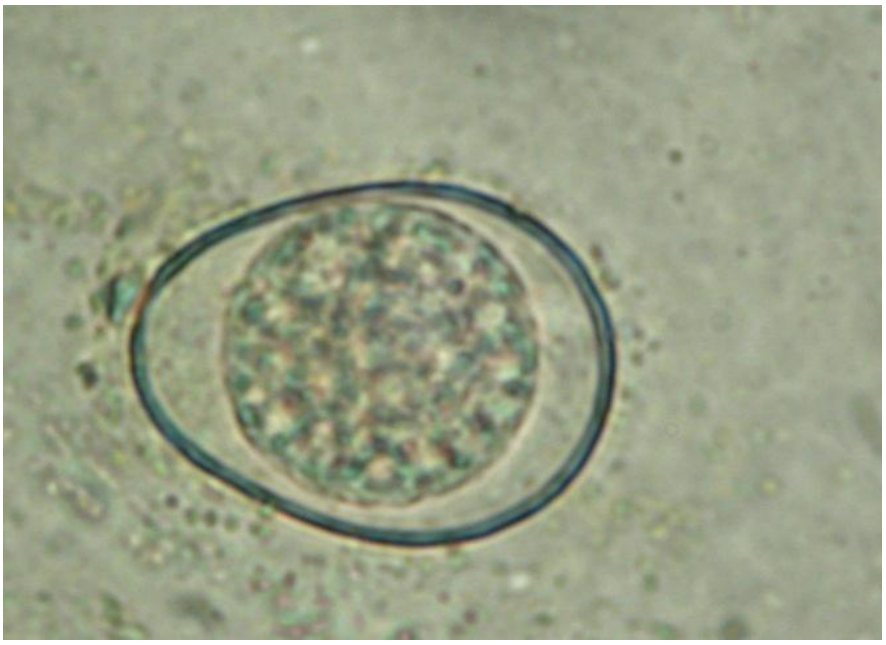

Figure 1. *Unsporulated* Eimeria dunsingi *oocyst in budgerigar*
Şekil 1. *Muhabbet kuşunda* Eimeria dunsingi*'nin sporlanmamış oocysti*

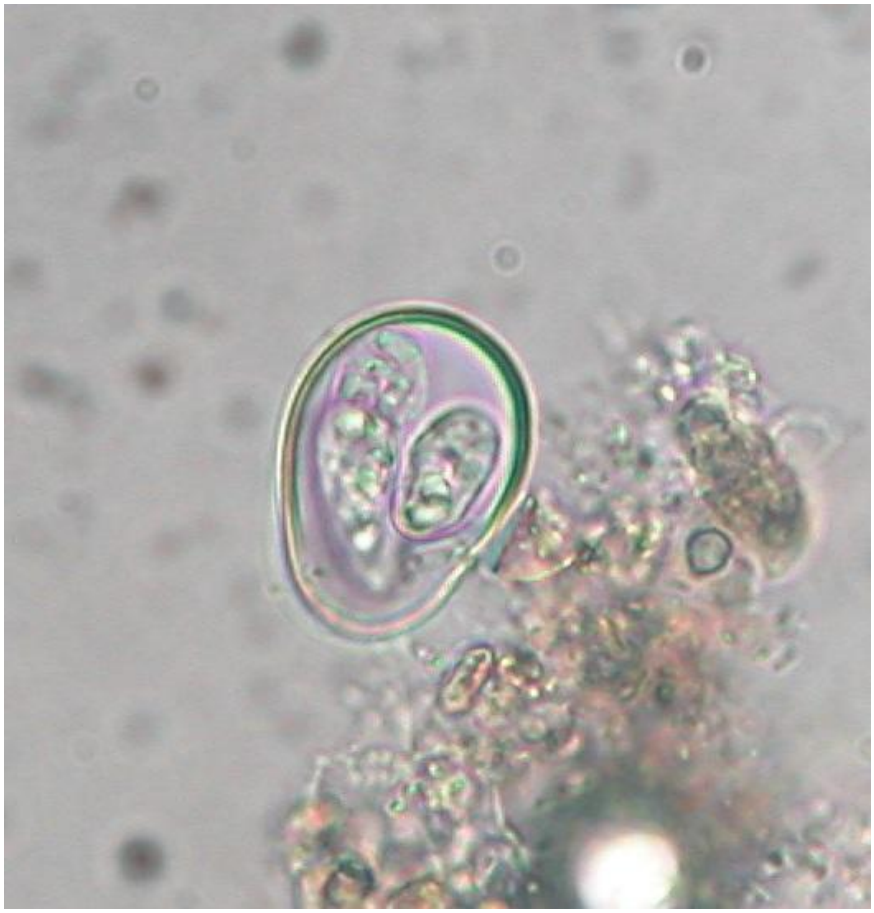

Figure 2. Sporulated *Eimeria dunsingi* oocyst in budgerigar
Şekil 2. Muhabbet kuşunda *Eimeria dunsingi*'nin sporlanmış oocysti

Cysts are elliptical with a thin and, smooth cyst wall where contain two to four nuclei, two slender, linear intracytoplasmic flagella and two thick, comma-shaped median bodies. This cyst measures 4.04-5.55 µm long, 6.06-7.57 µm wide. Trophozoites are dorsoventrally flattened, possess eight flagella, and have an adhesive disc on the ventral surface. They possess a claw-hammer-shaped median body, similar to other members of the genus. Trophozoites measures 10.1 µm to 15.15 µm long by 4.04 µm to 6.06 µm wide. *Giardia psittaci* differs with *Giardia duodenalis* of mammals by lacking a ventrolateral flange and thus having no marginal groove bordering the anterior and lateral borders of the adhesive disc.

According to these results remained birds in the free room were treated by metronidazole for 5 days (800 mg/L) in drinking water. Birds with *Eimeria dunsingi* were treated by toltrazuril 1.5 ml for 1 lt, 2 days by in drinking water.

Discussion

Giardia infections have been reported in budgerigars (*M. undulates*) associated with diarrhoea and death, especially in young birds (Box, 1981; Scholtens et al., 1982). *Giardia* infection can affect all age groups, but young birds are more susceptible and high mortalities can occur in budgerigars' nestlings. *Giardia* sp. is commonly found in the faeces of asymptomatic adult budgerigars (Panigrahy et al., 1979). Adult birds may have no signs but can continue to excrete infectious cysts (Scholtens et al., 1982). Asymptomatic birds may intermittently shed the parasite (Panigrahy et al., 1979). Many clinically affected psittacine birds are fed marginal diets, are maintained in overcrowded, hygienically unsanitary conditions or they are heavily inbred. Birds that recover from an infection are susceptible to re-infection which indicates that a long-lasting protective immune response does not occur with infection (Greiner and Ritchie, 1994). In this study more deaths occurred in free room where younger birds were there. In these birds *Giardia psittaci* was diagnosed. The results of the studies about the *Giardia* species in budgerigars are similar to our result. Therefore this parasite was called *Giardia psittaci* (Figure 3).

Birds in this section captived as free in 2x3 m^2 room that contained excessive moisture and loose droppings. In this room nearly 110 birds were maintained. Treatment with metronidazole in drinking water was effective in controlling mortality.

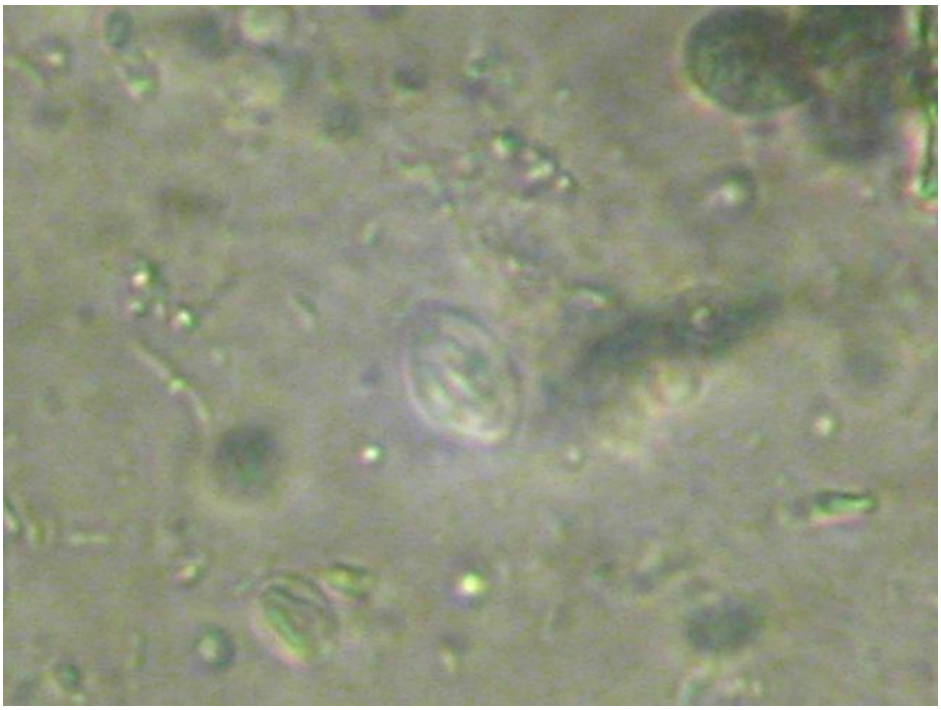

Figure 3. *Giardia psittaci* cyst in budgerigar
Şekil 3. Muhabbet kuşunda *Giardia psittaci* kisti

On the other hand in birds that were individually placed in small cages as pairs, *Eimeria dunsingi* was identified. The only coccidia known to be pathogenic for budgerigars is *E. dunsingi* (oocysts ovoid, colorless, without micropyle, 33x24µm) (Greve, 1996). *Eimeria dunsingi* is a very pathogenic *Eimeria* species and found in parrots and budgerigars. The agent localized in anterior part of the guts (Inci, 2001). Clinical coccidiosis is associated more with young birds, even nestlings, than it is with adults, which are more resistant. However, this age resistance is a relative matter, and clinical coccidiosis leading to fatalities is also known among adult birds (Greve, 1996). Preventing crowding or stress may be more effective approaches to reduce or prevent outbreaks of coccidiosis in free-ranging birds (Yabsley, 2008). In this study birds with coccidiosis were aged between 1-2 years old. They were older than birds with giardiasis. These birds were treated by toltrazuril, 1.5 ml for 1 lt, 2 days by in drinking water. Treatment with toltrazuril was also effective in controlling mortality.

To minimise faecal-oral transmission, metal wire-floored cages recommended reducing faecal access. To avoid faecal contamination, feed and water containers were elevated. Aquariums removed from both section and all areas susceptible to moisture kept dry. To avoid the crowd, the number of cages increased. For rodent control, the food sources, water, and items that provide them shelter, were removed. Holes were closed inside and

outside the rooms to prevent entry by rodents. Potential rodent food sources and nesting sites were cleaned up.

As a result, our results showed that insufficient hygiene, crowded colonies, infected feed and water containers, and poor quality food factors can play important role in budgerigar colonies' health. *Giardia psittaci* infection can occur mostly in young budgerigars, while *E. dunsingi* infection can occur in adult budgerigars. Metronidazole can be effective for treatment of *G. psittaci* and toltrazuril can be effective for treatment of *E. dunsingi* in budgerigars. After treatments, all of birds recovered and death stopped. The aim of this study is to examine parasitological findings of simultaneous infection by *E. dunsingi* and *G. psittaci* in budgerigars, treatment and prophylaxis of the disease.

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